# The New Senior Secondary Curriculum for Sierra Leone

**Subject syllabus for Geography and the Environment**
Subject stream: Social and Cultural Studies

This subject syllabus is based on the National Curriculum Framework for Senior Secondary Education. It was prepared by national curriculum specialists and subject experts.

SSSC
Senior Secondary School Curriculum

# Curriculum elements for Geography and the Environment – an applied subject

## Subject Description

This syllabus gives an introduction to understanding the environment and the effects of human activities on it. Pupils will learn to apply various concepts in the biological, physical, social sciences and humanities in order to understand the causes and consequences of environmental problems facing the world today as well as possible solutions to address them. This will enable pupils to identify and explain the patterns and diversity of the earth's environments, the interactions between human and their environment, and to develop and use local and global perspectives to environmental issues.

## Rationale for the inclusion of Geography and the Environment in the Senior Secondary School Curriculum

a) This is an important subject for senior secondary pupils in that it improves their knowledge and understanding of key aspects of the environment.
b) Pupils will develop competence and confidence in a variety of practical, problem solving and mathematical skills linked to environmental issues and the sustainable use of resources
c) Studying Geography and the Environment enables pupils to foster an awareness on the need for the sustainable use of our resources
d) Environmental education gives understanding about the current state and future prospects of nature. It enables pupils to explore all the problems related to the environment, and to engage in wise ways of preserving it.
e) Learning about the environment encourages pupils to research, to examine how and why things happen, and to make their own decisions. This in turn develops their critical, creative thinking as well as their practical skills and to enhance geographical knowledge.
f) Studying Geography and the Environment helps foster a new generation of informed consumers, workers and citizens, as well as responsible policy or decision makers.

## General learning outcomes and broad goals

By the end of the course, pupils will:

a) Have a better understanding of the environment, the services it provides, humans' perception as well as activities that bring change to the environment
b) Understand the importance of the conservation of biodiversity: resources and how sustainable habitat management strategies can be used to secure future supplies
c) Have examined various environments, their physical environment, distribution as well as the limitations of each environment as well as measures that can be used to ensure their sustainable management

d) Understand geographical phenomena and be able to follow contemporary issues affecting the environment, which will make them better citizens that can care for and advocate for the protection of the environment.
e) Have increased knowledge of resources (renewable and non-renewable), impacts of exploiting resources such as energy and mineral resources, sustainable options, and conservation measures that ensure the sustainable use of these resources
f) Have examined the consumption patterns of humans around the world and have an awareness of their per capita consumption of resources
g) Have improved their knowledge of waste generation and disposal and their awareness of sustainable waste management practices
h) Have developed an understanding of the importance of accuracy and objectivity in collecting, recording, processing, presenting, analysing and interpreting geographical data for informed decision making.

## Subject content outline (Themes and topics to be covered)

A range of themes is suggested for the following components of the syllabus:

1. The environment
2. Humans' view of the environment
3. Humans – the dominant change-agents in nature
4. Climate geography
5. Hydrology and the environment
6. Ecosystems
7. Landforms
8. Resources
9. Resource consumption and waste
10. Desert environments
11. Coastal landscapes
12. Conservation and environmental management
13. Introduction to disaster risk management
14. Mineral resources
15. Energy resources
16. Tropical rain forest environment
17. Introduction to the use of geographic information system (GIS) technology

## Structure of the Syllabus Over the Three Year Senior Secondary School cycle

| | SSS 1 | SSS 2 | SSS 3 |
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| **Term 1** | **The environment**<br>• Definitions and component services/benefits of the environment<br>**Humans' view of the environment**<br>• Environmental determinism<br>• Environmental probabilism<br>• Environmental possibilism<br>• Environmentalism<br>**Humans – the dominant change-agents in nature**<br>• Humans' contribution to climate change<br>• Desertification<br>• Pollution<br>• Environmental degradation –mudslides, flooding, erosion<br>• Changes in landforms | **Resources**<br>• Renewable and non-renewable resources<br>• Factors affecting the supply and use of resources: physical factors (climate, geology, water, soil, vegetation), human factors (technology, capital, transport, population, industry, energy/power)<br>**Resource consumption and waste**<br>• Consumption of resources – water, energy, marine and forest resources<br>• Demographic dimension of resource consumption<br>• Cultural dimension<br>• Economic dimension<br>• Over-consumption and ecological footprint<br>• Sustainable consumer behaviour<br>• Waste and types of waste<br>• Waste disposal methods<br>• Waste management | **Mineral resources**<br>• Definition and examples of mineral resources: Bauxite, iron ore, gold, aluminium, titanium, copper, salt, diamonds<br>• Benefits of mineral resources<br>• Environmental Impacts of mining- pollution, contamination of water resources, land loss, biodiversity loss<br>• Control of the environmental impacts of mineral exploitation: turbid drainage of water, spoil and leachate, Land reclamation and restoration<br>• Sustainable use of mineral resources<br>**Energy resources**<br>• Energy sources- renewable and non-renewable sources<br>• Impacts of energy systems on the environment<br>• Sustainable energy resources – Hydro-electric power (HEP), solar, windmills, geothermal |
| **Term 2** | **Climate geography**<br>• Definition of weather and climate<br>• Elements of climate and their instruments: rainfall, temperature, wind, humidity<br>• Climate change, global warming,<br>• Factors contributing to climate change<br>• Measures to mitigate climate change | **Desert environments**<br>• Distribution and characteristics<br>• Plant and animal life<br>• Classification of deserts<br>• Physical processes in desert environments: wind erosion, weathering, flash-floods<br>• Desert landforms- oasis, playa, sand dune, butte, yardangs, alluvial fans, inselberg | **Tropical rainforest environments**<br>• Distribution and climate<br>• Structure<br>• Biodiversity of tropical rain forest<br>• Importance of tropical rain forest environments<br>• Threats to tropical rain forests |

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| | **Hydrology and the environment**<br>• Hydrologic cycle<br>• ground water supply<br>• Water shortage problems<br>• Water Conservation Methods<br>• The impact of unsustainable exploitation of water resources<br>• Sustainable management of water resources | • Environmental problems: climate change, desertification, pollution<br>• Conservation measures of desert<br>**Coastal landscapes**<br>• Coastal landforms: beach, estuary, delta, sand-spit, tombolo<br>• Profile of coastal zones<br>• Waves<br>• Tides<br>• Ocean currents: the importance of thermohaline circulation in distributing heat and regulating climate | • Causes and impacts of deforestation on tropical forests<br>• Conservation measures of tropical rain forest<br>• Tropical rain forests and carbon trade |
| **Term 3** | **Ecosystems**<br>• Definition of terms: ecosystem, ecology, niche, habitat<br>• Energy flow in an ecosystem<br>• Ecosystem interactions: mutualism, commensalism, competition<br>**Landforms**<br>• Mountains, valleys, plains, karsts<br>• Volcanoes and earthquakes<br>• Prediction of earthquakes<br>• Hazard mapping techniques | **Conservation and environmental management**<br>• Biodiversity: definition, types,<br>• Importance of biodiversity<br>• Threats to biodiversity<br>• Conservation and biodiversity<br>• Sustainable natural resources management: forests, water, marine, minerals<br>**Introduction to disaster risk management**<br>• Common terminologies: disaster risk, vulnerability, early warning system, emergency services<br>• Characteristics of disaster<br>• Types of disaster<br>• Phases of disasters: mitigation, disaster preparedness, response, recovery<br>• The relationship between disasters and development<br>• Impacts of disasters on development | **Introduction to the use of geographic information system (GIS) technology**<br>• Basic concepts of GIS<br>• Components (hardware, software, data, procedures and experts)<br>• Sources of geographical data (land surveying, remote sensing, map digitizing, map scanning, field investigation and tabular data);<br>• Uses (defence, agriculture, urban development, mapping, surveying, transportation, census),<br>• Problems (power, personnel, capital) |

## Teaching Syllabus

## Senior Secondary Level 1

| Topic/Theme/Unit | Expected learning outcomes | Recommended teaching methods | Suggested resources | Assessment of learning outcomes |
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| **The environment**:<br>• Definition and component<br>• Services and benefits of the environment | By the end of this topic, pupils will be able to:<br>• Define the environment<br>• List the components of the environment and give examples of each<br>• List and explain the importance of services the environment provides to humans | • Take the pupils out for a walk around the school vicinity<br>• Start a discussion with pupils by asking them what they have seen and what they have learnt about the environment during the walk.<br>• Brainstorming session, e.g., When you think of the environment what images come to your mind? What has influenced you to imagine these images? How can you classify the environment? Discuss each category and give examples. How important is the environment to humans?<br>• Explain the concepts of the environment, the biotic and abiotic components, looking at | • Short videos on the environment and documentaries on YouTube and National Geographic<br>• Lesson plan manual and pupil handbook | • Class presentation of a poster on the environment and its benefits<br>• Short-answer questions, e.g., Show the difference between the biotic and abiotic environment; List the benefits of the environment |

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| | | the environment at varying scales and how humans cannot survive without the environment as it supplies his needs.<br>• List five examples of the biotic and abiotic environment respectively as well as the benefits of the environment for discussion.<br>• Summarise key points in the lesson for pupils to note | | |
| **Humans' view of the environment**<br>• Environmental determinism<br>• Environmental probabilism<br>• Environmental possibilism<br>Environmentalism | By the end of this topic, pupils will be able to:<br>• Summarise the various human views about the interaction of humans and the environment<br>• Critique and agree or disagree with each perception, giving reasons<br>• Build an opinion about humans' perception of the environment | • Start a discussion by showing pupils pictures of a place in Niamey and a place in Dubai and explaining the physical environments as well as their development status<br>• Brainstorm session, e.g., ask pupils what they think is the reason for the variation in the level of development of the locations you have shown them; elicit further explanations from pupils and note in | • Short video on YouTube explaining the environmental determinism, possibilism, probabilism and environmentalism<br>• Lesson plan manual and pupil handbooks | • Debate session where pupils will argue why they support or disagree with these approaches |

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| | | a spray diagram on the chalk board them as pupils offer ideas<br>• Build and expand on pupils' responses with comments<br>• Explain the concept of environmental determinism, possibilism, probabilism and environmentalism<br>• Encourage and guide pupils to list more examples of environmental determinism and possibilism | | |
| **Humans – the dominant change-agents in nature**<br>• Humans' contribution to climate change<br>• Desertification<br>• Pollution<br>• Environmental degradation – mudslides, flooding, erosion | By the end of this topic, pupils will be able:<br>• Give examples of human activities that transforms the natural environment<br>• List examples of ways in which humans change the natural environment | • Ask questions to assess the knowledge and views pupils already have, e.g., What is a change agent? What is nature? How have humans change agents influenced nature? Has the change been positive or negative?<br>• As the discussion develops, progressively list on the board negative | • Lesson plan manual and pupil handbook<br>• YouTube documentary on climate change, desertification, flooding<br>• A global map showing human footprints<br>• Field visits to areas that have experienced environmental degradation e.g., flooding, water pollution, mudslides, rock falls | • Short answer questions humans' contribution to environmental problems<br>• Presentation on current global environmental issues in the world |

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| | | impacts on the natural environment which have been triggered by humans' activities<br>• Explain the meaning of environmental phenomena including climate, desertification, climate change and flooding, and how humans contribute to the occurrence of environmental problems | | |
| **Climate geography**<br>• Definition of weather and climate<br>• Elements of climate and their instruments: rainfall, temperature, wind, humidity<br>• Climate change and global warming<br>• Factors contributing to climate change<br>• The impact and significance of climate change<br>• Measures to mitigate climate change | By the end of this topic, pupils will have an understanding of the following:<br>• Define weather and climate<br>• Know the difference between weather and climate<br>• Explain the process of key weather elements and how they are measured<br>• Explain the uses of a Stevenson's screen<br>• Explain the greenhouse effect, global warming and climate change; the causes, impacts and | • Question and answer session to take pupils from known to the unknown, e.g., What do you understand about the terms 'weather' and 'climate'? List five climatic elements? How do we collect these elements?<br>• Explain in depth each climatic element giving the instruments and how they are used.<br>• Discuss climate change, its causes and impacts, giving scenarios of | • Lesson plan manual and pupil handbook<br>• Weather station<br>• 'An Inconvenient Truth' (a documentary on climate change); YouTube video showing current climate change issues around the world<br>• A global map showing climate change vulnerability | • Assignment on compilation and graphical presentation of rainfall in Sierra Leone for the past five years<br>• Group presentations on measures that can be taken by countries to mitigate climate change and steps each individual person can take to reduce their personal contribution to climate change |

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| | measures to curb climate change | contemporary climate change issues such as the high incidences of bush fires, the melting of ice caps | | |
| **Hydrology and the environment**<br>• Hydrologic cycle<br>• ground water<br>• Water supply problems<br>• Water conservation methods | By the end of this topic, pupils will be able to:<br>• Explain the processes of the hydrological cycle<br>• Describe ground water and explain its importance as well as understand terms such as water table, aeration zone, saturation zone, aquifer<br>• Explain problems associated with water shortage<br>• List unsustainable water usage practices<br>• Explain impacts of using water unsustainably<br>• List and explain water conservation methods | • Navigate from known to unknown (e.g., What is the proportion of the human body made of water? What is the proportion of the Earth's surface that is covered by water? List the uses of water. Where do you get potable water? Briefly describe the water cycle?<br>• Explanation of ground and surface water, water problems and water conservation measures | • Computer simulation of the water cycle<br>• Lesson plan manual and pupil handbook<br>• Field visit to a common water collection site during the dry season | • Short answer questions e.g., What is an aquifer? Define evaporation, transpiration<br>• Presentation on individual and household strategies for water conservation. |
| **Ecosystems**<br>• Definition of terms: ecosystem, ecology, niche, habitat<br>• Energy flow in an ecosystem<br>• Ecosystem interactions: | By the end of this topic, pupils will be able to:<br>• Define terms such as ecosystem, ecology, mutualism<br>• Illustrate and explain the transfer of energy I an | • Test pre-knowledge of pupils by asking questions such as:<br>• What is an eco-system?<br>• What is a habitat?<br>• What is a food chain | • Lesson plan manual and pupil handbook<br>• YouTube video of a food chain<br>• Flash cards with definition of terms such as herbivore, carnivore, parasitism | • Short answer questions |

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| mutualism, commensalism, competition | ecosystem through a food chain | • What are producers and consumers?<br>• Poster showing a food chain with explanation the energy flow concept?<br>• Summary by giving a detailed explanation of key terms | | |
| **Landforms**<br>• Mountains, valleys, plains, karsts<br>• Volcanoes and earthquakes<br>• Prediction of earthquakes<br>• Hazard mapping techniques | By the end of this topic, pupils will be able to:<br>• Describe the formation and importance of mountains, karsts, plains,<br>• Describe how earthquakes and volcanoes are formed, predicted and monitored | • Show a short video of earthquakes and volcanoes from YouTube<br>• Small group discussions and a summarised presentation of what pupils have learnt from the video<br>• Lead follow-up exploration on key points by question and answer: What are mountains and how are they formed? What types of mountains are there? What characteristics do the distinct types of mountains have? What are volcanoes and what is responsible for their formation? Where | • Global maps of major earthquakes and volcanoes<br>• YouTube videos<br>• Lesson plan manual and pupil handbook<br>• Posters | • Class project where pupils will make a science model of a volcano eruption<br>• Project to make an earthquake and earthquake preparedness model |

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| | | can we find volcanic hotspots? How are volcanic activities (eruptions nd earthquakes) predicted, monitored and mapped?<br>• Chalk and talk by first drawing illustrations on the board followed by detailed explanation | | |

## Senior Secondary Level 2

| Topic/Theme/Unit | Expected learning outcomes | Recommended teaching methods | Suggested resources | Assessment of learning outcomes |
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| **Resources**<br>• Renewable and non-renewable resources<br>• Factors affecting the supply and use of resources: physical factors (climate, geology, water, soil, vegetation), human factors (technology, capital, transport, population, industry, energy/power) | By the end of this topic, pupils will be able to:<br>• Explain and give examples of what we mean by 'resources'<br>• Define and explain the difference between renewable and non-renewable resources<br>• List categories and give examples of physical factors and human factors affecting the supply of resources | • Question and answer session to stimulate thinking and discussion, e.g., What do you understand by 'resources', 'renewable' and 'non-renewable'?<br>• Note useful suggestions on the board as pupils propose them, asking pupils to say whether each is renewable or non-renewable<br>• Give examples to help pupils understand what you are meaning and ask them to suggest other examples<br>• Repeat the process, asking pupils: What factors do you think might affect how we have access to these different resources?<br>• Write pupils' suggestions on the board as they arise; | • Lesson plan manual and pupil handbook<br>• YouTube films on renewable resources | • Class presentation of a poster showing renewable and non-renewable resources<br>• Short-answer questions, e.g., List physical factors and human factors affecting the supply and use of resources |

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| | | then ask which factors part of the natural physical environment and which factors are the result of human activity; ask a student to label each as a physical factor or human factor.<br>• Add examples and explain, to reach a full picture<br>• Recap and summarise the categories and meanings which the class has discussed | | |
| **Resource consumption and waste**<br>• Consumption of resources – water, energy, marine and forest resources<br>• Demographic dimension of resource consumption<br>• Cultural dimension<br>• Economic dimension<br>• Over-consumption and ecological footprint<br>• Sustainable consumer behaviour<br>• Waste and types of waste | By the end of this topic, pupils will be able to:<br>• Summarise major uses of water, energy, marine and forest resources<br>• Discuss and give examples of demographic, cultural and economic dimensions of resource consumption<br>• Explain issues of over-consumption and the ecological footprint of individuals, organisations and societies | • Question and answer to refresh preceding unit, to focus on the subject of this unit, and to assess pre-knowledge of pupils, e.g., What are main categories of natural resources? What are the main uses by humans of these resources? What is 'waste'? What kinds of waste materials do we produce? How do we manage the waste we produce? What issues | • Lesson plan manual and pupil handbook<br>• YouTube videos on resource consumption, waste disposal and recycling<br>• Resource people from local industries, waste plants, recycling activities, as available | • Group presentations of findings from fieldwork, summaries of their conclusions and proposals for the future |

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| • Waste disposal methods<br>• Waste management<br>• Recycling – the concept, examples, benefits, issues and limitations | • Describe and evaluate sustainable consumer behaviour, with examples of its benefits and limitations<br>• Discuss types of waste<br>• Outline methods of waste disposal and waste management and discuss the benefits and problems of various methods, for distinct categories of waste<br>• Critically discuss recycling of different resources, the present and potential practices of recycling in Sierra Leone | are there with waste and disposing of waste?<br>• Using figures sourced from the Web and from school resource materials, introduce the diverse levels of resource consumption by different regions of the world and by contrasting example countries<br>• Introduce and discuss sustainable behaviour, over-consumption and ecological footprint on individual and society levels<br>• Introduce issues of waste, waste management, waste disposal and recycling<br>• Ask pupils to discuss in groups and report back to the class on how each aspect applies in Sierra Leone<br>• Field visits to local waste and recycling facilities | | |

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| **Desert environments**<br>• Distribution and characteristics<br>• Plant and animal life<br>• Classification of deserts<br>• Physical processes in desert environments- wind erosion, weathering, flash floods<br>• Desert landforms: oasis, playa, sand dune, butte, yardangs, alluvial fans, inselberg<br>• Environmental problems: climate change, desertification, pollution<br>• Conservation measures of desert | By the end of this topic, pupils will be able to:<br>• Describe deserts and explain their main characteristics<br>• List common plants and animals found in deserts<br>• Examine the types of deserts based on temperature and vegetation<br>• Explain key landform features unique to desert environments<br>• Examine problems common in deserts such as climate change, desertification, flash floods<br>• Discuss measures that can be used to sustainably manage desert environments | • Presentation of a video on deserts on YouTube<br>• Ask pupils questions to know what they have learnt, e.g., What are the factors responsible for the formation of deserts? What are sand dunes? Give examples of plants and animals that have adapted to the environment<br>• Chalk and talk for understanding of deserts, landforms, environmental problems and solutions | • YouTube video on deserts<br>• Course book<br>• Global map showing deserts | • Presentation of a poster on desert environments |
| **Coastal landscapes**<br>• Coastal Landforms- Beach, Estuary, Delta, sandspit, tombolo<br>• Profile of coastal zones<br>• Waves<br>• Tides<br>• Ocean currents: the importance of | By the end of this topic, pupils will be able to:<br>• Define coastal landscape and coastal landforms such as beach, estuary, tombolo .<br>• Illustrate and explain the profile of coastal zones | • Field trip to a nearby beach, if possible, to observe the waves and tides and available landforms<br>• YouTube video showing coastal landforms | • Coursebook<br>• YouTube videos | • Group presentation<br>• Short answer question on coastal landscapes |

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| thermohaline circulation in distributing heat and regulating climate | • Define tides and waves, describe their formation and types<br>• Explain ocean currents and the significance of the thermohaline circulation in distributing heat and regulating climate | • Group discussion waves, tides and ocean currents<br>• Chalk and talk to enhance understanding of the topic | | |
| **Conservation and environmental management**<br>• Biodiversity: definition, importance, of biodiversity<br>• threats of biodiversity<br>• conservation and biodiversity<br>• Sustainable natural resources management: forests, water, marine, minerals | By the end of this topic, pupils will be able to:<br>• Define biodiversity and explain its importance to humans<br>• Discuss the main threats to biodiversity<br>• Define conservation and examine its linkage to biodiversity<br>• Examine ways to sustainably manage natural resources | • Question and answer to test pre knowledge of pupils, e.g., what is biodiversity?<br>• Why is biodiversity important?<br>• What threatens biodiversity?<br>• What is extinction?<br>• Do you know of plants and animals that have become extinct?<br>• Summarise discussions and give detailed explanation of the topic<br>• Field trip to a locally accessible conservation project or site, depending on pupils' location in the country, e.g., Tacugama sanctuary, Outamba, Kilimi | • Lesson plan manual and pupil handbook<br>• YouTube videos on conservation and the environment | • Class presentation on findings from fieldwork |

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| | | National Park, Tiwai Island | | |
| **Introduction to disaster risk management**<br>• Common terminologies: hazards, disaster risk, vulnerability, early warning system, emergency services, .<br>• Characteristics of disasters<br>• Types of disaster<br>• Phases of disasters: mitigation, disaster preparedness, response, recovery<br>• The relationship between disasters and development<br>• Impacts of disasters on development | By the end of this topic, pupils will be able to:<br>• List three disasters that have occurred locally<br>• Describe in summary three international disasters, stating where they occurred and the impacts of such disasters<br>• Explain what is meant by hazards, disaster risk, vulnerability, early warning system, emergency services<br>• Outline standard phases of disasters | • Navigate from known to unknown by asking questions and expanding discussion from the pupils' responses, e.g., What is a disaster?<br>• Clarify we are talking about natural disasters, not directly human-made disasters (eg, major oil spill, nuclear leak, chemical leak) – solicit and give examples of both.<br>• Relating to disasters, ask pupils what they understand by vulnerability, early warning system, and emergency services<br>• Chalk and talk to explain the types of disasters, illustrate the phases of disasters and the linkage and impacts of disaster on development<br>• Field trip to a local area that has recently experienced a disaster, | • Lesson plan manual and pupil handbook<br>• Videos from YouTube showing 2010 earthquake in Haiti, 2004 Indian Ocean earthquake and tsunami, the 2021 wildfires in various locations around the world, floods<br>• Smartphones and a computer for design and collection of questionnaires using open-source data collection software such as ODK or Kobo Collect | • Presentation of findings from the fieldwork |

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| | | e.g., Mortomeh, Kroo Bay<br>• Pupils use questionnaires to interview local residents, asking about their experiences: the early warning system before the disaster occurred, the preparedness for the disaster, emergency response, impacts of the disaster, how they are recovering and any changes they have made or intend to make as a result of the disaster | | |

## Senior Secondary Level 3

| Topic/Theme/Unit | Expected learning outcomes | Recommended teaching methods | Suggested resources | Assessment of learning outcomes |
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| **Mineral resources**<br>• Definition and examples of mineral resources, e.g., bauxite, iron ore, gold, aluminium, titanium, copper, salt, diamonds<br>• Benefits of mineral resources<br>• Environmental impacts of mining: pollution, contamination of water resources, land loss, biodiversity loss<br>• Control of the environmental impacts of mineral exploitation: turbid drainage of water, spoil and leachate, land reclamation and restoration<br>• Sustainable use of mineral resources | By the end of this topic, student will be able to learn:<br>• Name examples of the main mineral resources of the world and their uses<br>• Summarise the benefits of these resources to humans<br>• Explain the environmental impacts of mining<br>• Describe measures that can be taken to control the environmental impacts of mineral exploitation<br>• Learn about sustainable ways to use natural resources<br>• Describe arguments on the positive and negative social and economic impacts of mining, at local and national levels | • YouTube video on a brief introduction to minerals<br>• Class discussion based on the video.<br>• List key minerals, identify where huge deposits are found and how their exploitation has benefited the countries in which they are found<br>• Examine the environmental consequences of mining in such places<br>• Discuss measures to combat the negative impacts of mining<br>• Fieldwork to a mining site e.g., Kono, Port Loko, Tonkolili<br>• Pupils discuss with residents of mining locations or with other people who have been involved | • Global map and maps of Sierra Leone showing mineral deposits<br>• Lesson plan manual and pupil handbook<br>• Camera to take pictures showing mining sites<br>• Current and archive news stories and reports on mining<br>• YouTube videos on mining and on the environmental impacts of mining | • Group presentation of fieldwork |

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| • Social and economic impacts of mining, locally and nationally | | or who know others who have been involved in mining, to find their views and experiences of benefits and problems associated with mining | | |
| **Energy resources**<br>• Energy sources: renewable and non-renewable sources<br>• Impacts of energy systems on the environment<br>• Sustainable energy resources: Hydro-electric power (HEP), solar, windmills, geothermal | By the end of this topic, pupils will be able to:<br>• Define renewable and non-renewable<br>• List four examples of renewable and four examples of non-renewable energy resources<br>• Explain how energy systems cause environmental problems | • Question and answer session: What are energy resources? What are renewable and non-renewable energy sources?<br>• List energy resources on the board and ask pupils to identify those that are renewable and those that are non-renewable<br>• Facilitate class discussion exploring the environmental impacts of energy systems | • Lesson plan manual and pupil handbook<br>• YouTube video on renewable and non-renewable energy sources | • Pupils present a poster of energy resources used in Sierra Leone and globally, showing renewable and non-renewables, and their environmental impacts |
| **Tropical rainforest environments**<br>• Distribution and climate of tropical rainforests<br>• The structure of tropical rainforests | By the end of this topic, pupils will be able to:<br>• Understand the characteristics and distribution of tropical rainforests in the world. | • Lead discussion with pupils to develop awareness and understanding: What are tropical rainforests? | • Global map showing the distribution of tropical rainforests<br>• Lesson plan manual and pupil handbook<br>• YouTube video of the Amazon rainforest | • Presentation from fieldwork and Google Earth |

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| • Biodiversity of tropical rainforests<br>• Importance of tropical rainforest environments<br>• Threats to tropical rainforests<br>• Causes and impacts of deforestation on tropical forests<br>• Conservation measures to protect and restore tropical rainforests<br>• Tropical rainforests and carbon trading | • Examine the structure of rainforests<br>• Discuss the importance of tropical rainforests<br>• Explain the threats faced by tropical forests<br>• List major causes and impacts of deforestation<br>• Name significant measures to conserve tropical rainforests<br>• Explain the concept and practice of carbon trading | • Where can we find tropical rainforests?<br>• What are the unique characteristics of tropical rainforest environments?<br>• What is the significance of rainforests in relation to carbon and climate change?<br>• How important are tropical rainforests?<br>• Field trip to the Western Area Peninsula Forest, e.g., Gola Forest | • Google Earth view of tropical rainforests around the world | |
| **Introduction to the use of geographic information system (GIS) technology**<br>• Basic concepts of GIS<br>• Components of GIS (hardware, software, data, procedures and experts)<br>• Sources of geographical data (land surveying, remote sensing, map digitising, map scanning, field | By the end of this topic, pupils will be able to:<br>• Define GIS<br>• Explain basic GIS concepts<br>• Give a brief history of GIS development<br>• Name the basic components of a GIS<br>• Explain uses and benefits of GIS data<br>• Explain the differences and relationships among GIS, GPS and QGIS | • Explain and demonstrate on computer or smartphone what GIS is, and what it does<br>• Explain in outline how GIS works and how it has developed<br>• Explanation of the components that are required for a GIS to function well, using a poster<br>• Explanation of the sources of | • YouTube videos on GIS fundamentals (many versions available)<br>• Computer<br>• Smartphones<br>• QGIS software https://en.wikipedia.org/wiki/QGIS<br>• Explanation of The Global Positioning System (GPS) https://www.gps.gov/ | • Hands-on exercise exploring spatial data in QGIS<br>• Fieldwork to collect GPS data<br>• Pupils' groups research and each group presents with examples a real-world practical example of GIS in use in Sierra Leone and purpose and benefit of the GIS (in government or private sector, or by an international agency) |

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| investigation and tabular data)<br>• Uses (defense, agriculture, urban development, mapping, surveying, transportation, census)<br>• Problems (power, personnel, capital) | • Problems and limitations encountered with using GIS data | geographical data using a computer demonstration<br>• PowerPoint presentation of uses of GIS, with pictures and demonstrations<br>• Exploration of popular examples of uses of GIS: QGIS, Google Earth, Google Maps<br>• Exploration of collecting Global Positioning System (GPS) data on smartphones using GPS apps | | |