

The New Senior Secondary Curriculum for Sierra Leone

Subject syllabus for Fishing Industry 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.





Curriculum elements for Fishing Industry and the Environment – an everyday subject

Subject Description

The Senior Secondary School (SSS) syllabus for Fishing Industry and the Environment provides essential concepts about the fishing industry, its contributions to development, its importance to the well-being of humans and its contribution to economic development. This syllabus introduces pupils both to basic knowledge about the fishing industry and also to some practical skills in fisheries. It is intended that this will develop pupils' understanding about the sector as well as build their curiosity and interest in the industry. The subject also includes the issue of climate change and its implications for fish and the fishing industry.

Rationale for the inclusion of Fishing Industry and the Environment in the Senior Secondary School Curriculum

- a) Fishing Industry and the Environment is an important subject in the senior secondary school curriculum in that it enables pupils to have an understanding of the industry as well as stimulate their interest in entrepreneurship and investment in the fishing industry
- b) It also promotes knowledge of the environmental impacts of fishing and sustainable fishing practices, and engages pupils in
- c) It builds pupils' knowledge-base about the fishing industry in Sierra Leone: regulations, policies and the challenges of the fishing industry in the country
- d) It enables pupils to develop an appreciation of fisheries resources and how they can be harnessed for a nation's development

General learning outcomes/broad goals

At the end of the course, pupils will be able to:

- a) Understand basic fisheries concepts
- b) Explain the socio-economic importance of fisheries locally, nationally and internationally
- c) Discuss the various types and methods of fishing
- d) Understand the fish species, fishing methods and regulations of Sierra Leone
- e) demonstrate basic practical skills in fishing such as pond construction and preparation, aquaculture and fish farming, fish feeds and seeds
- f) Explain the environmental impacts of fishing
- g) Apply, appropriate skills and techniques in fishing
- h) Appreciate sustainable fishing practices
- i) Discuss methods for fish processing, preservation, packaging and processing



Subject content outline (Themes and topics to be covered)

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

1. Introduction and types of fisheries
2. Identification of common fishery organism; fishery habitats
3. Methods, techniques and materials for catching fish (fisheries capture)
4. Fish feeds and feeding
5. Fish farming
6. Introduction to ecosystem approach to fisheries
7. Fish processing, preservation and packaging
8. Impact of climate change on fish and the fishing industry





Structure of the Syllabus Over the Three-Year Senior Secondary School Cycle

	SSS 1	SSS 2	SSS 3
Term 1	<p>Introduction and importance of Fisheries</p> <ul style="list-style-type: none"> • Meaning of fisheries • Fishing as a major source of protein for the world • Global fisheries and aquaculture production • Social and economic benefits of fishing <p>Types of fish</p> <ul style="list-style-type: none"> • Superclass Agnatha (jawless fishes) • Class Chondrichthyes (cartilaginous fishes) • Superclass Osteichthyes (bony fishes) <p>Identification and description of common fishery organisms</p> <ul style="list-style-type: none"> • Fin fishes (e.g. herring, tuna, tilapia) • Crustaceans (shrimp, prawns, lobsters, crabs) • Molluscs (clam, scallops, oyster, cuttle fish, squid) 	<p>Types of fisheries</p> <ul style="list-style-type: none"> • Culture fishes • Catching fish (fishing) • Subsistence fisheries • Artisanal fisheries • Commercial fisheries • Industrial fisheries <p>Fishery habitats</p> <ul style="list-style-type: none"> • Freshwater (river, lake), • brackish water (estuary, lagoon) and marine. <p>Fish seed production</p> <p>Brood stock selection and handling</p> <ul style="list-style-type: none"> • Difference between male and female sexually matured fishes • Qualities of good breeders • Ways of handling brood stock • Meaning and importance of artificial breeding • Steps involved in artificial breeding of fish 	<p>Common Fish in Sierra Leone</p> <ul style="list-style-type: none"> • Pelagic - The clupeids (<i>Ethmalosa fimbriata</i> (Bonga), <i>Sardinella maderensis</i>, <i>Sardinella aurita</i> (Herrings), <i>Illisha africana lati</i>) and <i>Engraulis encrasicolus</i> (langa mina)) • Demersals - Groupers (<i>Lutjanus</i>), Crocus (<i>Pomadasy</i>), Gwangwa (<i>Pseudotolithus</i>), Snappers (<i>Sparids</i>) and Sole (<i>Cynoglossus</i>) • Crustaceans • Others (mostly molluscs) <p>The fisheries sector in Sierra Leone</p> <ul style="list-style-type: none"> • Industrial fishery • Artisanal fishery • Limitations and challenges



<p>Term 2</p>	<p>Methods and techniques of catching fish</p> <ul style="list-style-type: none"> • Netting • Trawling • Angling • Hook and line • Trap • Electro-fishing • Dredging <p>Tools and materials used for catching fish and their uses</p> <ul style="list-style-type: none"> • Hooks, cages, knives/cutlasses, traps/basins, cast nets, seine nets, drag nets, lines <p>Fish feeds and feeding</p> <ul style="list-style-type: none"> • Identification of fish feed / food materials (natural fish food and artificial fish food) • Nutritive value of fish feed ingredients • Feeding regimes and ideal feeding periods for fish • Methods of feeding <p>Concept of aquaculture and fish farming</p> <ul style="list-style-type: none"> • Types of aquaculture • Management systems in aquaculture • Systems of fish farming • Advantages of fish farming • Identification of common qualities of culturable fish species. • Common culturable fishes 	<p>Introduction to the Ecosystem Approach to Fisheries (EAF)</p> <ul style="list-style-type: none"> • Global legal frameworks and instruments leading to the EAF • Definition of EAF • EAF Principles • Reasons for an EAF • Institutional arrangements in support of an EAF • Comparison with other approaches • Threats to implementing EAF <p>Water quality control and monitoring</p> <ul style="list-style-type: none"> • Definition of water quality • Water quality parameters • Water quality monitoring methods • Water pollution • Optimum water parameters range <p>Climate change and its impacts on fisheries</p> <ul style="list-style-type: none"> • Physical changes: surface water temperature rise, Sea level rise, increased water salinity • Biological changes: change in fish distribution, change of primary production • Fisheries and food security in Africa: fish productivity and poverty, fish and food supply • Investment in climate-proof fisheries 	<p>Fishing policy and regulations</p> <ul style="list-style-type: none"> • Sierra Leone as an international legal actor • International fisheries and environmental treaties • National fisheries law and policy • National legal framework <p>Fish Farming in Sierra Leone</p> <ul style="list-style-type: none"> • Farming systems distribution and characteristics • Cultured species • Practices of culture • Production • Market and trade • Contribution to the economy • Promotion and management
----------------------	--	--	---





<p>Term 3</p>	<p>Unsustainable fishing practices</p> <ul style="list-style-type: none"> • Overfishing, impacts and measures • Destructive fishing practices impacts and measures • Illegal, unreported and unregulated fishing (IUU), impacts and measures <p>Introduction to fisheries management</p> <ul style="list-style-type: none"> • Fisheries management and how it works • Reasons for fisheries management • Who is responsible for fisheries management? • Fisheries management measures and tools 	<p>Fish culture facilities</p> <ul style="list-style-type: none"> • Fishponds – types (earthen ponds, concrete tanks, plastic tanks, fibre glass tanks) • Components of fishponds (inlets, outlets, dykes/embankments/walls) <p>Fishpond preparation and management</p> <ul style="list-style-type: none"> • Fishpond construction • Pond preparation (preparation of tools and stocking for pond) • Pond management • Pond management practices 	<p>Fish processing and preservation</p> <ul style="list-style-type: none"> • Equipment used for fish processing and preservation • Fish products and by products • Fish packaging materials <p>Fish processing and packaging in Sierra Leone</p> <ul style="list-style-type: none"> • Post-harvest processing and packaging • Processing of fish from industrial factories • Fish marketing and wholesaling • Fish marketing and retailing
----------------------	--	--	---





Teaching Syllabus

Senior Secondary Level 1

Topic/Theme/Unit	Expected learning outcomes	Recommended teaching methods	Suggested resources	Assessment of learning outcomes
<p>Introduction and the importance of fisheries</p> <ul style="list-style-type: none"> • Meaning of 'fisheries' • Fishing as a major source of protein for the world • Global fisheries and aquaculture production • Social and economic benefits of fishing 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Define fisheries • Discuss the importance of fisheries 	<ul style="list-style-type: none"> • Start the discussion by defining fisheries for pupils showing them series of pictures for clearer understanding. • Divide class into small groups for brainstorming session on the importance of fisheries • Let pupils take turns in their small groups to identify the importance of fisheries. • Then representatives from each group present on what they have learnt about the importance of fisheries • Summarise key points in the lesson for pupils to note down. 	<ul style="list-style-type: none"> • Short videos on the marine biology at home channel, lesson 9 introduction to fisheries on YouTube • Pupil Handbook • Teacher Lesson-plan Manual 	<ul style="list-style-type: none"> • Class presentation of a poster on fisheries and its importance • Short answer questions (Define fisheries; List the importance of fisheries)
<p>Types of fish</p> <ul style="list-style-type: none"> • Superclass Agnatha (jawless fishes) • Class Chondrichthyes (cartilaginous fishes) • Superclass Osteichthyes (bony fishes) 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Examine the three main types of fishes and explain and their characteristics 	<ul style="list-style-type: none"> • PowerPoint presentation with pictures on the types of fishes and their characteristics 	<ul style="list-style-type: none"> • Short video on YouTube explaining the types of fishes and their characteristics • Pupil Handbook • Teacher Lesson-plan Manual 	<ul style="list-style-type: none"> • Poster presentation on the types of fishes



<p>Identification and description of common fishery organisms</p> <ul style="list-style-type: none"> • Fin fishes (e.g., herring, tuna, tilapia) • Crustaceans (shrimp/prawns/lobster, crabs) • Molluscs (clam, scallops, oyster, cuttle fish/squid) 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Identify common fishery organisms • List examples of each group of fishery organism 	<ul style="list-style-type: none"> • Present some pictures of fishery organisms for pupils to identify to assess their pre knowledge • Explain the main types, giving examples with pictures 	<ul style="list-style-type: none"> • Pupil Handbook • Teacher Lesson-plan Manual Camera to take photos of common fishery organisms • YouTube documentary on common fishery organisms 	<ul style="list-style-type: none"> • Report from field work • Short answer questions on man's contribution to environmental problems • Presentation on current global environmental issues in the world
<p>Methods and techniques of catching fish</p> <ul style="list-style-type: none"> • Netting • Trawling • Angling • Hook and line • Trap • Electro-fishing • Dredging 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Describe the main methods of catching fish and the advantages and disadvantages of each method 	<ul style="list-style-type: none"> • Question and answer session to take pupils from known to the unknown, e.g., What are methods of catching fish? List five methods and briefly explain each. List the advantages and disadvantages of each method. • Field work at a fishing site 	<ul style="list-style-type: none"> • Pupil Handbook • Teacher Lesson-plan Manual YouTube video 	<ul style="list-style-type: none"> • Presentation on common fishing methods in Sierra Leone
<p>Tools and materials used for catching fish and their uses</p> <ul style="list-style-type: none"> • Hooks, cages, knives/cutlasses, traps/basins, cast nets, seine nets, drag nets, lines 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Identify fishery tools and materials • Explain the uses and functions of common tools used for catching fish 	<ul style="list-style-type: none"> • Navigate from known to unknown, e.g., Do you know of any equipment used for fishing? • If yes list some of the equipment you know. Briefly explain how they are used. • Explanation of fishing equipment using pictures for clear understanding 	<ul style="list-style-type: none"> • YouTube video showing fishery tools and equipment • Pupil Handbook • Teacher Lesson-plan Manual Field visit to a common fishing ground 	<ul style="list-style-type: none"> • Short answer questions: e.g., What is a hook and line and how is it used? What is the difference between a cast net and a seine net?



<p>Fish feeds and feeding</p> <ul style="list-style-type: none"> • Identification of fish feed / food materials (natural fish food and artificial fish food) • Nutritive value of fish feed ingredients • Feeding regimes and ideal feeding periods for fish • Methods of feeding 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Identify natural and artificial fish feed. • Discuss the nutritive value of fish feeding ingredients • Explain the Ideal feeding periods for fish 	<p>Test pre-knowledge of pupils by asking questions such as:</p> <ul style="list-style-type: none"> • What is a fish feed? • What is natural fish feed? Give examples. • What is an artificial fish feed? Give examples. • What are the methods of feeding fish? • Poster showing fish feeds and feeding methods 	<ul style="list-style-type: none"> • Pupil Handbook • Teacher Lesson-plan Manual YouTube videos of fish feeds, and how to make fish feeds 	<ul style="list-style-type: none"> • Class project to make fish feeds from simple items
<p>The concept of aquaculture and fish farming</p> <ul style="list-style-type: none"> • Types of aquaculture • Management systems in aquaculture • Systems of fish farming • Advantages of fish farming • Identification of common qualities of culturable fish species. • Common culturable fishes 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Define aquaculture • List the types of aquacultures • Discuss management systems in aquaculture • Discuss fish farming systems and advantages 	<ul style="list-style-type: none"> • Show a short video on aquaculture and fish farming (YouTube) • Small group discussions and a summarised presentation by pupils of what they have learnt from the video. • After introducing information, pose questions for pupils to discuss and answer, e.g., What is aquaculture? List the types of aquaculture. What is fish farming? What are the advantages of fish farming? What is fish culture? List five qualities of common culturable fishes. • Chalk and talk by first drawing illustrations on the board, followed by detailed explanation 	<ul style="list-style-type: none"> • YouTube videos on aquaculture, fish farming and culturable fishes • Pupil Handbook • Teacher Lesson-plan Manual Posters • Flash cards showing common culturable fishes 	<ul style="list-style-type: none"> • Report and presentation of field visit • Short answer questions





		<ul style="list-style-type: none"> • Field visit to a nearby fish farm or use of the school's fishpond, if available 		
<p>Unsustainable fishing practices</p> <ul style="list-style-type: none"> • Overfishing, its impacts, and measures against it • Destructive fishing practices, their impacts, and measures against them • Illegal, unreported and unregulated fishing (IUU), its impacts and measures against it 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Define overfishing • Explain the impacts of overfishing and some of the measures that can be taken to minimise it • Define destructive fishing • Discuss the measures and impacts of destructive fishing • Discuss illegal, unreported and unregulated fishing, its impacts and measures against it • Undertake a field visit to a fishing community administering a questionnaire investigating unsustainable fishing practice, their impacts, and measures against them 	<ul style="list-style-type: none"> • Presentation of TEDx and TED Ed videos on unsustainable fishing from YouTube • Ask pupils questions to know what they have learnt (e.g., what is overfishing? List technologies used for overfishing. What are the impacts of overfishing?) • Use posters to explain overfishing, destructive fishing and illegal and unreported and unregulated fishing, their impacts and measures against them. 	<ul style="list-style-type: none"> • YouTube videos on overfishing, destructive and illegal fishing • Pupil Handbook • Teacher Lesson-plan Manual 	<ul style="list-style-type: none"> • Presentation of a poster on degraded fishery environments
<p>Introduction to fisheries management</p> <ul style="list-style-type: none"> • Fisheries management and how it works • Reasons for fisheries management 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Explain fisheries management and how it works 	<p>YouTube video on fisheries management</p> <ul style="list-style-type: none"> • Group discussion on waves, tides and ocean currents, on river flows and on water 	<ul style="list-style-type: none"> • Pupil Handbook • Teacher Lesson-plan Manual YouTube video on fisheries management • Poster • Resources on the Food and Agricultural 	<p>Group presentation on fisheries management and tools</p> <p>Short answer questions on fisheries management</p> <p>Assignment to investigate existing</p>



<ul style="list-style-type: none"> • Who is responsible for fisheries management? • Fisheries management measures and tools 	<ul style="list-style-type: none"> • Discuss reasons why fisheries management is important • Identify key stakeholders in fisheries management 	<p>management in ponds and lakes</p> <ul style="list-style-type: none"> • Chalk and talk to enhance proper understanding of the topic 	<p>Organisation (FAO)'s website</p> <p>https://www.fao.org/fishery-aquaculture/en/</p>	<p>fisheries management in Sierra Leone</p>
---	--	--	--	---

Senior Secondary Level 2

Topic/Theme/Unit	Expected learning outcomes	Recommended teaching methods	Suggested resources	Assessment of learning outcomes
<p>Types of fisheries</p> <ul style="list-style-type: none"> • Catching fish (fishing) • Subsistence fisheries • Artisanal fisheries • Commercial fisheries • Industrial fisheries 	<p>By the end of the topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Identify and discuss the various types of fisheries 	<ul style="list-style-type: none"> • PowerPoint presentation showing the types of fisheries • Audio-visual materials to give exposure to a range of examples and contexts and to aid better understanding 	<ul style="list-style-type: none"> • Pupil Handbook • Teacher Lesson-plan Manual • YouTube videos on types of fisheries 	<ul style="list-style-type: none"> • Poster presentations by pupils on the types of fisheries
<p>Fishery habitats</p> <ul style="list-style-type: none"> • Freshwater (rivers, lakes, ponds), • Brackish water (somewhat salty - estuaries, lagoons, salt marshes) • Marine (salt water – the sea) • Coral reefs and marine protected areas 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Identify and discuss the various types of fishery habitats • Define coral reefs and marine protected areas and their importance 	<ul style="list-style-type: none"> • Field trips to fresh water, brackish and marine habitats. • Engage a local guide or fisheries worker on each visit, if available, as a resource person to explain and to answer pupils' questions. • Pupils observe these habitats and discuss their management. • Pupils take notes about the characteristics of 	<ul style="list-style-type: none"> • Pupil Handbook • Teacher Lesson-plan Manual • YouTube videos on fishery habitats and marine protected areas • National Geographic Coral reefs 101 video http://nationalvideographic.com/coral-reefs-101-national-geographic/ 	<ul style="list-style-type: none"> • Presentations, posters and reports by pupils of findings from the field work



		each habitat and the common fishery organisms common there.		
<p>Fish seed production</p> <ul style="list-style-type: none"> • Brood stock selection and handling • Differences between male and female sexually matured fishes • Qualities of good breeders • Ways of handling brood stock • The meaning and importance of artificial breeding • Steps involved in artificial breeding of fishes 	<p>By the end of this topic, pupil will be able to:</p> <ul style="list-style-type: none"> • Discuss on broodstock / fishbrood and how they are selected and handled for fish farming. • Explain the differences between male and female sexually matured fishes • Explain the qualities of good breeders • Artificial breeding and its importance • Steps involved in artificial breeding of fishes 	<ul style="list-style-type: none"> • Show Youtube video on broodstock selection and handling from the masters' vessel classic channel https://www.youtube.com/watch?v=EG0tGXy2Hs0 • Class discussion based on the video. • What is broodfish / broodstock? • List the requirements for selecting broodfish • What are the differences between male and female fish? • List some qualities of good breeders • Field trip to a nearby fish farm • If possible, get a male catfish, bisect it and remove the milt sac and present in class 	<ul style="list-style-type: none"> • You Tube video • Pupil Handbook • Teacher Lesson-plan Manual • Camera to take pictures of broodstock 	<ul style="list-style-type: none"> • Group presentation of fieldwork





<p>Introduction to the ecosystem approach to fisheries (EAF)</p> <ul style="list-style-type: none"> • Definition of EAF • Global legal frameworks and instruments leading to the EAF • EAF Principles • Reasons for an EAF • Institutional arrangements in support of an EAF • Comparison with other approaches • Threats to implementing EAF 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Define EAF • Explain the legal framework and instruments leading to the EAF • List some of the principles of EAF • Explain the reasons for an EAF • Compare the EAF with other approaches • Discuss the threats in implementing the EAF 	<ul style="list-style-type: none"> • Question and answer session: What is an ecosystem? • Ecosystems in the context of fisheries • Explain using PowerPoint presentations of an EAF in detail • Show examples using audio- visuals for better understanding 	<ul style="list-style-type: none"> • Pupil Handbook • Teacher Lesson-plan Manual • YouTube video on EAF • Resources on FAO's website • The Ecosystem Approach to Fisheries Management website http://eafmlearn.org/ 	<ul style="list-style-type: none"> • Assignment to discuss the history and objectives of the EAF
<p>Water quality control and monitoring</p> <ul style="list-style-type: none"> • Definition of water quality • Water quality parameters • Water quality monitoring methods • Water pollution • Optimum water parameters range • Chemical pollution into the water table, watercourses and the sea – pesticides, chemicals, sewage • Plastics and microplastics, their progression into the aquatic environment and then into living organisms • Marine plastics, including ghost nets, and their devastating effects on wildlife 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Define water quality • Explain terms such as Dissolved Oxygen (DO), acidity (pH), temperature, turbidity • Understand water quality parameters • Examine water quality monitoring methods • Discuss the causes, prevention and control of water pollution • Explain the problem of plastic and microplastics and the importance of minimising the use of plastic and its spread in the environment 	<ul style="list-style-type: none"> • Show videos on water quality, water quality parameters and pollution, on YouTube • Small group discussion among learners, and presentation • Fieldwork by collecting water samples from a nearby water source (river, lake, stream, sea, pond or other) 	<ul style="list-style-type: none"> • Pupil Handbook • Teacher Lesson-plan Manual • YouTube video of water quality • Water quality testing instruments • Marine plastic pollution https://www.iucn.org/resources/issues-brief/marine-plastic-pollution 	<ul style="list-style-type: none"> • Presentation from field work and google earth exercise Practical session for testing water quality





Climate change and its impacts on fisheries

- Physical changes: surface water temperature rise, sea level rise, increased water salinity. Increased water acidity
- Biological changes: change in fish distribution, change of primary production
- Fisheries and food security in Africa: fish productivity and poverty, fish and food supply
- Investment in climate-proof or climate-resilient fisheries
- Bleaching and death of coral reefs from water temperature rise
- Algal blooms and their effects on the water ecology
- Changing conditions for reproduction and growth of fish, and changing patterns of fish locations
- The importance of sea grass and other coastal marine plants for habitat and carbon capture
- Phytoplankton, their role in carbon capture, and the marine food chain they support
- The impact of increased and erratic river flows arising from changing climate, affecting fish spawning, migration and

By the end of this topic, pupils will be able to:

- Explain the physical and biological changes related to climate change
- Discuss sustainable fisheries as part of food security in Africa
- Argue the importance of investment in climate-proof or climate-resilient fisheries

- Navigate from the known to unknown by asking questions such as: What is climate change? What are the causes of climate change? What are the effects of climate change?
- Then explain about impacts specifically on fisheries
- Show FAO's video of climate change effects on fisheries on YouTube <https://www.youtube.com/watch?v=ACsKKJlhMNo>
- Discussions based on the video
- Explain vulnerability of sub-Saharan Africa to the impacts of climate change
- Show other videos, if facilities allow, or share links to phones, or summarise orally or on flash cards key points; use in group and class discussion activities and in direct teaching

- Pupil Handbook
- Teacher Lesson-plan Manual
- YouTube videos on climate change and its effects on fisheries
- Marine Stewardship Council (MSC) site on climate change and fisheries [Climate change and fishing | Marine Stewardship Council \(msc.org\)](http://Climate%20change%20and%20fishing%20|%20Marine%20Stewardship%20Council%20(msc.org))
- Our planet – How to Save Our High Seas (overview video presented by Sir David Attenborough) <https://www.ourplanet.com/en/video/how-to-save-our-high-seas>
- ICUN resource sheet on marine plastic pollution <https://www.iucn.org/resources/issue-brief/marine-plastic-pollution>
- UN SDG 14 information sheet, Life below water: conserve and sustainably use the oceans, seas and marine resources <https://www.un.org/sustainabledevelopment/oceans/>
- UNEP poster sheet on SDG 14, Life below water https://wedocs.unep.org/bitstream/handle/20.500.11822/22749/14_Life%20below%20waterFINAL.pdf?sequence=1&isAllowed=y

- Short answer questions on climate change impacts on fisheries, food security and climate change in Africa
- Group presentations of projects and field visits on local fisheries and how their approaches and experience relate to climate change and environmental issues identified
- Debate teams performance on protecting the oceans and fresh water for future generations versus exploiting to the maximum possible to satisfy immediate needs





<p>survival, and increasing run-off of pollutants into rivers, lakes and the sea</p>			<ul style="list-style-type: none"> • World Economic Forum resource, To feed the world, we need to waste less fish. Here's how https://www.weforum.org/agenda/2022/09/feed-world-sustainably-reduce-fish-waste/ • World Economic Forum resource page, 60% of the world's fish species at risk of extinction due to climate change https://www.weforum.org/agenda/2020/07/climate-change-threatens-60-percent-of-the-world-s-fish-species • WWF information sheets, Our Seas https://www.wwf.org.uk/sites/default/files/2020-01/Our_Planet_ourseas.pdf • WWF information sheets, Our freshwater https://www.wwf.org.uk/sites/default/files/2020-01/Our_Planet_ourfreshwaters.pdf 	
<p>Fish culture facilities</p> <ul style="list-style-type: none"> • Fishpond types: earthen ponds, concrete tanks, plastic tanks, fiberglass tanks • Components of fishponds (inlets, outlets, dykes, embankments, walls) 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Define fishpond and their main types as well as their characteristics • Describe the components of fish tanks 	<ul style="list-style-type: none"> • Brainstorming session: What is a fishpond? • List and describe the types of fishponds • YouTube video showing various types of fishponds their advantages and disadvantages 	<ul style="list-style-type: none"> • YouTube video on fishpond facilities and their use https://www.youtube.com/watch?v=ACsKKJlhMNo • FAO's website • Video of a fish farm initiative in Sierra Leone https://www.youtube.com/watch?v=opxJYWq7_Qw • A fishpond 	<ul style="list-style-type: none"> • Short answer questions • Compare between concrete tanks and earthen ponds





		<ul style="list-style-type: none"> Field visit of a fishpond if not available at school 	<ul style="list-style-type: none"> Pupil Handbook Teacher Lesson-plan Manual 	
Fishpond preparation and management <ul style="list-style-type: none"> Fishpond construction Pond preparation (preparation of tools and stocking for pond) Pond management practices 	By the end of this topic, pupils will be able to: <ul style="list-style-type: none"> Describe the procedures of constructing a fishpond Understand pond preparation in terms of tools and stocking of the pond Explain methods in managing ponds 	<ul style="list-style-type: none"> YouTube video showing the construction, preparation and management of a fishpond Field visit to witness the construction and or preparation of fishponds 	<ul style="list-style-type: none"> YouTube videos on fishpond construction and preparation FAO's website Pupil Handbook Teacher Lesson-plan Manual 	<ul style="list-style-type: none"> Report from field visit

Senior Secondary Level 3

Topic/Theme/Unit	Expected learning outcomes	Recommended teaching methods	Suggested resources	Assessment of learning outcomes
Common Fish in Sierra Leone <ul style="list-style-type: none"> Pelagic- The clupeids (<i>Ethmalosa fimbriata</i> (Bonga), <i>Sardinella maderensis</i>, <i>Sardinella aurita</i> (Herrings), <i>Illisha africana</i> (lati) and <i>Engraulis encrasicolus</i> (langa mina)) Demersals- Groupers (<i>Lutjanus</i>), crocus (<i>Pomadasy</i>), Gwangwa (<i>Pseudotolithus</i>), Snappers (<i>Sparids</i>) and Sole (<i>Cynoglossus</i>) Crustaceans 	By the end of this topic, pupils will be able to: <ul style="list-style-type: none"> Identify the common fish species in Sierra Leone 	<ul style="list-style-type: none"> Field trip to a fishery site, beach or market (e.g., Goderich, Tombo, Bondapi, Gbanbatoke) where pupils can see some common fishery organisms 	<ul style="list-style-type: none"> Flash cards showing common fish species in Sierra Leone YouTube videos Camera (phone) Pupil Handbook Teacher Lesson-plan Manual 	<ul style="list-style-type: none"> Quiz Report presentation from field trip





<ul style="list-style-type: none"> • Others (mostly molluscs) <p>The fisheries sector in Sierra Leone</p> <ul style="list-style-type: none"> • Industrial fishery • Artisanal fishery • Limitations and challenges 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Explain how artisanal fishery operates in Sierra Leone • Describe the contrasting features and characteristics of industrial fishery and artisanal fishery 	<ul style="list-style-type: none"> • Teacher introduces the concepts of artisanal fishery and industrial fishery • Pupils discuss in pairs then small groups examples of industrial fisheries and artisanal fisheries they know, and what features, benefits and limitations each has • Pupils in groups research sea or freshwater fisheries in their location, with field visit and interviews • Pupils prepare reports of their field research for presentation to the class 	<ul style="list-style-type: none"> • Pupil Handbook • Teacher Lesson-plan Manual • Local fishing activities, at industrial or artisanal scales • Locally accessible fishers, fish processors and fish sellers 	<ul style="list-style-type: none"> • Reports and presentation on fisheries practised in Sierra Leone and off the coast, on small artisanal and larger industrial scales. • Questions and answers on the features, benefits, limitations and challenges of the fisheries researched
<p>Fishing policy and regulations</p> <ul style="list-style-type: none"> • Sierra Leone as an international legal actor • International fisheries and environmental treaties • National fisheries law and policy • National legal framework 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • List and name key purposes of international fisheries and environmental treaties • Summarise the main points of fisheries laws and policy in Sierra Leone 	<ul style="list-style-type: none"> • Summarise the fisheries policies and laws in Sierra Leone 	<ul style="list-style-type: none"> • Summary descriptions of fisheries legal and policy documents of Sierra Leone and international treaties • Pupil Handbook • Teacher Lesson-plan Manual 	<ul style="list-style-type: none"> • Question and answer. • Pupil essays
<p>Fish Farming in Sierra Leone</p> <ul style="list-style-type: none"> • Farming systems • Distribution and characteristics 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Answer questions accurately about the status of fish farming in Sierra Leone 	<ul style="list-style-type: none"> • Discussion, question and answer session: e.g., what is fish farming? How would you rate fish farming in Sierra Leone? 	<ul style="list-style-type: none"> • YouTube videos on fish farms in Sierra Leone and other countries (for comparison) • Pupil Handbook 	<ul style="list-style-type: none"> • Report presentation from field visit





<ul style="list-style-type: none"> • Cultured species • Practices of culture • Production • Market and trade • Contribution to the economy • Promotion and management 	<ul style="list-style-type: none"> • Identify the cultured fishery species in Sierra Leone • Explain the production, market, trade and contribution of fish farming to the economy of Sierra Leone 	<ul style="list-style-type: none"> • What culturable fishery species are common in Sierra Leone? • How does fish farming contribute to the economy? • PowerPoint presentation where pupils will be through the fish farming sector in the country citing examples of fish farms that are thriving in the country. • If possible, field visit to a successful fish farm in Sierra Leone 	<ul style="list-style-type: none"> • Teacher Lesson-plan Manual 	
<p>Fish processing and preservation</p> <ul style="list-style-type: none"> • Equipment used for fish processing and preservation • Fish products and by products • Fish packaging materials 	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none"> • Describe the basic processes of processing and preserving fish • Identify fish products and by products • Explain fish packaging 	<ul style="list-style-type: none"> • Discussion from observations from field visit • Explanation of equipment used for preserving fish, fish products and by products, packaging materials 	<ul style="list-style-type: none"> • YouTube videos on fish processing and preservation • Pupil Handbook • Teacher Lesson-plan Manual 	<ul style="list-style-type: none"> • Presentation of poster on fish processing and preservation techniques





<p>Fish processing and packaging in Sierra Leone</p> <ul style="list-style-type: none">• Post-harvest processing and packaging• Processing of fish from industrial factories• Fish marketing and wholesaling• Fish marketing and retailing	<p>By the end of this topic, pupils will be able to:</p> <ul style="list-style-type: none">• Describe the basic processes of processing and packaging fish used in Sierra Leone	<ul style="list-style-type: none">• Field visit to a fish processing site (e.g., Tombo fishery company), where pupils will be taken through the methods of processing and packaging fish	<ul style="list-style-type: none">• YouTube video on fish processing and packaging in Sierra Leone• Pupil Handbook• Teacher Lesson-plan Manual	<ul style="list-style-type: none">• Presentation of report from field visit
--	---	--	--	---

