Cambridge Assessment International Education

Syllabus

Cambridge O Level

Environmental Management 5014

Use this syllabus for exams in 2022, 2023 and 2024.
Exams are available in the June and November series.

Version 1

Please check the syllabus page at **www.cambridgeinternational.org/olevel** to see if this syllabus is available in your administrative zone.

Cambridge Pathway

Why choose Cambridge International?

Cambridge International prepares school students for life, helping them develop an informed curiosity and a lasting passion for learning. We are part 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 learners to progress from one stage to the next, and are well supported by teaching and learning resources.

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.

'We think the Cambridge curriculum is superb preparation for university.'

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**

Contents

1 Why choose this syllabus? 2

2 Syllabus overview 5

Aims 5
Content overview 6
Assessment overview 6
Assessment objectives 7

3 Subject content 9

Expected knowledge 9
Gathering of data 23
Mathematical requirements 24

4 Details of the assessment 25

Paper 1 – Theory 25
Paper 2 – Management in context 25
Presentation of data 26
Glossary of terms used in science papers 27

5 What else you need to know 28

Before you start 28
Making entries 29
After the exam 30
How students and teachers can use the grades 30
Grade descriptions 30
Changes to this syllabus for 2022, 2023 and 2024 31

Changes to this syllabus

For information about changes to this syllabus for 2022, 2023 and 2024, go to page 31.

The latest syllabus is version 1, published September 2019. There are no significant changes which affect teaching.

Any textbooks endorsed to support the syllabus for examination from 2019 are still suitable for use with this syllabus.

1 Why choose this syllabus?

Key benefits

Cambridge O Level is typically for 14 to 16 year olds and is an internationally recognised qualification. It has been designed especially for an international market and is sensitive to the needs of different countries. Cambridge O Level is designed for learners whose first language may not be English, and this is acknowledged throughout the examination process.

Our programmes balance a thorough knowledge and understanding of a subject and help to develop the skills learners need for their next steps in education or employment.

Cambridge O Level Environmental Management encourages learners to:

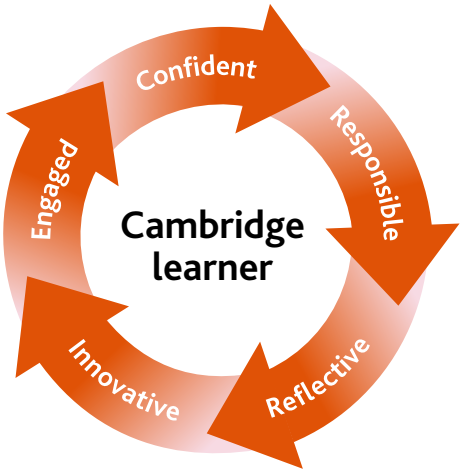
- draw upon disciplines such as biology, Earth science, geography, economics and demographics
- consider the interdependence of the Earth's natural systems and how people use natural resources
- examine the impact of development on the environment considering issues such as environmental pollution and resource depletion
- explore ways in which we may change the nature of future development to make it more sustainable.

Environmental Management is concerned not only with the impact of humans on the planet but also with the patterns of human behaviour necessary to preserve and manage the environment in a self-sustaining way. Study is linked to the areas of new thinking in environmental management, environmental economics and the quest for alternative technologies. Case studies allow candidates to obtain a local as well as a global perspective.

Environmental Management recognises that human behaviour towards the environment is guided by the survival needs, perceptions and values of people. Underlying the syllabus there is a recognition that cultural, social and political attitudes directly influence the economy of nature. A core principle of the syllabus is that sustainability will only be achieved by changes in the ways in which people think and make decisions.

A course in Environmental Management therefore calls upon learners to be participants in defining the future of their world.

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



'Cambridge O Level has helped me develop thinking and analytical skills which will go a long way in helping me with advanced studies.'

Kamal Khan Virk, former student at Beaconhouse Garden Town Secondary School, Pakistan, who went on to study Actuarial Science at the London School of Economics

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. The combination of knowledge and skills in Cambridge O Level Environmental Management gives learners a solid foundation for further study. Candidates who achieve grades A* to C are well prepared to follow a wide range of courses including Cambridge International AS Level Environmental Management.

Cambridge O Levels are accepted and valued by leading universities and employers around the world as evidence of academic achievement. Many universities require a combination of Cambridge International AS & A Levels and Cambridge O Levels or equivalent to meet their entry requirements.

Learn more at **www.cambridgeinternational.org/recognition**

Cambridge Assessment International Education is an education organisation and politically neutral. The content 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.

Supporting teachers

We provide a wide range of practical resources, detailed guidance and innovative training and professional development so that you can give your students the best possible preparation for Cambridge O Level.

Support for Cambridge O Level

Teaching resources

- School Support Hub
  www.cambridgeinternational.org/support
- Syllabuses
- Schemes of work
- Learner guides
- Discussion forums
- Endorsed resources

Exam preparation resources

- Question papers
- Mark schemes
- Example candidate responses to understand what examiners are looking for at key grades
- Examiner reports to improve future teaching

Training

- Introductory – face-to-face or online
- Extension – face-to-face or online
- Enrichment – face-to-face or online
- Coursework – online
- Cambridge Professional Development Qualifications

Find out more at
www.cambridgeinternational.org/profdev

Community

You can find useful information, as well as share your ideas and experiences with other teachers, on our social media channels and community forums.

Find out more at
www.cambridgeinternational.org/social-media

2 Syllabus overview

Aims

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

The aims are to enable students to acquire:

- 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.

Support for Cambridge O Level Environmental Management

The School Support Hub is our secure online site for Cambridge teachers where you can find the resources you need to deliver our programmes, including schemes of work, past papers, mark schemes and examiner reports. You can also keep up to date with your subject and the global Cambridge community through our online discussion forums.

www.cambridgeinternational.org/support

Content overview

The syllabus is divided into nine topics which have been designed to develop an understanding of both the natural and the human environment:

1 Rocks and minerals and their exploitation
2 Energy and the environment
3 Agriculture and the environment
4 Water and its management
5 Oceans and fisheries
6 Managing natural hazards
7 The atmosphere and human activities
8 Human population
9 Natural ecosystems and human activities.

Assessment overview

All candidates take two papers. Candidates will be eligible for grades A* to E.

All candidates take:

Paper 1 1 hour 45 minutes
Theory 50%

80 marks

Section A: short and structured questions

- 20 marks

Section B: short-answer and extended response questions based on source material

- 60 marks

Externally assessed

and:

Paper 2 1 hour 45 minutes
Management in context 50%

80 marks

Short, and extended response questions based on source material

Externally assessed

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

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
- technological applications with their social, economic and environmental implications.

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.

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
- present reasoned explanations for phenomena, patterns and relationships
- 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 the qualification

Assessment objective	Weighting in O Level %
AO1 Knowledge and understanding	40
AO2 Information handling and analysis	35
AO3 Investigation skills and making judgements	25
Total	100

Assessment objectives as a percentage of each component

Assessment objective	Weighting in components %	
	Paper 1	**Paper 2**
AO1 Knowledge and understanding	40	40
AO2 Information handling and analysis	40	30
AO3 Investigation skills and making judgements	20	30
Total	100	100

3 Subject content

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.

Case studies

The curriculum gives teachers the opportunity to select their own case studies to illustrate the content.

Teachers should select appropriate examples where specified. The same case study can be used to illustrate more than one topic as long as it gives candidates the opportunity to study an example of appropriate content.

Candidates are encouraged to integrate appropriate information from their case studies into their answers.

Expected knowledge

Candidates should be able to identify and name the world's continents and oceans:

- Africa, Antarctica, Asia, Europe, North America, Oceania and South America
- Atlantic Ocean, Pacific Ocean, Indian Ocean, Arctic Ocean and Southern Ocean.

1 Rocks and minerals and their exploitation

1.1 Formation of rocks

Candidates should be able to:	Further guidance and exemplification:
• describe and interpret the rock cycle • state and explain the formation and characteristics of named igneous, sedimentary and metamorphic rocks	• igneous: granite and basalt • sedimentary: limestone, sandstone and shale • metamorphic: marble and slate

1.2 Extraction of rocks and minerals from the Earth

Candidates should be able to:	Further guidance and exemplification:
• describe the following methods of extraction of rocks and minerals from the Earth: – surface mining – subsurface mining • discuss the factors that affect the decision to extract rocks and minerals	• opencast / open-pit / open-cut / strip mining • deep mining / shaft mining • exploration • geology • accessibility • environmental impact assessment • supply and demand

1.3 Impact of rock and mineral extraction

Candidates should be able to:	Further guidance and exemplification:
• describe and explain the environmental, economic and social impacts of rock and mineral extraction	• loss of habitat • noise, water, land, air, visual pollution • management of waste • employment opportunities • improvements in local / national economy • improvements in facilities and infrastructure

1.4 Managing the impact of rock and mineral extraction

Candidates should be able to:	Further guidance and exemplification:
• describe and evaluate strategies for restoring landscapes damaged by rock and mineral extraction	• safe disposal of mining waste • land restoration: soil improvement, bioremediation, tree planting • making lakes and nature reserves • using as landfill sites

1.5 Sustainable use of rocks and minerals

Candidates should be able to:	Further guidance and exemplification:
• define sustainable resource and sustainable development	
• describe and evaluate strategies for the sustainable use of rocks and minerals	• increased efficiency of the extraction of rocks and minerals • increased efficiency of the use of rocks and minerals • the need to recycle rocks and minerals • legislation

Case study:

- Study the development, impact and management of a mine including land restoration after the mine has closed.

2 Energy and the environment

2.1 Fossil fuel formation

Candidates should be able to:

- describe the formation of the fossil fuels: coal, oil and gas

2.2 Energy resources and the generation of electricity

Candidates should be able to:

- classify the following energy resources as non-renewable or renewable:
- fossil fuels, nuclear power, biofuels, geothermal power, hydro-electric power, tidal power, wave power, solar power, wind power
- describe how each of these energy resources is used to generate electricity
- describe the environmental, economic and social advantages and disadvantages of each of these energy resources

Further guidance and exemplification:

- non-renewable: fossil fuels, nuclear power using uranium
- renewable: biofuels (bioethanol, biogas and wood), geothermal power, hydro-electric power, tidal power, wave power, solar power, wind power

2.3 Energy demand

Candidates should be able to:

- describe and explain the factors affecting the demand for energy

Further guidance and exemplification:

- domestic demand
- industrial demand
- transport
- personal and national wealth
- climate

2.4 Conservation and management of energy resources

Candidates should be able to:

- describe and explain strategies for the efficient management of energy resources
- research and development of new energy resources

Further guidance and exemplification:

- reducing consumption, such as using insulation, turning electrical devices off and using energy efficient devices and vehicles
- energy from waste cooking oil
- exploiting existing energy sources
- education of people for energy conservation
- transport policies
- fracking

2.5 Impact of oil pollution

Candidates should be able to:	Further guidance and exemplification:
• describe the causes and impacts of oil pollution on marine and coastal ecosystems	• causes: off-shore oil extraction, pipelines and shipping • impacts on ecosystems: birds, marine mammals, coral reefs, beaches

2.6 Management of oil pollution

Candidates should be able to:	Further guidance and exemplification:
• discuss strategies for reducing oil spills in marine and coastal ecosystems	• MARPOL (International Convention for the Prevention of Pollution from Ships) • double-hulled oil tankers
• discuss strategies for minimising the impacts of oil spills on the marine and coastal ecosystems	• dealing with oil spills (booms, detergent sprays, skimmers)

Case study:

- Study the impact and management of an oil pollution event.

3 Agriculture and the environment

3.1 Soil composition

Candidates should be able to:	Further guidance and exemplification:
• describe and explain the composition of soils	• composition: mineral particles, organic content (living plants, animals, microorganisms and their dead remains), air and water • particle size: sand, silt, clay

3.2 Soils for plant growth

Candidates should be able to:	Further guidance and exemplification:
• describe soils as a medium for plant growth	• mineral ions • nitrogen as nitrate ions (NO_3^-), phosphorus as phosphate ions (PO_4^{3-}), potassium as potassium ions (K^+) • organic content • pH
• describe the differences between a sandy and clay soil	• air content • water content • drainage • ease of cultivation

3.3 Agriculture types

Candidates should be able to:	Further guidance and exemplification:
• describe the different types of agriculture	• arable, pastoral and mixed • subsistence and commercial

3.4 Increasing agricultural yields

Candidates should be able to:	Further guidance and exemplification:
• describe techniques used to increase agricultural yields	• rotation • fertilisers • irrigation • insect control (insecticide and biological control), weed control (herbicide), fungi control (fungicide) • mechanisation • selective breeding of animals and plants • genetically modified organisms • controlled environments: greenhouses and hydroponics

3.5 Impact of agriculture

Candidates should be able to:	Further guidance and exemplification:
• describe and explain the impact of agricultural practices on the environment and people	• overuse of insecticides and herbicides • overuse of fertilisers • mismanagement of irrigation causing salinisation and waterlogging • overproduction and waste • exhaustion of mineral ion content • soil erosion • cash crops replacing food crops

3.6 Causes and impacts of soil erosion

Candidates should be able to:	Further guidance and exemplification:
• describe the causes of soil erosion	• removal of natural vegetation by over cultivation and overgrazing • water and wind erosion
• describe and explain the impacts of soil erosion	• loss of habitats • desertification • silting of rivers • displacement of people • malnutrition and famine

3.7 Managing soil erosion

Candidates should be able to:	Further guidance and exemplification:
• describe and explain strategies to reduce soil erosion	• terracing • contour ploughing • bunds • wind breaks • maintaining vegetation cover • addition of organic matter to improve soil structure • planting trees, mixed cropping, intercropping and crop rotation

3.8 Sustainable agriculture

Candidates should be able to:	Further guidance and exemplification:
• describe and explain strategies for sustainable agriculture	• organic fertiliser (crop residue, manure) • managed grazing (livestock rotation) • crop rotation • use of pest resistant and drought resistant varieties of crops • trickle drip irrigation • rainwater harvesting

Case study:

- Study an example where agriculture has had severe environmental consequences including soil erosion and strategies for the conservation of the soil.

4 Water and its management

4.1 Global water distribution

Candidates should be able to:	Further guidance and exemplification:
• describe the distribution of the Earth's water	• oceans • fresh water: ice sheets and glaciers, ground water, atmosphere, lakes and rivers

4.2 The water cycle

Candidates should be able to:	Further guidance and exemplification:
• describe and interpret the water cycle	• precipitation, surface run-off, interception, infiltration, through-flow, ground water flow, transpiration, evaporation and condensation

4.3 Water supply

Candidates should be able to:	Further guidance and exemplification:
• describe the sources of fresh water used by people	• aquifers, wells, rivers, reservoirs, desalination plants

4.4 Water usage

Candidates should be able to:	Further guidance and exemplification:
• describe the different ways in which fresh water can be used	• domestic, industrial, agricultural

4.5 Water quality and availability

Candidates should be able to:	Further guidance and exemplification:
• compare the availability of safe drinking water (potable water) in different parts of the world	• between water-rich and water-poor regions and the potential for water conflict • access to safe drinking water in urban and rural areas

4.6 Multipurpose dam projects

Candidates should be able to:	Further guidance and exemplification:
• describe and evaluate multipurpose dam projects	• choice of site • environmental, economic and social impacts • sustainability

4.7 Water pollution and its sources

Candidates should be able to:	Further guidance and exemplification:
• describe the sources of water pollution	• domestic waste, including sewage from urban and rural settlements • industrial processes • agricultural practices

4.8 Impact of water pollution

Candidates should be able to:	Further guidance and exemplification:
• describe and explain the impact of pollution of fresh water on people and on the environment	• global inequalities in sewage and water treatment • risk of infectious bacterial diseases, typhoid and cholera • accumulation of toxic substances from industrial processes in lakes and rivers • bioaccumulation of toxic substances in food chains • the effect of acid rain on organisms in rivers and lakes • nutrient enrichment leading to eutrophication

4.9 Managing pollution of fresh water

Candidates should be able to:	Further guidance and exemplification:
• describe and explain strategies for improving water quality	• improved sanitation • treatment of sewage • pollution control and legislation

4.10 Managing water-related disease

Candidates should be able to:	Further guidance and exemplification:
• describe the life cycle of the malaria parasite • describe and evaluate strategies to control malaria • describe strategies to control cholera	• antimalarial drugs, vector control, eradication • safe drinking water (potable water) supply • boiling and chlorination

Case studies:

- Study the impact of a named multipurpose dam scheme.
- Study the causes, impact and management of pollution in a named body of water.

5 Oceans and fisheries

5.1 Oceans as a resource

Candidates should be able to:

- outline the resource potential of the oceans

Further guidance and exemplification:

- food, chemicals, building materials
- wave / tidal energy
- tourism
- transport
- potential for safe drinking water

5.2 World fisheries

Candidates should be able to:

- outline the distribution of major ocean currents
- explain the distribution of major marine fish populations
- describe the El Niño Southern Oscillation (ENSO) phenomenon and its effects on fisheries along the Pacific coast of South America

Further guidance and exemplification:

- identify the position of major cold and warm ocean currents (names are **not** required)
- shallow water of continental shelves
- cold and warm ocean currents

5.3 Impact of exploitation of the oceans

Candidates should be able to:

- describe and explain the impact of exploitation of fisheries
- describe how farming of marine species reduces the exploitation of fisheries

Further guidance and exemplification:

- overfishing of marine species
- effect on target and bycatch species

5.4 Management of the harvesting of marine species

Candidates should be able to:

- describe, explain and evaluate strategies for management of the harvesting of marine species

Further guidance and exemplification:

- net types and mesh size
- other species-specific methods: pole and line
- quotas
- closed seasons
- protected areas and reserves
- conservation laws
- international agreements (implementation and monitoring)

Case studies:

- Study the resource potential, exploitation, impact and management of a marine fishery.
- Study an example of farming of marine species, including the source of food, pollution from waste and impact on the natural habitat.

6 Managing natural hazards

6.1 Earthquakes and volcanoes

Candidates should be able to:	Further guidance and exemplification:
• describe the structure of the Earth	• crust, mantle and core
• describe and explain the distribution and causes of earthquakes and volcanoes	• global pattern and structure of plates • plate movement: constructive, destructive and conservative
• understand magnitude and the Richter scale	

6.2 Tropical cyclones

Candidates should be able to:	Further guidance and exemplification:
• describe and explain the distribution and causes of tropical cyclones (storms, hurricanes and typhoons)	• between 5° and 20° north and south of the Equator, ocean surface temperature of at least 27 °C and ocean depth of at least 60 m

6.3 Flooding

Candidates should be able to:	Further guidance and exemplification:
• describe and explain the causes of flooding	• heavy rainfall, prolonged rainfall, snowmelt • land relief • saturated soil, compacted soil • deforestation, cultivation and urbanisation • storm surges, tsunamis • rise in sea level through climate change

6.4 Drought

Candidates should be able to:	Further guidance and exemplification:
• describe and explain the causes of drought	• lack of rain caused by prolonged high pressure • effect of El Niño Southern Oscillation (ENSO) and La Niña on ocean temperatures and evaporation • effect of climate change

6.5 The impacts of natural hazards

Candidates should be able to:	Further guidance and exemplification:
• describe and explain the impacts of natural hazards on people and the environment	• tectonic events: damage to buildings and infrastructure, fire, tsunamis, landslides, loss of farmland and habitats, water-related disease, loss of life, trauma, financial losses • tropical cyclones: flooding, loss of life, financial losses, damage to buildings and infrastructure, loss of crops and habitats, water-related disease • flooding: loss of life, loss of livestock, loss of crops, damage to buildings and infrastructure, contamination of drinking water supplies, water-related disease, financial losses • drought: death of organisms, water sources dry up, decline in crop yields, starvation, increased soil erosion, desertification, decrease in air quality, increased risk of wildfires

6.6 Managing the impacts of natural hazards

Candidates should be able to:	Further guidance and exemplification:
• describe and evaluate the strategies for managing the impacts of natural hazards before, during and after an event	• tectonic: monitoring and warning, land use zoning, structure of buildings, disaster preparation (plans, drills, emergency supplies and emergency rescue teams), evacuation, rebuilding of damaged areas, international aid • tropical cyclones: monitoring and warning, structure of buildings, disaster preparation (plans, drills, emergency supplies and emergency rescue teams), evacuation, emergency shelters, rebuilding of damaged areas, international aid • flooding: monitoring and warning, use of storm hydrographs (run-off, through-flow, ground water flow), shelters, rescue, rebuilding of damaged areas, flood management techniques • drought: monitoring, emergency water supplies, water conservation, increase water supply (dams and reservoirs, wells, use of aquifers, water transfer, desalination, rainwater harvesting), international aid

6.7 Opportunities presented by natural hazards

Candidates should be able to:

- describe and explain the opportunities presented by natural hazards to people

Further guidance and exemplification:

- flooding: deposition of silt on farmland
- volcanoes: fertile soils, extraction of minerals, geothermal energy resources

Case studies:

- Compare and contrast the strategies for managing the impacts of tectonic events between a named more economically developed country (MEDC) and a named less economically developed country (LEDC).
- Study the strategies for managing the impacts of a tropical storm or flood or drought.

7 The atmosphere and human activities

7.1 The atmosphere

Candidates should be able to:

- describe the structure and composition of the atmosphere
- describe the natural greenhouse effect

Further guidance and exemplification:

- troposphere, stratosphere, mesosphere, thermosphere
- nitrogen, oxygen, carbon dioxide, argon, water vapour
- the ozone layer

7.2 Atmospheric pollution and its causes

Candidates should be able to:

- describe and explain the causes of atmospheric pollution, with reference to:
  - smog
  - acid rain
  - ozone layer depletion
  - enhanced greenhouse effect

Further guidance and exemplification:

- smog: volatile organic compounds (from industrial processes), vehicle emissions, impact of temperature inversion
- acid rain: sulfur dioxide and oxides of nitrogen
- ozone layer depletion: action of chlorofluorocarbons (CFCs)
- enhanced greenhouse effect: greenhouse gases (carbon dioxide, water vapour and methane)

7.3 Impact of atmospheric pollution

Candidates should be able to:

- describe and explain the impact of atmospheric pollution

Further guidance and exemplification:

- smog: effects on human health
- acid rain: acidification of bodies of water, effects on fish populations, damage to crops and vegetation, damage to buildings
- ozone depletion: higher levels of ultraviolet radiation reaching the Earth's surface, increased rates of skin cancer and cataracts, damage to vegetation
- climate change: melting of ice sheets, glaciers and permafrost; rise of sea-level; flooding and loss of land; forced migration

7.4 Managing atmospheric pollution

Candidates should be able to:

- describe and explain the strategies used by individuals, governments and the international community to reduce the effects of atmospheric pollution

Further guidance and exemplification:

- reduction of carbon footprint
- reduced use of fossil fuels
- energy efficiency
- carbon capture and storage
- transport policies
- international agreement and policies
- CFC replacement
- catalytic converters
- flue-gas desulfurisation
- taxation
- reforestation and afforestation

Case study:

- Study the causes, impact and management of a specific example of atmospheric pollution.

8 Human population

8.1 Human population distribution and density

Candidates should be able to:

- identify where people live in the world

Further guidance and exemplification:

- population density
- population distribution

8.2 Changes in population size

Candidates should be able to:

- describe and explain the growth curve of populations
- describe and explain the changes in human populations

Further guidance and exemplification:

- lag, exponential (log), carrying capacity
- birth and death rates
- factors affecting birth and death rates
- factors affecting migration

8.3 Population structure

Candidates should be able to:

- describe population structure in MEDCs and LEDCs

Further guidance and exemplification:

- population pyramids

8.4 Managing human population size

Candidates should be able to:	Further guidance and exemplification:
• evaluate strategies for managing human population size	• family planning • improved health and education • national population policies – pronatalist or antinatalist

Case study:

- Study the strategies a named country or region has used to manage population size.

9 Natural ecosystems and human activities

9.1 Ecosystems

Candidates should be able to:	Further guidance and exemplification:
• define the terms *ecosystem*, *population*, *community*, *habitat* and *niche*	
• describe the biotic (living) and abiotic (non-living) components of an ecosystem	• biotic: producers, primary, secondary and tertiary consumers, decomposers • abiotic: temperature, humidity, water, oxygen, salinity, light, pH
• describe biotic interactions	• competition, predation and pollination
• describe the process of photosynthesis	• state the word equation and the importance of chlorophyll
• describe energy flow using food chains, food webs and trophic levels	
• describe and explain ecological pyramids based on numbers and energy	
• describe the process of respiration	• state the word equation
• describe the carbon cycle	

9.2 Ecosystems under threat

Candidates should be able to:	Further guidance and exemplification:
• describe and explain causes and impacts of habitat loss	• causes: the drainage of wetlands, intensive agricultural practices, deforestation • impacts: loss of biodiversity and genetic depletion, extinction

9.3 Deforestation

Candidates should be able to:	Further guidance and exemplification:
• describe and explain the causes and impacts of deforestation	• causes: timber extraction and logging, subsistence and commercial farming, roads and settlements, rock and mineral extraction • impacts: habitat loss, soil erosion and desertification, climate change, loss of biodiversity and genetic depletion

9.4 Managing forests

Candidates should be able to:	Further guidance and exemplification:
• describe and explain the need for the sustainable management of forests	• growing forests act as carbon sinks and mature forests act as carbon stores • role in water cycle • prevention of soil erosion • biodiversity as a genetic resource • food, medicine and industrial raw materials • ecotourism

9.5 Measuring and managing biodiversity

Candidates should be able to:	Further guidance and exemplification:
• describe and evaluate methods for estimating biodiversity	• pitfall traps, pooters, quadrats and transects • random and systematic sampling
• apply sampling techniques to unfamiliar situations	
• evaluate national and international strategies for conserving the biodiversity and genetic resources of natural ecosystems	• sustainable harvesting of wild plant and animal species • sustainable forestry / agroforestry • national parks, wildlife / ecological reserves and corridors • extractive reserves • world biosphere reserves • seed banks • role of zoos and captive breeding • sustainable tourism and ecotourism

Case studies:

- Study the causes and impacts of deforestation in a named area.
- Study the conservation of a named species.
- Study a named biosphere reserve.

Gathering of data

Candidates should be able to:

- formulate aims and hypotheses
- design questionnaires that can be oral or written 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)
- design a simple experiment using suitable controls
- understand and evaluate random and systematic sampling techniques.

Mathematical requirements

Calculators may be used in all parts of the examination.

Candidates should be able to:

- add, subtract, multiply and divide
- use averages, decimals, fractions, percentages, ratios and reciprocals
- understand the terms *mean* and *range*
- use standard notation, including both positive and negative indices
- understand significant figures and use them appropriately
- recognise and use direct and inverse proportion
- draw tables, charts and graphs from given data
- interpret charts and graphs
- determine the gradient and intercept of a graph
- select suitable scales and axes for graphs
- make approximate evaluations of numerical expressions
- understand the meaning of angle, curve, circle, radius, diameter, area, circumference, square, rectangle and diagonal
- understand map scale and the use of the scale line.

4 Details of the assessment

All candidates take two papers.

Paper 1 – Theory

Written paper, 1 hour 45 minutes, 80 marks

Paper 1 contains two sections:

- Section A short and structured questions testing AO1 and AO2 (20 marks)
- Section B short and extended response questions, based on source material, testing AO1, AO2 and AO3 (60 marks)

Candidates should answer **all** the questions.

Externally assessed.

Paper 2 – Management in context

Written paper, 1 hour 45 minutes, 80 marks

This paper consists of short-answer, data processing and analysis, and extended response questions based on source material. Candidates will be expected to make use of information from the source material to help illustrate issues of environmental management.

This paper tests assessment objective AO1, AO2 and AO3.

Candidates should answer **all** the questions.

Externally assessed.

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, 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 (⊙).
- Large 'dots' are penalised. Each data point should be plotted to an accuracy of better than one half of each of the smallest squares on the grid.
- 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) Numerical results

- Data should be recorded so as to reflect the precision of the measuring instrument.
- The number of significant figures given for calculated quantities should be appropriate to the least number of significant figures in the raw data used.

(d) 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.

(e) 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.

(f) 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.

Glossary of terms used in science papers

This list is neither exhaustive nor definitive. The glossary has been deliberately kept brief, not only with respect to the number of terms included, but also to the descriptions of their meanings. Candidates should appreciate that the meaning of a term must depend, in part, on its context.

1 *Define* (the term(s) …) is intended literally, only a formal statement or equivalent paraphrase being required.

2 *What do you understand by/What is meant by* (the term(s) …) normally implies that a definition should be given, together with some relevant comment on the significance or context of the term(s) concerned, especially where two or more terms are included in the question. The amount of supplementary comment intended should be interpreted in the light of the indicated mark value.

3 *State* implies a concise answer with little or no supporting argument (e.g. a numerical answer that can readily be obtained 'by inspection').

4 *List* requires a number of points, generally each of one word, with no elaboration. Where a given number of points is specified this should not be exceeded.

5 (a) *Explain* may imply reasoning or some reference to theory, depending on the context. It is another way of asking candidates to give reasons. The candidate needs to leave the examiner in no doubt why something happens.

(b) *Give a reason/Give reasons* is another way of asking candidates to explain why something happens.

6 *Describe* requires the candidate to state in words (using diagrams where appropriate) the main points.

Describe and *explain* may be coupled, as may *state* and *explain*.

7 *Discuss* requires the candidate to give a critical account of the points involved.

8 *Outline* implies brevity (i.e. restricting the answer to giving essentials).

9 *Predict* implies that the candidate is expected to make a prediction not by recall but by making a logical connection between other pieces of information.

10 *Deduce* implies that the candidate is not expected to produce the required answer by recall but by making a logical connection between other pieces of information.

11 *Suggest* is used in two main contexts, i.e. either to imply that there is no unique answer (e.g. in chemistry, two or more substances may satisfy the given conditions describing an 'unknown'), or to imply that candidates are expected to apply their general knowledge of the subject to a 'novel' situation, one that may be formally 'not in the syllabus' – many data response and problem solving questions are of this type.

12 *Find* is a general term that may variously be interpreted as *calculate, measure, determine*, etc.

13 *Calculate* is used when a numerical answer is required. In general, working should be shown, especially where two or more steps are involved.

14 *Measure* implies that the quantity concerned can be directly obtained from a suitable measuring instrument (e.g. length using a rule, or mass using a balance).

15 *Determine* often implies that the quantity concerned cannot be measured directly but is obtained from a graph or by calculation.

16 *Estimate* implies a reasoned order of magnitude statement or calculation of the quantity concerned, making such simplifying assumptions as may be necessary about points of principle and about the values of quantities not otherwise included in the question.

17 *Sketch*, when applied to graph work, implies that the shape and/or position of the curve need only be qualitatively correct, but candidates should be aware that, depending on the context, some quantitative aspects may be looked for (e.g. passing through the origin, having an intercept).

In diagrams, *sketch* implies that simple, freehand drawing is acceptable; nevertheless, care should be taken over proportions and the clear exposition of important details.

5 What else you need to know

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**

Before you start

Previous study

We do not expect learners starting this course to have previously studied environmental management.

Guided learning hours

We design Cambridge O Level syllabuses based on learners having about 130 guided learning hours for each subject during the course but this is for guidance only. The number of hours a learner needs to achieve the qualification may vary according to local practice and their previous experience of the subject.

Availability and timetables

All Cambridge schools are allocated to one of six administrative zones. Each zone has a specific timetable. This syllabus is **not** available in all administrative zones. To find out about availability check the syllabus page at **www.cambridgeinternational.org/olevel**

You can enter candidates in the June and November exam series. You can view the timetable for your administrative zone at **www.cambridgeinternational.org/timetables**

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

Private candidates can enter for this syllabus.

Combining with other syllabuses

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

- Cambridge IGCSE™ Environmental Management (0680)
- syllabuses with the same title at the same level.

Cambridge O Level, Cambridge IGCSE and Cambridge IGCSE (9–1) syllabuses are at the same level.

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**

Retakes

Candidates can retake the whole qualification as many times as they want to. This is a linear qualification so candidates cannot re-sit individual components.

Equality and inclusion

We have taken great care to avoid bias of any kind in the preparation of this syllabus and related assessment materials. In compliance with the UK Equality Act (2010) we have designed this qualification to avoid any direct and indirect discrimination.

The standard assessment arrangements may present unnecessary barriers for candidates with disabilities or learning difficulties. We can put arrangements in place for these candidates to enable them to access the assessments and receive recognition of their attainment. We do not agree access arrangements if they give candidates an unfair advantage over others or if they compromise the standards being assessed.

Candidates who cannot access the assessment of any component may be able to receive an award based on the parts of the assessment they have completed.

Information on access arrangements is in the *Cambridge Handbook* at **www.cambridgeinternational.org/eoguide**

Language

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

After the exam

Grading and reporting

Grades A*, A, B, C, D or E indicate the standard a candidate achieved at Cambridge O Level.

A* is the highest and E is the lowest. 'Ungraded' means that the candidate's performance did not meet the standard required for 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)
- Y (to be issued).

These letters do not appear on the certificate.

How students and teachers can use the grades

Assessment at Cambridge O Level has two purposes:

- to measure learning and achievement

  The assessment:
  - confirms achievement and performance in relation to the knowledge, understanding and skills specified in the syllabus, to the levels described in the grade descriptions.
- 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
  - help students choose the most suitable course or career.

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 O Level Environmental Management will be published after the first assessment of the syllabus in 2022. Find more information at **www.cambridgeinternational.org/olevel**

Changes to this syllabus for 2022, 2023 and 2024

This syllabus is version 1, published September 2019.

We have updated the look and feel of this document. The subject content remains the same.

Minor changes to the wording of some sections have been made to improve clarity.

You are strongly advised to read the whole syllabus before planning your teaching programme.

Any textbooks endorsed to support the syllabus for examination from 2019 are still suitable for use with this syllabus.

Cambridge Assessment International Education
The Triangle Building, Shaftesbury Road, Cambridge, CB2 8EA, United Kingdom
Tel: +44 (0)1223 553554 Fax: +44 (0)1223 553558
Email: info@cambridgeinternational.org www.cambridgeinternational.org