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## Why choose Cambridge International?

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Cambridge International prepares school students for life, helping them develop an informed curiosity and a lasting passion for learning. We are part of Cambridge University Press & Assessment, which is a department of the University of Cambridge.

Our Cambridge Pathway gives students a clear path for educational success from age 5 to 19. Schools can shape the curriculum around how they want students to learn – with a wide range of subjects and flexible ways to offer them. It helps students discover new abilities and a wider world, and gives them the skills they need for life, so they can achieve at school, university and work.

Our programmes and qualifications set the global standard for international education. They are created by subject experts, rooted in academic rigour and reflect the latest educational research. They provide a strong platform for students to progress from one stage to the next, and are well supported by teaching and learning resources.

We review all our syllabuses regularly, so they reflect the latest research evidence and professional teaching practice – and take account of the different national contexts in which they are taught.

We consult with teachers to help us design each syllabus around the needs of their learners. Consulting with leading universities has helped us make sure our syllabuses encourage students to master the key concepts in the subject and develop the skills necessary for success in higher education.

Our mission is to provide educational benefit through provision of international programmes and qualifications for school education and to be the world leader in this field. Together with schools, we develop Cambridge learners who are confident, responsible, reflective, innovative and engaged – equipped for success in the modern world.

Every year, nearly a million Cambridge students from 10 000 schools in 160 countries prepare for their future with the Cambridge Pathway.

**School feedback:** ‘We think the Cambridge curriculum is superb preparation for university.’

**Feedback from:** Christoph Guttentag, Dean of Undergraduate Admissions, Duke University, USA

### Quality management



Cambridge International is committed to providing exceptional quality. In line with this commitment, our quality management system for the provision of international qualifications and education programmes for students aged 5 to 19 is independently certified as meeting the internationally recognised standard, ISO 9001:2015. Learn more at [www.cambridgeinternational.org/ISO9001](http://www.cambridgeinternational.org/ISO9001)

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## **Important: Changes to this syllabus**

The latest syllabus is version 2, published March 2023. There are no significant changes which affect teaching.

Any textbooks endorsed to support the syllabus for examination from 2022 are still suitable for use with this syllabus.

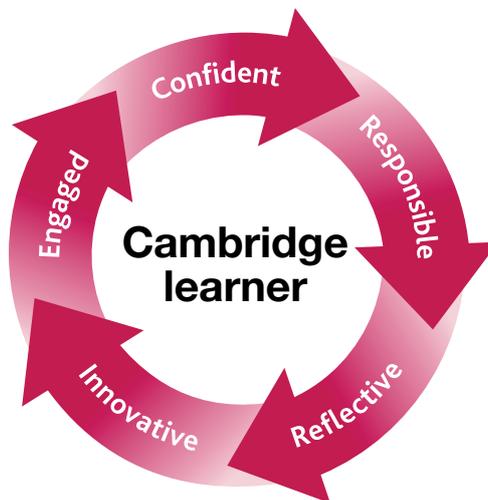
# 1 Why choose this syllabus?

## Key benefits

The best motivation for a student is a real passion for the subject they're learning. By offering students a variety of Cambridge International AS & A Levels, you can give them the greatest chance of finding the path of education they most want to follow. With over 50 subjects to choose from, students can select the ones they love and that they're best at, which helps motivate them throughout their studies.

Following a Cambridge International AS & A Level programme helps students develop abilities which universities value highly, including:

- a deep understanding of their subjects
- higher order thinking skills – analysis, critical thinking, problem solving
- presenting ordered and coherent arguments
- independent learning and research.



**Cambridge International AS Level Environmental Management** develops a set of transferable skills including handling data, practical problem-solving, and applying the scientific method. Learners develop relevant attitudes, such as concern for accuracy and precision, objectivity, integrity, enquiry, initiative and inventiveness. They acquire the essential scientific skills required for progression to further studies or employment.

Our approach in Cambridge International AS Level Environmental Management encourages learners to be:

**confident**, secure in their knowledge, and keen to explore the application of scientific approaches to manage the environment

**responsible**, developing efficient and safe scientific practices, recognising the human impact on the environment and working collaboratively to manage this impact

**reflective**, able to evaluate evidence to draw informed and appropriate conclusions and recognising that the applications of environmental management have the potential to be both helpful and harmful to the individual, the community and the environment

**innovative**, applying problem-solving skills to novel situations and engaging with tools and techniques, including information technology, to develop successful approaches

**engaged**, developing an enquiring mind, and conscious of the social impacts of environmental management.

**School feedback:** 'Cambridge students develop a deep understanding of subjects and independent thinking skills.'

**Feedback from:** Principal, Rockledge High School, USA

## Key concepts

Key concepts are essential ideas that help students develop a deep understanding of their subject and make links between different aspects. Key concepts may open up new ways of thinking about, understanding or interpreting the important things to be learned.

Good teaching and learning will incorporate and reinforce a subject's key concepts to help students gain:

- a greater depth as well as breadth of subject knowledge
- confidence, especially in applying knowledge and skills in new situations
- the vocabulary to discuss their subject conceptually and show how different aspects link together
- a level of mastery of their subject to help them enter higher education.

The key concepts identified below, carefully introduced and developed, will help to underpin the course you will teach. You may identify additional key concepts which will also enrich teaching and learning.

The key concepts for Cambridge International AS Level Environmental Management are:

- **Sustainability**  
The use and management of resources to meet the needs of the present global population without compromising the ability of future generations to meet their own needs is a goal underlying all environmental management strategies.
- **Interactions**  
The interactions within and between the living and physical environments shape all environments on Earth. Environmental management strategies aim to protect and maintain this balance.
- **Pressure on the environment**  
Human activities create challenges and put pressure on the local and global environment. Diverse influences may be environmental, economic, social, political or historical and need to be managed to protect the environment.
- **Global dimensions**  
Actions taken at a local level may have local, regional and global environmental impacts which must be considered. Consequences may be positive or negative, may not take effect immediately, and may not be easily detected.
- **Research methodology**  
Scientific investigations and research are fundamental to understanding an environment and developing environmental management strategies. Using the appropriate methodology to answer a specific question means the results are more likely to be reliable.

## International recognition and acceptance

Our expertise in curriculum, teaching and learning, and assessment is the basis for the recognition of our programmes and qualifications around the world. Every year thousands of students with Cambridge International AS & A Levels gain places at leading universities worldwide. Our programmes and qualifications are valued by top universities around the world including those in the UK, US (including Ivy League universities), Europe, Australia, Canada and New Zealand.

UK NARIC\*, the national agency in the UK for the recognition and comparison of international qualifications and skills, has carried out an independent benchmarking study of Cambridge International AS & A Level and found it to be comparable to the standard of AS & A Level in the UK. This means students can be confident that their Cambridge International AS & A Level qualifications are accepted as equivalent, grade for grade, to UK AS & A Levels by leading universities worldwide.

Cambridge International AS Level Environmental Management provides knowledge and transferable skills that support further subject specific study. Depending on local university entrance requirements, students may be able to use it to progress directly to university courses in Environmental Management or related subjects. It is also suitable as part of a course of general education.

We recommend learners check the Cambridge recognition database and university websites to find the most up-to-date entry requirements for courses they wish to study.

\* Due to the United Kingdom leaving the European Union, the UK NARIC national recognition agency function was re-titled as UK ENIC on 1 March 2021, operated and managed by Ecctis Limited. From 1 March 2021, international benchmarking findings are published under the Ecctis name.

Learn more at [www.cambridgeinternational.org/recognition](http://www.cambridgeinternational.org/recognition)

**School feedback:** ‘The depth of knowledge displayed by the best A Level students makes them prime targets for America’s Ivy League universities.’

**Feedback from:** Yale University, USA

## Supporting teachers

We provide a wide range of resources, detailed guidance, innovative training and professional development so that you can give your students the best possible preparation for Cambridge International AS & A Level. To find out which resources are available for each syllabus go to [www.cambridgeinternational.org/support](http://www.cambridgeinternational.org/support)

The School Support Hub is our secure online site for Cambridge teachers where you can find the resources you need to deliver our programmes. You can also keep up to date with your subject and the global Cambridge community through our online discussion forums.

Find out more at [www.cambridgeinternational.org/support](http://www.cambridgeinternational.org/support)

Support for Cambridge International AS & A Level			
<b>Planning and preparation</b> <ul style="list-style-type: none"><li>• Schemes of work</li><li>• Specimen papers</li><li>• Syllabuses</li><li>• Teacher guides</li></ul>	<b>Teaching and assessment</b> <ul style="list-style-type: none"><li>• Endorsed resources</li><li>• Online forums</li><li>• Support for coursework and speaking tests</li></ul>	<b>Learning and revision</b> <ul style="list-style-type: none"><li>• Example candidate responses</li><li>• Past papers and mark schemes</li><li>• Specimen paper answers</li></ul>	<b>Results</b> <ul style="list-style-type: none"><li>• Candidate Results Service</li><li>• Principal examiner reports for teachers</li></ul>

Sign up for email notifications about changes to syllabuses, including new and revised products and services at [www.cambridgeinternational.org/syllabusupdates](http://www.cambridgeinternational.org/syllabusupdates)

## Professional development

We support teachers through:

- Introductory Training – face-to-face or online
- Extension Training – face-to-face or online
- Enrichment Professional Development – face-to-face or online

Find out more at [www.cambridgeinternational.org/events](http://www.cambridgeinternational.org/events)

- Cambridge Professional Development Qualifications

Find out more at [www.cambridgeinternational.org/profdev](http://www.cambridgeinternational.org/profdev)



### Supporting exams officers

We provide comprehensive support and guidance for all Cambridge exams officers.

Find out more at: [www.cambridgeinternational.org/eoguide](http://www.cambridgeinternational.org/eoguide)

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## 2 Syllabus overview

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### Aims

The aims describe the purposes of a course based on this syllabus.

The aims are to enable students to develop:

- knowledge of natural systems which make life possible on Earth
- an understanding that humans are part of these systems and depend on them
- an appreciation of the diverse influences of human activity on natural systems
- an awareness of the need to manage natural systems
- an understanding of sustainable development to meet the needs of the present, without compromising the ability of future generations to meet their own needs
- a sense of responsibility and concern for the welfare of the environment and all organisms
- an awareness of their own values concerning environmental issues
- an awareness of the values of others
- a willingness to review their own attitudes in the light of new knowledge and experiences
- a sound basis for further study, personal development and participation in local and global environmental concerns.

Cambridge Assessment International Education is an education organisation and politically neutral. The contents of this syllabus, examination papers and associated materials do not endorse any political view. We endeavour to treat all aspects of the exam process neutrally.



## Content overview

Candidates for Cambridge International AS Level Environmental Management study the following topics:

- 1 Introduction to environmental management
- 2 Environmental research and data collection
- 3 Managing human population
- 4 Managing ecosystems and biodiversity
- 5 Managing resources
- 6 Managing water supplies
- 7 Managing the atmosphere
- 8 Managing climate change

AS Level candidates also study investigative skills.

**School feedback:** ‘Cambridge International AS & A Levels prepare students well for university because they’ve learnt to go into a subject in considerable depth. There’s that ability to really understand the depth and richness and the detail of a subject. It’s a wonderful preparation for what they are going to face at university.’

**Feedback from:** US Higher Education Advisory Council

## Assessment overview

Paper 1	Paper 2
<p><b>Principles of Environmental Management</b>                      1 hour 45 minutes</p> <p>80 marks</p> <p>[Section A: between four and six structured questions, with a range of task types. (60 marks)</p> <p>Section B: one essay from a choice of two questions. (20 marks)</p> <p>Externally assessed</p> <p>50% of the AS Level</p>	<p><b>Management in Context</b>                      1 hour 45 minutes</p> <p>80 marks</p> <p>Between four and six structured questions, with a range of task types.</p> <p>Externally assessed</p> <p>50% of the AS Level</p>

Information on availability is in the **Before you start** section.

There is one route for Cambridge International AS Level Environmental Management:

Route	Paper 1	Paper 2
<p><b>AS Level only</b> (Candidates take all AS components in the same exam series)</p>	yes	yes

## Assessment objectives

The assessment objectives (AOs) are:

### AO1 Knowledge and understanding

Candidates should be able to demonstrate knowledge and understanding, in familiar and unfamiliar contexts, of:

- phenomena, facts, definitions, concepts and theories
- vocabulary, terminology and conventions
- policies, strategies and technological applications for managing the environment at local, regional and global levels.

### AO2 Information handling and analysis

Candidates should be able, in words or using other forms of presentation (e.g. graphical or numerical), in familiar and unfamiliar contexts, to:

- locate, select, organise and present information from a variety of sources
- translate information and evidence from one form to another
- manipulate numerical data
- interpret and evaluate data, report trends and draw inferences.
- give reasoned explanations for phenomena, patterns and relationships.

### AO3 Investigation skills and making judgements

Candidates should be able, in familiar and unfamiliar contexts, to:

- plan investigations
- identify limitations of methods and suggest possible improvements
- make reasoned judgements and reach conclusions based on qualitative and quantitative information.

## Weighting for assessment objectives

The approximate weightings allocated to each of the assessment objectives (AOs) are summarised below.

### Assessment objectives as a percentage of each qualification

Assessment objective	Weighting in AS Level %
AO1 Knowledge and understanding	40
AO2 Information handling and analysis	40
AO3 Investigation skills and making judgements	20
Total	100

### Assessment objectives as a percentage of each component

Assessment objective	Weighting in components %	
	Paper 1	Paper 2
AO1 Knowledge and understanding	45	35
AO2 Information handling and analysis	40	40
AO3 Investigation skills and making judgements	15	15
Total	100	100

## 3 Subject content

Candidates for Cambridge International AS Level Environmental Management should study all topics.

At the end of topics 2 to 8 there is a case study. This is intended to illustrate the content and help students to understand and engage with it. For each case study, teachers should choose their own examples to investigate. In the assessment, candidates are expected to refer to relevant examples and/or case studies in Section B of Paper 1 and where indicated in other questions.

Candidates are expected to carry out investigative work. Candidates will be expected to apply the investigation skills in section 2 to any investigative work throughout this course. Paper 2 assesses the skills of planning investigations and identifying the limitations of methods.

This syllabus gives you the flexibility to design a course that will interest, challenge and engage your learners. Where appropriate you are responsible for selecting suitable subject contexts, resources and examples to support your learners' study. These should be appropriate for the learners' age, cultural background and learning context as well as complying with your school policies and local legal requirements.

### 1 Introduction to environmental management

Environmental management is concerned with the impacts of human activity on the environment. Having a basic understanding of the structure of the earth and the science of key natural phenomena is essential to the study of environmental management. This section introduces these foundations and they are used as a starting point for other sections in this syllabus. Some candidates may have previously studied the knowledge in this section as part of a Level 2 course (GCSE, IGCSE, O Level).

#### 1.1 Continents and oceans

##### Learning outcomes

Candidates should be able to:

identify and name the world's continents and major oceans

##### Further guidance:

- continents (Africa, Antarctica, Asia, Europe, North America, South America and Oceania)
- oceans (Atlantic Ocean, Pacific Ocean, Indian Ocean, Arctic Ocean and Southern Ocean)

#### 1.2 Country classification by income level

##### Learning outcomes

Candidates should be able to:

describe the income groups the World Bank uses to classify countries

##### Further guidance:

limited to countries with:

- low income economies (LICs)
- middle income economies (MICs)
- high income economies (HICs)

### 1.3 Sustainability

#### Learning outcomes

Candidates should be able to:

- 1 define the term sustainability as the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs
- 2 understand the need for the sustainable management of resources

#### Further guidance:

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### 1.4 The water cycle

#### Learning outcomes

Candidates should be able to:

- 1 describe the water cycle
- 2 interpret and draw diagrams representing the water cycle

#### Further guidance:

limited to:

- condensation
- precipitation
- interception
- infiltration
- surface run-off
- through-flow
- ground water flow
- transpiration
- evaporation

---

### 1.5 The structure and composition of the atmosphere

#### Learning outcomes

Candidates should be able to:

- 1 state the major components of the Earth's atmosphere

#### Further guidance:

limited to:

- nitrogen
  - oxygen
  - carbon dioxide
  - argon
  - water vapour
-

## 1.5 The structure and composition of the atmosphere (continued)

### Learning outcomes

Candidates should be able to:

- 2 describe the structure of the Earth's atmosphere as divided into four primary layers
- 3 state that the ozone layer is located within the stratosphere
- 4 describe the ozone layer and outline its role in absorbing ultraviolet radiation
- 5 outline the natural greenhouse effect that maintains the Earth's ambient temperature

### Further guidance:

- troposphere
  - stratosphere
  - mesosphere
  - thermosphere
- 
- ultraviolet radiation (shortwave radiation) passes through the Earth's atmosphere and is absorbed by the Earth's surface
  - some energy is re-emitted back into the atmosphere as infrared radiation (longwave radiation)
  - greenhouse gases absorb some of this infrared radiation and prevent it from leaving the atmosphere

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## 1.6 Ecosystems

### Learning outcomes

Candidates should be able to:

- 1 define the terms biome, ecosystem, population, community, habitat and niche
- 2 state the biotic and abiotic components of an ecosystem
- 3 describe how biotic factors affect the number and the diversity of organisms found within an ecosystem
- 4 outline examples of biotic interactions
- 5 define photosynthesis as the process by which plants synthesise glucose using carbon dioxide, water and energy from sunlight

### Further guidance:

- biotic components:
  - producers, consumers (primary, secondary and tertiary) and decomposers
- abiotic components:
  - temperature, humidity, water, oxygen, salinity, light, pH

limited to:

- competition (inter-specific and intra-specific)
- grazing
- predation

## 1.6 Ecosystems (continued)

### Learning outcomes

Candidates should be able to:

- 6 state the word and chemical equations for photosynthesis
- 7 state that chlorophyll captures light energy for photosynthesis
- 8 explain that the availability of water, concentration of carbon dioxide and the availability of light are limiting factors in the rate of photosynthesis
- 9 explain how photosynthesis on land and in the oceans is a vital part of the carbon cycle and has an important effect on carbon dioxide concentrations in the atmosphere by forming carbon stores
- 10 define the terms producer, primary consumer, secondary consumer, tertiary consumer and decomposer
- 11 define trophic levels as feeding levels within food chains
- 12 identify organisms at different feeding levels in a food chain or food web
- 13 state that energy is transferred between organisms in a food chain, starting with a producer
- 14 explain how energy is lost in food chains
- 15 construct simple food chains and food webs
- 16 define aerobic respiration as the chemical reactions in cells that break down glucose molecules and release energy, carbon dioxide and water
- 17 state the word and chemical equation for aerobic respiration
- 18 describe the carbon cycle
- 19 interpret and draw diagrams representing the carbon cycle

### Further guidance:

- carbon dioxide + water → glucose + oxygen
- $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$

including: loss by respiration and waste products

- glucose + oxygen → carbon dioxide + water
- $\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$

limited to the stages:

- photosynthesis
- respiration
- feeding
- decomposition
- fossilisation
- combustion

## 2 Environmental research and data collection

Scientific environmental studies are essential to understand environments and develop management strategies. The design of environmental studies to collect and analyse reliable data is described in this section. Using the context of climate change, the importance of the integrity of data and the influence of groups and organisations will be discussed. As more environmental data are available now than ever before, the use and impacts of a wide variety of data sources are explored.

Candidates will be expected to carry out investigative work. Candidates will be expected to apply the investigation skills in this section to any investigative work throughout this course. The planning of investigations and identification of limitations of methods and evaluation are limited to Paper 2.

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### 2.1 The scientific method

#### Learning outcomes

Candidates should be able to:

- 1 describe how the scientific method involves the interplay between observations and the formation, testing and evaluation of hypotheses
- 2 formulate hypotheses based on observations or experimental data
- 3 design investigations in which variables are controlled and quantitative results are collected
- 4 explain the terms dependent and independent variable and identify each type in a given experiment
- 5 interpret data to determine whether they support or refute the hypothesis being tested
- 6 explain how limitations in the measurement of data lead to uncertainty in the results
- 7 demonstrate an understanding that a hypothesis that is consistently supported by investigation and observation can become a theory

#### Further guidance:

candidates should be able to apply the scientific method to the collection of reliable data and the design of environmental investigations

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### 2.2 Environmental research in the context of climate change

#### Learning outcomes

Candidates should be able to:

- 1 define the terms reliable and bias and explain their significance to environmental investigations
- 2 using examples related to climate change, outline how historical data have developed

#### Further guidance:

- limited amount of historical data
- development of scientific theory
- advances in technology

## 2.2 Environmental research in the context of climate change (continued)

### Learning outcomes

Candidates should be able to:

- 3 using examples related to climate change, outline how bias has led to the misuse of scientific data
- 4 using examples related to climate change, outline how unreliable data has led to false reporting of scientific conclusions

### Further guidance:

- limited amount of data
- lack of public and media knowledge
- uncertainty in climate models

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## 2.3 Collection of environmental data

### Learning outcomes

Candidates should be able to:

- 1 state that sampling strategies are used to collect representative data
- 2 explain how random sampling and systematic sampling strategies aim to ensure samples are well distributed with a low risk of bias
- 3 describe and explain factors influencing the suitability of random sampling or systematic sampling strategies for different studies
- 4 evaluate the choice of random and systematic sampling strategies in familiar and unfamiliar contexts

### Further guidance:

including:

- size
- ease of access
- knowledge of the environment

including: precision, bias and efficiency of strategies

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## 2.4 Data collection techniques and data analysis

### Learning outcomes

Candidates should be able to:

- 1 describe techniques used to collect sample data
- 2 describe benefits and limitations of each sampling technique listed
- 3 select and use a suitable sampling technique to collect environmental data

### Further guidance:

limited to:

- quadrats (open frame, grid and point), pitfall traps, sweep nets, beating trays, kick sampling, light traps, capture-mark-recapture
- water turbidity
- questionnaires, interviews

## 2.4 Data collection techniques and data analysis (continued)

### Learning outcomes

Candidates should be able to:

- 4 use data to:
  - (a) calculate estimated population size using the Lincoln index
  - (b) calculate estimated biodiversity using the Simpson's index of diversity
  - (c) estimate percentage cover and frequency using quadrat data
  - (d) estimate abundance using quadrat data

### Further guidance:

- Lincoln index

$$N = \frac{n_1 \times n_2}{m_2}$$

$N$  = estimate of population size

$n_1$  = number of individuals captured in first sample

$n_2$  = number of individuals (both marked and unmarked) captured in second sample

$m_2$  = number of marked individuals recaptured in second sample

This formula will be given in the question papers

- Simpson's index of diversity ( $D$ )

$$D = 1 - \left( \sum \left( \frac{n}{N} \right)^2 \right)$$

$\sum$  = sum of (total)

$n$  = the number of individuals of each type present in the sample (types may be species and/or higher taxa such as genera, families, etc.)

$N$  = the total number of all individuals of all types present in the sample

This formula will be given in the question papers

- use of a suitable abundance scale, such as ACFOR

## 2.5 The use of technology in data collection and analysis

### Learning outcomes

Candidates should be able to:

- 1 state that there are methods of data collection that include the use of technology
- 2 describe what is meant by the term 'big data'
- 3 outline the benefits and limitations of the analysis of big data

### Further guidance:

including:

- geospatial systems
- satellite sensors
- radio tracking
- computer modelling
- crowd sourcing

including benefits and limitations of:

- amount and type of data stored
- speed at which new data is generated
- trustworthiness of the data
- ways the data can be used

**Case study:** Plan an environmental management investigation of your choosing. The investigation should include a research aim, methodology, how the data would be collected and how this data could be processed.

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### 3 Managing human population

Changes to the size, composition and distribution of populations have fundamental impacts on natural resources. These changes and their impacts are different for countries with differing economies. This section outlines how human population change is measured, the impacts of population changes, and strategies for managing population expansion and ageing populations.

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#### 3.1 Human population dynamics and structure

##### Learning outcomes

Candidates should be able to:

- 1 calculate population density from given data
- 2 describe and explain factors influencing population density and distribution
- 3 describe populations in terms of their size and the composition of different age groups
- 4 explain how changes in birth rates, death rates and migration rates may affect population size and composition
- 5 define and calculate dependency ratio
  
- 6 suggest reasons for differences between the population structures of HICs and LICs

##### Further guidance:

including: environmental, economic, social, political and historical factors

- dependency ratio = 
$$\frac{[\text{young population (0 to 14)} + \text{old population (65+)}] \times 100}{\text{population aged 15 to 64}}$$

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#### 3.2 Impacts of human population change

##### Learning outcomes

Candidates should be able to:

describe the impacts of ageing populations on countries

##### Further guidance:

including:

- lower tax revenues
  - higher pension spending
  - pressure on health care
  - pressure to raise retirement age
-

### 3.3 Managing human population change

#### Learning outcomes

Candidates should be able to:  
describe and evaluate strategies for managing a changing population

#### Further guidance:

including:

- improved availability of contraception
- improved education about contraception
- improved education and opportunities for women
- improved health care
- local, national and global policies: pronatalist and antinatalist policies, United Nations (UN) Agenda 21, The Club of Rome. (Detailed knowledge of these policies is not required.)

**Case study:** Compare and contrast the population dynamics of a HIC and a LIC.

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## 4 Managing ecosystems and biodiversity

The world's ecosystems are essential for the survival and well-being of people everywhere in the world. The emphasis in this section is on understanding the energy transfers that sustain the biodiversity of the world's ecosystems and how we can best manage these ecosystems to conserve that biodiversity.

### 4.1 Ecosystems

#### Learning outcomes

Candidates should be able to:

- 1 describe the world's major terrestrial biomes in terms of their climate, soil type and vegetation
- 2 outline the characteristics of primary and secondary succession from pioneer species through intermediate stages to a climax community
- 3 define the terms gross primary productivity and net primary productivity
- 4 define ecosystem productivity as the rate of production of biomass for an ecosystem
- 5 discuss the efficiency of energy transfer between trophic levels
- 6 interpret and draw ecological pyramids based on numbers, biomass and energy
- 7 explain the shapes of ecological pyramids

#### Further guidance:

limited to: desert, forest, grassland and tundra

limited to: relative timescale, starting point, soil, pioneer species

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### 4.2 Managing the conservation of biodiversity

#### Learning outcomes

Candidates should be able to:

- 1 define the terms native species and invasive species
- 2 explain the impacts of invasive species on biodiversity
- 3 describe and explain the benefits of conserving biodiversity

#### Further guidance:

including:

- resources of potential medicines
  - food, wood, fibres, oils and fuels
  - diversity in genes
  - ecological services
  - cultural and recreational value
-

## 4.2 Managing the conservation of biodiversity (continued)

### Learning outcomes

Candidates should be able to:

- 4 describe and evaluate legislation and protocols as methods of conserving biodiversity
  
- 5 describe and explain the role of the Evolutionarily Distinct and Globally Endangered species (EDGE) programme in the conservation of biodiversity
  
- 6 describe and evaluate captive breeding and release as a method of conserving biodiversity
  
- 7 describe and evaluate habitat conservation and creation as methods of conserving biodiversity

### Further guidance:

limited to:

- protection of species
- regulation of sustainable harvesting
- international trade in endangered species (CITES)
- International Whaling Commission (IWC)
- European Union Common Fisheries Policy (EU CFP)
- International Tropical Timber Organisation (ITTO)
- International Union for Conservation of Nature (IUCN) Red List

detailed knowledge of international agreements is not required

including:

- rewilding and management and conservation of habitats:
  - extracted reserves
  - protection of habitats
  - nature reserves
  - protected areas
  - conservation zones
  - national parks

### 4.3 Impacts of human activity on ecosystems

#### Learning outcomes

Candidates should be able to:

- 1 describe and explain the impacts of human activity on tropical rainforests
- 2 describe and evaluate strategies for managing the impacts of human activity on tropical rainforests
- 3 describe and explain the impacts of human activity on Antarctica
- 4 describe and evaluate strategies for managing the impacts of human activity on Antarctica

#### Further guidance:

including:

- deforestation leading to fragmentation
- fuel wood and timber collection
- agricultural expansion
- mineral extraction
- hydroelectric and reservoir projects
- climate change
- exploitation of individual species

including:

- legislation and international agreement
- sustainable harvesting
- debt for nature swaps
- creation of protected areas

detailed knowledge of international agreements is not required

including:

- climate change
- ozone depletion
- tourism
- overfishing
- future mineral and oil extraction
- scientific research

including:

- legislation and international agreement (the Antarctic Treaty 1959)
- protected areas
- fisheries regulation
- prohibited activities such as mineral extraction
- protection from non-native animals or plants
- waste management
- tourism control and permits for travel

detailed knowledge of international agreements is not required

**Case study:** Evaluate the strategies in place to conserve the biodiversity of a named ecosystem.

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## 5 Managing resources

Greater stresses on food and energy resources present environmental management challenges. The causes and impacts of food insecurity and energy insecurity need to be understood in order to design management strategies that strive for food and energy security

### 5.1 Food security

#### Learning outcomes

Candidates should be able to:

- 1 define food security as when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life
- 2 describe and explain causes of food insecurity and threats to food security
  
- 3 outline the impacts of food insecurity

#### Further guidance:

limited to:

- population growth
- unsustainable production, increase in homogeneity in global food supply
- price setting
- land degradation
- agricultural disease
- diverting crops for biofuels
- climate change
- water shortages
- poverty

limited to:

- regional food scarcity
- nutritional deficiency and malnutrition
- poverty
- forced migration
- conflict
- famine
- death

## 5.1 Food security (continued)

### Learning outcomes

Candidates should be able to:

- 4 describe and evaluate strategies for managing food security

### Further guidance:

including:

- subsistence agriculture
- increase food production by intensification and extensification
- improved agricultural techniques and efficiency
  - aquaculture and hydroponics
  - use of selective breeding and genetically modified (GM) crops to developing pest-resistant crops and crops with a higher yield
  - controlling limiting factors, e.g. use of fertilisers in areas short of nutrients
  - increasing productivity by removing competition from weeds by the use of herbicides, reducing fungal disease by use of fungicides, reducing pest species by use of biological control
- reduction in livestock and increase in growing crops
- reduce food waste
- large-scale food stockpiling
- improve transportation of food
- protecting pollinating insects
- the World Food Programme and food aid
- rationing

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## 5.2 Energy resources

### Learning outcomes

Candidates should be able to:

- 1 classify energy resources as renewable or non-renewable

### Further guidance:

- renewable resources:
  - biofuels (biomass including wood, bioethanol and biogas), geothermal energy, hydroelectric dams, tidal energy, wave energy, solar energy, wind energy
- non-renewable resources:
  - fossil fuel (oil, natural gas, coal), nuclear energy using uranium as a fuel

## 5.2 Energy resources (continued)

### Learning outcomes

Candidates should be able to:

2 define energy security as the reliable availability of energy sources at an affordable price with a consideration of the environmental impacts

3 describe and explain the causes of energy insecurity

4 outline the impacts of energy insecurity

5 describe and evaluate strategies for managing energy security

### Further guidance:

- long-term energy security:
  - supply of energy that is in line with economic developments and environmental needs
- short-term energy security:
  - systems that react promptly to sudden changes in the supply-demand balance

including:

- fossil fuel depletion
- inequality in global energy resources
- population growth
- differing energy needs of countries in different income groups
- climate change
- supply disruption
  - natural disasters, piracy, terrorism

including:

- disrupted electricity supply to homes and industry
- increasing prices for energy resources
- increasing costs for industry
- job losses, economic recession
- increased levels of poverty and low standards of living
- reliance on imported sources of energy
- civil disruption and conflict

including:

- increasing energy efficiency
- increasing energy production
- reducing reliance on fossil fuels
- investing in renewable resources and carbon neutral fuels
- development of alternative energy technologies
- investment in local energy projects
- rationing

### 5.3 Waste management

#### Learning outcomes

Candidates should be able to:

- 1 describe methods of waste disposal and treatment
- 2 explain the impacts of waste disposal methods
- 3 describe and evaluate strategies to reduce the impacts of waste disposal

#### Further guidance:

limited to:

- landfill sites
- incineration
- storage
- disposal at sea
- recycling
- exporting waste

including:

- contamination of soil leading to leaching and contamination of ground water
- build-up and release of the greenhouse gas methane (CH<sub>4</sub>) with a danger of explosions
- visual and noise pollution and unpleasant odour
- risk of spread of disease
- release of toxic substances
- bioaccumulation and biomagnification
- plastics and microplastics in oceans

including:

- reduce, reuse and recycle
- biodegradable plastics
- food waste for animal feed
- composting
- fermentation
- use of waste to generate energy
- education
- financial incentives and legislation

**Case study:** Compare and contrast the impacts of future energy insecurity on a HIC and a LIC.

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## 6 Managing water supplies

Managing the supply of water is one of the greatest environmental management challenges. The causes and impacts of water insecurity need to be understood in order to design effective water security management strategies.

### 6.1 Global water distribution

#### Learning outcomes

Candidates should be able to:

1 describe the distribution of the Earth's water

#### Further guidance:

- salt water in oceans
- surface fresh water
  - ice sheets, glaciers, lakes, rivers, swamps, marshes, permafrost
- sub-surface fresh water
  - soil moisture, ground water, permafrost
- atmospheric water

2 define the term water security as the ability to access sufficient quantities of clean water to maintain adequate standards of food and manufacturing of goods, adequate sanitation and sustainable health care

3 explain the causes of water insecurity

including:

- climate change, including changes in rainfall
- natural disasters, including drought and flooding
- pollution events
- inadequate sanitation
- population growth, changes in land usage including deforestation and urbanisation
- competing demands from agricultural, industrial, energy and domestic sectors
- mismanagement of irrigation, including salinisation
- international competition over water sources
- inequality of availability between water-rich and water-poor regions
- differing access to safe drinking water in urban and rural areas

4 explain the impacts of water insecurity

including:

- reduced crop yield and crop failure
- livestock death
- food shortages, malnutrition and famine
- illness caused by contaminated drinking water, limited to diarrhoea and cholera

## 6.1 Global water distribution (continued)

### Learning outcomes

Candidates should be able to:

- 5 describe and evaluate strategies for managing water security

### Further guidance:

including:

- sustainable water extraction and improved supply (piped supply, aquifers and artesian wells, boreholes, gravity-fed schemes, reservoirs and dams)
- reduction in water usage (improved irrigation techniques, growing crops less dependent on high water supply, recycling and rain water catchment)
- education on sustainable water use
- poverty reduction
- international agreement and water-related aid (detailed knowledge of international agreements is not required)
- rationing

**Case study:** Study the impacts that the lack of water security has had on a region and evaluate the strategies in place to improve the water security of that region.

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## 7 Managing the atmosphere

The management of the atmosphere requires understanding of the causes and impacts of air pollution. This section examines these through the study of acid deposition, photochemical smog and ozone depletion.

### 7.1 Acid deposition

#### Learning outcomes

Candidates should be able to:

- 1 define acid deposition as a mix of air pollutants that deposit from the atmosphere as acidic wet deposition (with a pH <5.6) or acidic dry deposition

- 2 describe the two types of acid deposition

- 3 outline the formation of acid deposition

- 4 outline the impacts of acid deposition on:

- aquatic environments
- vegetation and crops
- stone and brick buildings

#### Further guidance:

- wet deposition
  - snow, rain, hail, fog
- dry deposition
  - dust and gases
- fossil fuels contain sulfur compounds
- combustion of fossil fuels releases sulfur dioxide gas
- sulfur dioxide gas reacts with water and oxygen in the atmosphere to form sulfuric acid
- nitrogen from the atmosphere reacts with oxygen in the high temperatures of vehicle engines to form nitrogen monoxide gas
- nitrogen monoxide gas is released into the atmosphere in vehicle emissions
- nitrogen monoxide gas reacts with oxygen and water in the atmosphere to form nitric acid

limited to:

- the effects on fish gills and fish populations
- defoliation and reduced crop yield
- enhanced chemical weathering

## 7.2 Photochemical smog

### Learning outcomes

Candidates should be able to:

- 1 define photochemical smog as a mixture of air pollutants and particulates, including ground level ozone, that is formed when oxides of nitrogen and volatile organic compounds (VOCs) react in the presence of sunlight
- 2 describe the impacts of photochemical smog

### Further guidance:

including:

- eye and respiratory irritation
- decreased crop yields
- deterioration of plastics and rubber

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## 7.3 Managing air pollution

### Learning outcomes

Candidates should be able to:

describe strategies for managing air pollution

### Further guidance:

including:

- reduced use of fossil fuels
- reducing emissions of:
  - sulfur dioxide by flue gas desulfurisation and fuel desulfurisation
  - oxides of nitrogen by catalytic converters
  - particulates using electrostatic precipitators
  - volatile organic compounds (VOCs)
    - safe usage, storage and disposal of household products
- restricting vehicle use in urban areas
- legislation
  - local, national and international legislation (detailed knowledge of specific legislation and agreements is not required)
  - polluter pays principle

## 7.4 Ozone depletion

### Learning outcomes

Candidates should be able to:

- 1 outline how ozone depletion occurs
- 2 state that ozone concentration is measured using the Dobson Unit
- 3 define the term ozone hole as an area where the average concentration of ozone is below 100 Dobson Units
- 4 explain why ozone depletion has been greatest over Antarctica
- 5 describe the impacts of ozone depletion due to the increased amounts of ultraviolet radiation
- 6 evaluate the international agreements used to reduce and phase out the use of ozone depleting substances
- 7 outline the impacts associated with the use of some alternatives to ozone depleting substances
- 8 outline the importance of experimental evidence to support a hypothesis, using the ozone destruction hypothesis suggested by Rowland-Molina as an example

### Further guidance:

- chlorofluorocarbons (CFCs) from aerosols and refrigerants are unreactive compounds and are not broken down in the troposphere
  - CFCs move into the stratosphere and break down in the presence of ultraviolet light to release a chlorine atom
  - rapid reactions between chlorine atoms and ozone breaks down ozone ( $O_3$ ) to oxygen ( $O_2$ ), causing ozone depletion
  - chlorine atoms remain in the stratosphere and can continue to destroy ozone
- detailed chemical mechanisms are not required

including: temperature, polar vortex, polar stratospheric clouds (PSCs)

including:

- human health (cataracts, skin cancer)
- decreased crop yields
- biodiversity of terrestrial and aquatic ecosystems
- degradation of materials used in clothing and construction

detailed knowledge of specific international agreements is not required

including:

- hydrochlorofluorocarbons (HCFCs)
- fluorinated gases (F-gases)
- initially the main hypothesis was not accepted
- some of the auxiliary hypotheses were not backed up by experimental evidence
- the hypothesis led to further research and data collection by other scientists, which confirmed that CFCs are ozone depleting

**Case study:** Study the causes and impacts of a named atmospheric pollution event and evaluate the management of the pollution event.

## 8 Managing climate change

The difficulties of monitoring and predicting climate change lead to significant challenges in the management of climate change. To be able to evaluate strategies for managing climate change, the causes of climate change need to be understood, as well as the impacts on human populations and the environment.

### 8.1 Climate change

#### Learning outcomes

Candidates should be able to:

- 1 define greenhouse gases as gases in the atmosphere that absorb infrared radiation and identify some common greenhouse gases
- 2 state the major sources of greenhouse gas emissions from human activities
- 3 explain how increased concentrations of greenhouse gases in the atmosphere cause the enhanced greenhouse effect leading to global warming
- 4 outline the difficulties of monitoring and predicting climate change

#### Further guidance:

limited to: the greenhouse gases carbon dioxide, water vapour and methane

including:

- combustion of fossil fuels (carbon dioxide and water vapour)
- rice fields and livestock (methane)
- landfill sites (methane)

including:

- limited historical data used to reconstruct past climate conditions (ice cores, tree rings, historical accounts)
- future climate predictions are made using computer climate models which use different variables
- climate feedback mechanisms are not fully understood
- time delay between cause and effect
- uncertainty over the use of some data in drawing conclusions has resulted in differences in scientific and political opinion

## 8.2 The impacts of climate change

### Learning outcomes

Candidates should be able to:

- 1 state the impacts of climate change on the environment
  
- 2 describe the impacts of climate change on human populations

### Further guidance:

including changes in:

- temperature and precipitation
- sea level
- ocean and wind circulation
- melting of sea ice, ice sheets, glaciers and permafrost
- species distribution and biodiversity

including:

- increased frequency and severity of extreme weather events leading to flooding and loss of land, drought and wild fires
  - damage to property and loss of life during extreme weather events
  - forced migration
  - impacts on crop yields and increased pest outbreaks
  - impacts on food, energy and water security
-

### 8.3 Managing climate change

#### Learning outcomes

Candidates should be able to:

- 1 describe strategies for managing climate change through the reduction of greenhouse gas emissions
  
  
  
  
  
  
  
  
  
  
- 2 outline geo-engineering strategies to counteract climate change
  
  
  
  
  
  
  
  
  
  
- 3 evaluate strategies for managing climate change

#### Further guidance:

including:

- reduction of global and individual carbon footprint (fewer children per woman, eating a plant-based diet, adopt an energy-efficient lifestyle)
- switching to low-carbon fuels
- reducing the use of fossil fuels
- using alternative forms of energy
- transport policies
- use of carbon capture and storage
- reducing deforestation, increasing reforestation and afforestation
- energy efficient buildings and infrastructure
- adaptation to climate change
- national and international agreements such as Kyoto Protocol 1992, Paris Agreement 2016 (detailed knowledge of international agreements is not required)

including:

- solar radiation management (SRM)
  - albedo enhancement, space reflectors, stratospheric aerosols

**Case study:** Evaluate the impacts climate change may have on a named country or location.

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## 4 Details of the assessment

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### Paper 1 – Principles of Environmental Management

Written paper, 1 hour 45 minutes, 80 marks

Paper 1 contains two sections:

- Section A has between four and six structured questions (60 marks)
- Section B has two essay questions (20 marks each)

Candidates should answer all the questions in Section A, and choose one question from two in Section B.

#### Section A

Questions examine candidates' knowledge and understanding of syllabus content and their ability to apply this knowledge by handling and analysing information in familiar and unfamiliar contexts.

There is a range of question types including:

- structured short-answer questions
- extended response
- data manipulation and calculation
- identification of features and patterns
- graph, table and diagram drawing, labelling and interpretation

Candidates should demonstrate AO1 and AO2 skills.

#### Section B

The essay examines the environmental management perspective of a topic from the syllabus content.

Candidates are expected to refer to relevant examples and/or case studies, using any relevant quantitative or qualitative information to support their answers. They will be expected to present reasoned explanations, make reasoned judgements and reach conclusions.

Candidates should demonstrate AO2 and AO3 skills.

## Paper 2 – Management in Context

Written paper, 1 hour 45 minutes, 80 marks

Paper 2 has between four and six structured questions.

Questions examine the investigation skills obtained by candidates through class and field-based practical activities. Questions will examine the application of environmental management in familiar and unfamiliar contexts. Questions require candidates to handle information, analyse sources, plan investigations, identify limitations of methods and suggest improvements.

There is a range of question types, including:

- structured short-answer questions
- extended response
- data manipulation and calculation questions
- identification of features and patterns
- graph, table and diagram drawing, labelling and interpretation and source interpretation and practical questions

Candidates should demonstrate AO1, AO2 and AO3 skills.

## Command words

Command words and their meanings help candidates know what is expected from them in the exam. The table below includes command words used in the assessment for this syllabus. The use of the command word will relate to the subject context.

Command word	What it means
<b>Analyse</b>	examine in detail to show meaning, identify elements and the relationship between them
<b>Assess</b>	make an informed judgement
<b>Calculate</b>	work out from given facts, figures or information
<b>Comment</b>	give an informed opinion
<b>Compare</b>	identify/comment on similarities and/or differences
<b>Consider</b>	review and respond to given information
<b>Contrast</b>	identify/comment on differences
<b>Define</b>	give precise meaning
<b>Demonstrate</b>	show how or give an example
<b>Describe</b>	state the points of a topic / give characteristics and main features
<b>Discuss</b>	write about issue(s) or topic(s) in depth in a structured way
<b>Evaluate</b>	judge or calculate the quality, importance, amount, or value of something
<b>Examine</b>	investigate closely, in detail
<b>Explain</b>	set out purposes or reasons / make the relationships between things evident / provide why and/or how and support with relevant evidence
<b>Give</b>	produce an answer from a given source or recall/memory
<b>Identify</b>	name/select/recognise
<b>Justify</b>	support a case with evidence/argument
<b>Outline</b>	set out main points
<b>Predict</b>	suggest what may happen based on available information
<b>Sketch</b>	make a simple freehand drawing showing the key features, taking care over proportions
<b>State</b>	express in clear terms
<b>Suggest</b>	apply knowledge and understanding to situations where there are a range of valid responses in order to make proposals / put forward considerations
<b>Summarise</b>	select and present the main points, without detail

### Additional guidance

Phrases such as ‘To what extent do you agree...?’, ‘How significant...?’ and ‘How far do you agree...?’ may also be seen in the assessment for this syllabus.

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## 5 Additional information

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We expect candidates to be able to use the following mathematical skills and knowledge in the assessment. Teaching the mathematical requirements should be included in the AS Level Environmental Management course.

### Mathematical requirements

Candidates should be able to:

- use a calculator for addition, subtraction, multiplication and division, and to calculate squares ( $x^2$ ), square roots ( $\sqrt{x}$ ), reciprocals ( $\frac{1}{x}$ ) and use of fractions
- recognise and use numbers in decimal and standard form
- interpret negative numbers in calculations
- understand and use the prefixes: giga (G), mega (M), kilo (k), milli (m), micro ( $\mu$ )
- understand and use the symbols:  $<$ ,  $>$ ,  $\leq$ ,  $\geq$ ,  $/$ , and  $\propto$
- take account of significant figures in calculations (the correct number of significant figures for calculated quantities is the same as, or one more than, the smallest number of significant figures in the data used in the calculation)
- understand the use of decimal places and rounding to the nearest quoted decimal place
- calculate percentages and percentage changes
- calculate magnifications and actual sizes
- calculate areas of triangles, rectangles and circles
- calculate perimeters of rectangles and circumferences of circles
- calculate the mean, median, mode and range of a set of values (a range is a calculated value of the difference between the lowest and highest values)
- calculate gradients
- recognise and use ratios
- make estimations of the results of calculations
- select and use the most appropriate units for recording data and the results of calculations
- record data in a suitable table, with appropriate units in the row or column headings
- record data from experiments to an appropriate and consistent precision
- translate information between graphical, numerical, and algebraic forms
- use a sharp pencil to construct and interpret diagrammatic representations of data, including line graphs, scatter graphs, pie charts, bar charts, divided bar charts, histograms and population pyramids
- recognise and use the most appropriate form of diagrammatic representation of data
- record and interpret tally charts, and transform information into other forms of data presentation
- understand map scale and the use of the scale line
- understand the importance of probability when interpreting data
- describe correlations as either positive, negative or having no correlation
- understand the difference between correlation and causation and that a correlation does not necessarily imply a causative relationship
- understand the principles of sampling as applied to environmental management situations.

## Gathering of data

Candidates should be able to:

- formulate aims and hypotheses
- identify the independent and dependent variables
- decide a suitable range to use for an independent variable and decide how to change its values
- decide the number of values at which measurements are recorded (a minimum of 5 measurements, replicates or more measurements around a specific value)
- identify and apply suitable controls
- design questionnaires to gain information from an individual or a group of individuals (consideration should be given to factors influencing the successful design of questionnaires, e.g. layout, format of questions, the appropriate wording of questions and the number of questions. The practical considerations of conducting a questionnaire, e.g. the sampling methods, pilot survey and location of survey should also be discussed)
- decide an appropriate number of significant figures for measurements or give clear descriptions of observations
- understand and evaluate random and systematic sampling techniques, including identification of the limitations of these methods.

## Presentation of data

The solidus (/) is to be used for separating the quantity and the unit in tables, graphs and charts, e.g. time / s for time in seconds.

(a) Tables

- Each column of a table should be headed with the physical quantity and the appropriate unit, e.g. time / s.
- The column headings of the table can then be directly transferred to the axes of a constructed graph.

(b) Graphs

- Unless instructed otherwise, the independent variable should be plotted on the x-axis (horizontal axis) and the dependent variable plotted on the y-axis (vertical axis).
- Each axis should be labelled with the physical quantity and the appropriate unit, e.g. time / s.
- The scales for the axes should allow more than half of the graph grid to be used in both directions, allow the graph to be read easily to half a 2 mm square and be based on sensible ratios, e.g. 2 cm on the graph grid representing 1, 2 or 5 units of the variable.
- The graph is the whole diagrammatic presentation, including the best-fit line when appropriate. It may have one or more sets of data plotted on it.
- Points on the graph should be clearly marked as crosses (×) or encircled dots (⊙).
- A best-fit line (trend line) should be a single, thin, smooth straight-line or curve. The line does not need to coincide exactly with any of the points; where there is scatter evident in the data, Examiners would expect a roughly even distribution of points either side of the line over its entire length. Points that are clearly anomalous should be ignored when drawing the best-fit line.
- The gradient of a straight line should be taken using a triangle whose hypotenuse extends over at least half of the length of the best-fit line, and this triangle should be marked on the graph.

(c) Pie charts

- These should be drawn with the sectors in rank order, largest first, beginning at 'noon' and proceeding clockwise. Pie charts should preferably contain no more than six sectors.

(d) Bar charts

- These should be drawn when one of the variables is not numerical. They should be made up of narrow blocks of equal width that do **not** touch.

(e) Histograms

- These are drawn when plotting frequency graphs with continuous data. The blocks should be drawn in order of increasing or decreasing magnitude and they **should** touch.

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## 6 What else you need to know

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This section is an overview of other information you need to know about this syllabus. It will help to share the administrative information with your exams officer so they know when you will need their support. Find more information about our administrative processes at [www.cambridgeinternational.org/eoguide](http://www.cambridgeinternational.org/eoguide)

### Before you start

#### Previous study

We recommend that learners starting this course should have completed a course in Environmental Management, Science and/or Geography equivalent to Cambridge IGCSE™ or Cambridge O Level.

#### Guided learning hours

We design Cambridge International AS & A Level syllabuses to require about 180 guided learning hours for each Cambridge International AS Level. The number of hours a learner needs to achieve the qualification may vary according to each school and the learners' previous experience of the subject.

#### Availability and timetables

All Cambridge schools are allocated to an administrative zone. Each zone has a specific timetable.

You can view the timetable for your administrative zone at [www.cambridgeinternational.org/timetables](http://www.cambridgeinternational.org/timetables)

You can enter candidates in the June and November exam series.

Check you are using the syllabus for the year the candidate is taking the exam.

Private candidates can enter for this syllabus. For more information, please refer to the *Cambridge Guide to Making Entries*.

#### Combining with other syllabuses

Candidates can take this syllabus alongside other Cambridge International syllabuses in a single exam series. The only exceptions are:

- syllabuses with the same title at the same level.

#### Group awards: Cambridge AICE

Cambridge AICE (Advanced International Certificate of Education) is a group award for Cambridge International AS & A Level. It allows schools to offer a broad and balanced curriculum by recognising the achievements of learners who pass exams in a range of different subjects.

Learn more about Cambridge AICE at [www.cambridgeinternational.org/aice](http://www.cambridgeinternational.org/aice)

## Making entries

Exams officers are responsible for submitting entries to Cambridge International. We encourage them to work closely with you to make sure they enter the right number of candidates for the right combination of syllabus components. Entry option codes and instructions for submitting entries are in the *Cambridge Guide to Making Entries*. Your exams officer has a copy of this guide.

### Exam administration

To keep our exams secure, we produce question papers for different areas of the world, known as administrative zones. We allocate all Cambridge schools to one administrative zone determined by their location. Each zone has a specific timetable. Some of our syllabuses offer candidates different assessment options. An entry option code is used to identify the components the candidate will take relevant to the administrative zone and the available assessment options.

### Support for exams officers

We know how important exams officers are to the successful running of exams. We provide them with the support they need to make your entries on time. Your exams officer will find this support, and guidance for all other phases of the Cambridge Exams Cycle, at [www.cambridgeinternational.org/eoguide](http://www.cambridgeinternational.org/eoguide)

### Retakes

Candidates can retake Cambridge International AS Level and Cambridge International A Level as many times as they want to. Information on retake entries is at [www.cambridgeinternational.org/retakes](http://www.cambridgeinternational.org/retakes)

### Language

This syllabus and the related assessment materials are available in English only.

## Accessibility and equality

### Syllabus and assessment design

Cambridge International works to avoid direct or indirect discrimination. We develop and design syllabuses and assessment materials to maximise inclusivity for candidates of all national, cultural or social backgrounds and candidates with protected characteristics; these protected characteristics include special educational needs and disability, religion and belief, and characteristics related to gender and identity. In addition, the language and layout used are designed to make our materials as accessible as possible. This gives all candidates the fairest possible opportunity to demonstrate their knowledge, skills and understanding and helps to minimise the requirement to make reasonable adjustments during the assessment process.

### Access arrangements

Access arrangements (including modified papers) are the principal way in which Cambridge International complies with our duty, as guided by the UK Equality Act (2010), to make 'reasonable adjustments' for candidates with special educational needs (SEN), disability, illness or injury. Where a candidate would otherwise be at a substantial disadvantage in comparison to a candidate with no SEN, disability, illness or injury, we may be able to agree pre-examination access arrangements. These arrangements help a candidate by minimising accessibility barriers and maximising their opportunity to demonstrate their knowledge, skills and understanding in an assessment.

### Important:

- Requested access arrangements should be based on evidence of the candidate's barrier to assessment and should also reflect their normal way of working at school; this is in line with the *Cambridge Handbook* [www.cambridgeinternational.org/eoguide](http://www.cambridgeinternational.org/eoguide)
- For Cambridge International to approve an access arrangement, we will need to agree that it constitutes a reasonable adjustment, involves reasonable cost and timeframe and does not affect the security and integrity of the assessment.
- Availability of access arrangements should be checked by centres at the start of the course. Details of our standard access arrangements and modified question papers are available in the *Cambridge Handbook* [www.cambridgeinternational.org/eoguide](http://www.cambridgeinternational.org/eoguide)
- Please contact us at the start of the course to find out if we are able to approve an arrangement that is not included in the list of standard access arrangements.
- Candidates who cannot access parts of the assessment may be able to receive an award based on the parts they have completed.

## After the exam

### Grading and reporting

Grades a, b, c, d or e indicate the standard a candidate achieved at Cambridge International AS Level. 'a' is the highest and 'e' is the lowest grade.

'Ungraded' means that the candidate's performance did not meet the standard required for the lowest grade (e). 'Ungraded' is reported on the statement of results but not on the certificate. In specific circumstances your candidates may see one of the following letters on their statement of results:

- Q (PENDING)
- X (NO RESULT).

These letters do not appear on the certificate.

On the statement of results and certificates, Cambridge International AS Level is shown as General Certificate of Education, GCE Advanced Subsidiary Level (GCE AS Level).

**School feedback:** 'Cambridge International A Levels are the 'gold standard' qualification. They are based on rigorous, academic syllabuses that are accessible to students from a wide range of abilities yet have the capacity to stretch our most able.'

**Feedback from:** Director of Studies, Auckland Grammar School, New Zealand

## How students, teachers and higher education can use the grades

### Cambridge International AS Level

Assessment at Cambridge International AS Level has two purposes:

- 1 to measure learning and achievement

The assessment confirms achievement and performance in relation to the knowledge, understanding and skills specified in the syllabus.

- 2 to show likely future success

The outcomes help predict which students are well prepared for a particular course or career and/or which students are more likely to be successful.

The outcomes help students choose the most suitable course or career

The outcomes help decide whether students part way through a Cambridge International A Level course are making enough progress to continue

The outcomes guide teaching and learning in the next stages of the Cambridge International A Level course.

### Grade descriptions

Grade descriptions are provided to give an indication of the standards of achievement candidates awarded particular grades are likely to show. Weakness in one aspect of the examination may be balanced by a better performance in some other aspect.

Grade descriptions for Cambridge International A Level Environmental Management will be published after the first assessment of the AS Level in 2022.

## Changes to this syllabus for 2025, 2026 and 2027

The syllabus has been updated. This is version 2, published March 2023.

**You must read the whole syllabus before planning your teaching programme.**

### Changes to version 2 of the syllabus, published March 2023

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**Publishers' endorsed resources**

- Any textbooks endorsed to support the syllabus for examination from 2022 are still suitable for use with this syllabus.
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We review our syllabuses regularly to make sure they continue to meet the needs of our schools. In updating this syllabus, we have made it easier for teachers and students to understand, keeping the familiar features that teachers and schools value.

Any textbooks endorsed to support the syllabus for examination from 2022 are still suitable for use with this syllabus.



**School feedback:** ‘While studying Cambridge IGCSE and Cambridge International A Levels, students broaden their horizons through a global perspective and develop a lasting passion for learning.’

**Feedback from:** Zhai Xiaoning, Deputy Principal, The High School Affiliated to Renmin University of China

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