Earth & Environmental Science
Stage 2
Assessment Type 3: Earth Systems Study (30%)

Task
Students undertake one fieldwork investigation into a particular local environmental issue, concern, initiative, or successful undertaking that can be linked to topics studied in Stage 2 Earth & Environmental Science. Students develop a research question, then design, plan, undertake, and report on a field-based extended investigation to answer the question.

The investigation must include collection and analysis of both primary and secondary data. Students analyse the information gathered in terms of the interactions of two or more Earth systems.

Part A: The Proposal
Each student designs an investigation proposal.
Students may trial their methods to assist the design of their procedure.
One draft of the proposal should be submitted for teacher feedback and approval.
Students may modify their proposal in response to teacher feedback before they undertake their investigation.

The proposal should include:

- A statement of an investigable question or hypothesis.
- A rationale for and an outline of the proposed research approach and method.
- A list of equipment required.
- The procedure to be followed.
- The type of data that will be collected.
- A risk assessment that addresses safety, ethical and legal considerations.

Part B: The Report

- The report should use scientific terminology and include:
- An introduction to identify the purpose, and relevant background or previous research into the topic.
- Appropriate representation of data, e.g. tables, graphs, maps, charts, photographs or other illustrations.
- Analysis of the information gathered in terms of the interaction of two or more Earth systems.
- Evaluation of procedures and results to identify limitations of, and improvements to the investigation.
- A conclusion, which includes predictions or advice based on findings.
- Citations and referencing.

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Assessment Conditions

The combined word count for the proposal and the report should be a maximum of 2,000 words, if written, or the equivalent in multimodal form.

The following specific features of the assessment design criteria for this subject are assessed in the Earth Systems Study:

Assessment Design Criteria

Investigation, Analysis and Evaluation

IAE1 **Design** a logical, coherent and detailed science investigation
IAE2 **Obtain and record data**, use appropriate conventions and formats
IAE3 **Analyse and interpret data**, form conclusions with justification
IAE4 **Evaluate procedures** and state their effect on data gathered

Knowledge and Application

KA1 Demonstrate deep and broad **understanding of relevant science** concepts
KA4 Communicate knowledge of science, with **appropriate use of terms, conventions and representations**

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A suggested structure/check-list for you

Part A: Proposal

Aim
Describe what you are planning to investigate in your Earth Systems Study.
Write a guiding question.

Guiding Question/Hypothesis
What do you expect to find out? This is the hypothesis that you will be investigating.
Write it in the correct format.
What scientific knowledge do you already have that has led you to form this hypothesis?

The type of data that will be collected.
Identify the relevant data that will be obtained in your Earth Systems Study.
If appropriate identify independent and dependent variables.
Are there factors that need to be controlled?
Are there any factors that may not be able to be controlled (and why not)?

Equipment
Make a complete and detailed list of everything needed to carry out the study.

Procedure
Describe the investigation that will appropriately test your hypothesis. This should be step by step with sufficient detail to enable another student to duplicate the Earth Systems Study exactly. It should be written using appropriate scientific style. How will the results be recorded?

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Part B: Report

Introduction
The introduction or literature review should identify the relevant background or previous research into the topic. References should be used in this sections, and appropriately acknowledged both in-text and at the end of the report.

- The report should use scientific terminology and include:
- Evaluation of procedures and results to identify limitations of, and improvements to the investigation.
- A conclusion, which includes predictions or advice based on findings.
- Citations and referencing.

Results

Record and display the results of the study. Appropriate representation of data including tables, graphs, maps, charts, photographs or other illustrations.

Discussion
Use the data that you have collected to write a report about your investigation. It should be organised into paragraphs and include the following aspects:

- Is there any pattern to the results? Explain.
- Is the data exactly as predicted or are there inconsistencies or differences from the predictions?
- Analysis of the information gathered in terms of the interaction of two or more Earth systems.
- What steps were taken to control other variables/factors?
- Assess the reliability and accuracy of your data. Suggest how the reliability and accuracy of your data could be increased if you were to repeat the investigation.
- Evaluate the method and suggest and explain modification you would make if you were to repeat the investigation.

Conclusion
What conclusion can you reach based on your original hypothesis and your results?
What are the implications of your findings beyond the scope of your study?
Make recommendations for further work that could be carried out to extend the significance of your findings.

Bibliography/Reference List

Details of sources information not your own need to be acknowledged both in-text and at the end of text in a reference list or bibliography. Use only credible authors, institutions or sources of information. Sufficient detail needs to be supplied so that each point of information can easily be referred to by other people reading your work.

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	Investigation, Analysis and Evaluation	**Knowledge and Application**
A	1 Designs a *logical, coherent, detailed* Scientific investigation. 2 Obtains, records, and *represents data*, using appropriate conventions and formats accurately and *highly effectively*. 3 Systematically analyses and interprets data and evidence to formulate *logical conclusions with detailed justification.* 4 *Critically and logically evaluates procedures* and their effect on data.	1 Demonstrates *deep and broad knowledge* and understanding *of a range of Scientific concepts*. 2 Develops and *applies Scientific concepts highly effectively* in new and familiar contexts. 3 Critically explores and *understands in depth* the interaction between Science and society 4 Communicates knowledge and understanding of Science, with *highly effective use of appropriate terms*, conventions, and representations.
B	1 Designs a *well-considered* and clear Scientific investigation. 2 Obtains, records, and *represents data*, using appropriate conventions and formats *mostly accurately* and effectively. 3 Logically analyses and interprets data and evidence to formulate suitable *conclusions with reasonable justification*. 4 *Logically evaluates procedures* and their effect on data.	1 Demonstrates *some depth and breadth of knowledge* and understanding of a range of Scientific concepts. 2 Develops and *applies Scientific concepts mostly effectively* in new and familiar contexts. 3 Logically explores and understands *in some depth* the interaction between Science and society 4 Communicates knowledge and understanding of Science mostly coherently, with *effective use of appropriate terms*, conventions and representations.
C	1 Designs a-considered and *generally clear* Scientific investigation 2 Obtains, records, and represents data, using *generally appropriate* conventions and formats generally accurately and effectively. 3 Undertakes some analyses and interpretation of data and evidence to formulate *generally appropriate* conclusions with some justification. 4 Evaluates procedures and *some of their effect on data*.	1 Demonstrates knowledge and *understanding of a general range* of Scientific concepts. 2 Develops and applies Scientific concepts *generally effectively* in new or familiar contexts. 3 Explores and *understands aspects* of the interaction between Science and technology. 4 Communicates knowledge and understanding of Science *generally effectively*, using some appropriate terms, conventions and representations.
D	1 Prepares the *outline of a Scientific investigation*. 2 Obtains, *records, and represents data*, using conventions and formats *inconsistently*, with occasional accuracy and effectiveness. 3 Describes data and undertakes some basic interpretation to *formulate a basic conclusion*. 4 *Attempts to evaluate procedures* or suggest an effect on data.	1 Demonstrates *some basic knowledge* and partial understanding of Scientific concepts. 2 Develops and *applies some Scientific concepts* in familiar contexts. 3 *Partially explores* and recognises aspects of the interaction between Science and society. 4 Communicates *basic Scientific information*, using some appropriate terms and/or conventions.
E	1 Identifies *a simple procedure* for a Scientific investigation. 2 Attempts to record and represent some data, with *limited accuracy or effectiveness*. 3 Attempts to describe results and/or interpret data to *formulate a basic conclusion*. 4 *Acknowledges that procedures affect data*.	1 Demonstrates *limited recognition and awareness* of Scientific concepts. 2 *Attempts to develop* and apply Scientific concepts in familiar contexts. 3 *Attempts to explore and identify an aspect* of the interaction between Science and society. 4 *Attempts to communicate* information about Science.

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