SCQF level 5
Unit Specification

# Environmental Science: Earth's Resources

**SCQF:** level 5 (6 SCQF credit points)

**Unit code:** J263 75

## Unit outline

The general aim of this Unit is to develop skills of scientific inquiry, investigation and analytical thinking, along with knowledge and understanding of the Earth's resources. Learners will apply these skills when considering the applications of the Earth's resources on our lives, as well as the implications on society and the environment. This can be done by using a variety of approaches, including investigation and problem solving.

The Unit covers the key areas of an overview of Earth systems and their interactions; the geosphere; the hydrosphere; the biosphere; the atmosphere.

Learners will research issues, apply scientific skills and communicate information related to their findings, which will develop skills of scientific literacy.

Learners who complete this Unit will be able to:

1. Apply skills of scientific inquiry and draw on knowledge and understanding of the key areas of this Unit to carry out an experiment/practical investigation

2. Draw on knowledge and understanding of the key areas of this Unit and apply scientific skills

This Unit is available as a free-standing Unit. The Unit Specification should be read in conjunction with the *Unit Support Notes*, which provide advice and guidance on delivery, assessment approaches and development of skills for learning, skills for life and skills for work. Exemplification of the standards in this Unit is given in *Unit Assessment Support*.

## Recommended entry

Entry to this Unit is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by one or more of the following or equivalent qualifications and/or experience:

- National 4 Environmental Science Course or relevant component Units
- National 4 Geography Course or relevant component Units
- National 4 Biology Course or relevant component Units

There may also be progression from National 4 Chemistry or National 4 Physics.

In terms of prior learning, relevant experiences and outcomes may also provide an appropriate basis for doing this Unit.

## Equality and inclusion

This Unit Specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence. For further information, please refer to the *Unit Support Notes.*

# Standards

## Outcomes and Assessment Standards

### Outcome 1

The learner will:

**1 Apply skills of scientific inquiry and draw on knowledge and understanding of the key areas of this Unit to carry out an experiment/practical investigation by:**

1.1 Planning an experiment/practical investigation
1.2 Following procedures safely
1.3 Making and recording observations/measurements correctly
1.4 Presenting results in an appropriate format
1.5 Drawing valid conclusions
1.6 Evaluating experimental procedures

### Outcome 2

The learner will:

**2 Draw on knowledge and understanding of the key areas of this Unit and apply scientific skills by:**

2.1 Making accurate statements
2.2 Solving problems

# Evidence Requirements for the Unit

Assessors should use their professional judgement, subject knowledge and experience, and understanding of their learners, to determine the most appropriate ways to generate evidence and the conditions and contexts in which they are used.

The key areas covered in this Unit are:

- An overview of Earth systems and their interactions
- the geosphere
- the hydrosphere
- the biosphere
- the atmosphere

The *Unit Support Notes* (Appendix) provide details of skills, knowledge and understanding sampled in the Unit assessment.

The following table describes the evidence for the Assessment Standards.

| Assessment Standard | Evidence required |
|---|---|
| Planning an experiment or practical investigation | A plan that must include:<br><br>♦ a clear statement of the aim<br>♦ a dependent and independent variable<br>♦ variables to be kept constant<br>♦ observations and/or measurements to be made<br>♦ necessary equipment and/or materials<br>♦ a clear and detailed description of how the experiment or practical investigation should be carried out, including safety considerations |
| Following procedures safely | Record showing that the learner was observed following procedures safely. |
| Making and recording observations/measurements correctly | Raw data recorded in a relevant format, for example a table.<br><br>Repeated measurements, where appropriate.<br>Where measurements are repeated, averages must be calculated. |
| Presenting results in an appropriate format | One format from: line graph, bar graph, scatter graph or other appropriate format. |
| Drawing a valid conclusion | A conclusion that includes reference to the aim, and is supported by the data. |
| Evaluating experimental procedures | An evaluative statement, with justification, about the procedures used. |
| Making accurate statements and solving problems | Achievement of at least 50% of the total marks available in a holistic assessment.<br><br>The assessment must **not** be split into smaller sections, such as individual key areas. |

Exemplification of assessment is provided in *Unit Assessment Support*.

# Assessment Standards thresholds

**Outcome 1**
Learners are not required to show full mastery of the Assessment Standards to achieve Outcome 1. Instead, five out of the six Assessment Standards for Outcome 1 must be met to achieve a pass. Learners must be given the opportunity to meet all Assessment Standards.

**Outcome 2**
Learners are assessed using a holistic test that covers Assessment Standards 2.1 and 2.2. To gain a pass for Outcome 2, learners must achieve 50% or more of the total marks available in the assessment.

## Transfer of evidence

Evidence for the achievement of Outcome 1 for this Unit can be used as evidence of Outcome 1 in the SCQF level 5 Units: *Environmental Science: Living Environment* (J25Y 75) and *Environmental Science: Sustainability* (J265 75).

Evidence for the achievement of Outcome 2 for this Unit is **not** transferable between the SCQF level 5 Units: *Environmental Science: Living Environment* (J25Y 75) and *Environmental Science: Sustainability* (J265 75).

## Re-assessment

SQA's guidance on re-assessment is that there should be only one or, in exceptional circumstances, two re-assessment opportunities. Re-assessment must be carried out under the same conditions as the original assessment and must be of equal demand.

**Outcome 1**
Learners can either re-draft their original Outcome 1 report or carry out a new experiment or practical investigation.

**Outcome 2**
Learners must have a full re-assessment opportunity that consists of a holistic assessment. For Outcome 2, learners must achieve 50% of the total marks available in the re-assessment.

# Development of skills for learning, skills for life and skills for work

It is expected that learners will develop broad, generic skills through this Unit. The skills that learners will be expected to improve on and develop through the Unit are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and drawn from the main skills areas listed below. These must be built into the Unit where there are appropriate opportunities.

**2 Numeracy**

2.1 Number processes
2.2 Money, time and measurement
2.3 Information handling

**4 Employability, enterprise and citizenship**

4.6 Citizenship

**5 Thinking skills**

5.3 Applying
5.4 Analysing and evaluating

Amplification of these is given in SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work*. The level of these skills should be at the same SCQF level of the Unit and be consistent with the SCQF level descriptor. Further information on building in skills for learning, skills for life and skills for work is given in the *Unit Support Notes.*

# Appendix: Unit Support Notes

## Introduction

These support notes provide advice and guidance on developing skills, knowledge and understanding for the Unit assessment. They should be read in conjunction with:

- *Unit Assessment Support*

## Developing skills, knowledge and understanding

Teachers and lecturers are free to select the skills, knowledge and understanding, and contexts that are most appropriate for delivery in their centres.

## Skills, knowledge and understanding for the Unit assessment

The following information provides details of skills, knowledge and understanding sampled in the Unit assessment.

### Earth's Resources

**1 Overview of Earth systems and their interactions**

**a. Identification of the main Earth systems**
Geosphere, hydrosphere, biosphere, atmosphere.

**b. Classification of resources**
Physical, biological, renewable, and non-renewable.

**2 Geosphere**

**a. Definitions**

- weathering — the exposure and breaking down of rocks in situ at the Earth's surface over geological time due to interaction with the atmosphere
- transportation — the movement of rock fragments by water, wind, ice, or gravity from the place where they were originally weathered
- erosion — the breaking down of rock fragments into smaller pieces and sediments due to collision with other rock fragments during transportation
- deposition — the settling out of rock fragments and sediments after transportation by water, wind, ice, or gravity
- igneous — rock that forms through the cooling of molten rock (magma) to a solid form in the upper crust or on the surface of the Earth
- sedimentary — rock that is formed from weathered rock fragments and sediments that have been eroded, transported, deposited, compacted, and cemented
- metamorphic — rock that has been subjected to heat and/or pressure, permanently altering the minerals or internal structure
- rock — a solid mass made of one or more minerals
- mineral — an element or chemical compound formed as a result of rock cycle processes
- ore — a naturally occurring solid material from which a metal or valuable mineral can be extracted profitably
- porosity — a measure of a rock's ability to hold fluid
- permeability — a measure of the amount of water allowed to pass through a rock

**b. Structure of the Earth**
Core (inner and outer), mantle, and crust (oceanic and continental).

**c. Rock cycle processes**

- erosion
- weathering (physical, chemical, biological, link with soil formation)
- transportation
- deposition
- melting
- effects of heat and pressure
- formation of igneous (granite, basalt), sedimentary (sandstone, shale), and metamorphic (marble, slate) rocks

**d. Relationship between rocks, minerals, and ores**

- rock — granite is mostly composed of quartz, biotite, and feldspar minerals
- minerals — quartz (silica and oxygen), calcium carbonate (calcium, carbon, and oxygen)
- ore — metallic iron can be economically extracted from iron ores

**e. Properties of rocks**

Porosity and permeability.

**f. Limestone**

- formation (formed in shallow, tropical seawater as a result of calcium carbonate precipitating out)
- extraction (quarrying)
- processing (cutting, crushing)
- uses
- environmental impacts of extraction and/or processing

Uses of limestone: cement manufacture, construction, agriculture, iron and steel manufacture.

**g. Geological carbon cycle; the role of limestone and coal as carbon sinks; and chemical weathering (carbonic acid)**

**h. Iron ore**

- formation (formed in seawater as a result of oxygen release by photosynthesising organisms; the oxygen combines with dissolved iron in the ocean to form iron oxide)
- extraction (opencast mining)
- processing (blast furnace)
- uses
- environmental impacts of extraction and/or processing

Processing: ore smelting in a blast furnace; inputs (iron ore, limestone, oxygen, coke) and outputs (pig iron, slag, carbon dioxide).

Uses of iron: steel manufactured products, reinforced concrete, cast iron and wrought iron products.

**i. Crude oil**

- formation (formed from the remains of small animals and plants that died and fell to the seafloor millions of years ago; compression and heating of these remains within the Earth's crust forms oil)
- extraction (drilling)
- processing (fractional distillation)
- uses
- environmental impacts of extraction, processing, and uses

Processing: fractional distillation (including role of temperature in formation of outputs), graduation in molecule size.

Uses: domestic and industrial fuels, electricity generation, petrol, diesel, fuel oil, plastics, tar, bitumen, lubricants, roofing felt, medicines, and cosmetics.

Environmental impacts of crude oil products.

## 3 Hydrosphere

**a. Definitions**

- evaporation — the process of turning from liquid into vapour or gas
- condensation — the process of a vapour or gas turning into a liquid
- precipitation — moisture that falls from the air to the ground (rain, snow, sleet, hail, drizzle, fog, mist)
- transpiration — the evaporation of water from plant leaves, stems, or flowers
- runoff — the precipitation that flows across the surface of the ground
- infiltration — the physical movement of water through soil (relative to the soil's porosity and permeability)
- percolation — the movement of water through soil by gravity and capillary forces
- throughflow — the horizontal flow of water within soil
- groundwater — water that occupies pore spaces in soil and bedrock
- groundwater flow — the movement of groundwater horizontally

**b. Water cycle**

Evaporation, condensation, precipitation, transpiration, runoff, infiltration, percolation, throughflow, groundwater flow, storage.

**c. Main stores of water**

Atmosphere, oceans, ice, freshwater (rivers, streams, springs), groundwater (soil moisture, rock pores and crevices), and aquifers.

**d. Uses of water**
Industrial, domestic, and agricultural.

**e. Issues arising from availability of water resources in Scotland and the rest of the British Isles**
Drought and flooding.

Role of SEPA in flood warning and water quality.

**f. Energy from water**
Hydro-electric, tidal, wave, energy changes involved (kinetic to electrical).

**g. Requirements and considerations for siting hydro-electric and tidal power stations**

- hydro-electric power (HEP): steep gradient, high precipitation, narrow deep valley, impermeable geology, population density, proximity to National Grid, current land use
- tidal: narrow channel, large water volume, large tidal stream, population density, proximity to National Grid, current water use

## 4 Biosphere

**a. Definitions**

- biomass — the mass of living or recently living plants or animals
- biofuels — combustible biomass or fuels derived from biofuels

**b. Oceanic and freshwater resources**
Economically important species of plants and animals.

**c. Terrestrial resources**
Economically important species of domesticated and hunted animals, agricultural crops, forestry (native and plantation).

**d. Energy from biological resources**
Biomass (peat, wood).

Process of fermentation in formation of biofuels: conditions required for formation of peat (acidic and anaerobic), and methane as the primary biogas.

## 5 Atmosphere

**a. Definition**

- natural greenhouse effect — the process by which radiation reflected from the Earth's surface is absorbed by gases in the atmosphere and prevented from escaping into space, thus keeping the Earth warmer than it would otherwise be

**b. Composition of the atmosphere (nitrogen, oxygen, and carbon dioxide), and the importance of the 'natural' greenhouse effect**

**c. Energy from wind, including energy changes (kinetic to electrical)**

**d. Requirements and considerations for siting wind farms**
Strong/steady wind flow, exposed site, population density, proximity to National Grid, current land/water use.

## Apparatus and techniques

In addition to the skills, knowledge and understanding listed above, learners must have knowledge of the following pieces of apparatus and techniques. Where it is not possible to carry out a fieldwork technique, learners should be made aware of the purpose and methodology of the technique through teaching.

### Apparatus

- beaker
- balance
- measuring cylinder
- dropper/pipette
- test tube
- stopwatch
- funnel
- crucible
- oven
- thermometer
- ID cards/keys: rocks

### Techniques

- interpreting case study documentary evidence, including Ordnance Survey map content, sketch maps, photographic evidence, tabular data, and/or short passages of text. The ability to read and provide grid references is not required.

## Reporting experimental and/or fieldwork

Learners should be familiar with the following:

- setting an aim and/or hypothesis
- describing experimental/fieldwork procedures
- drawing labelled diagrams of experimental/fieldwork apparatus
- presenting data in tabular form, with appropriate headings and units of measurement
- presenting data in graphical form: bar graph, line graph, scatter graph or other graphical form appropriate to environmental science, with appropriate scales, labels, keys and units
- including a line of best fit (straight or curved) on a scatter graph, if appropriate, to represent the trend observed in experimental/field work data
- processing data (using calculations and units, where appropriate)
- comparing and/or analysing data sets
- drawing valid conclusions from the data, and relating them to the aim
- evaluating an experimental/field work procedure and suggesting and justifying improvements
- citing and referencing sources of data/information

## Calculations

Learners should be familiar with the following methods of calculation:

- measures of average: mean
- ratio
- percentage
- percentage increase and decrease
- calculations involving number substitution in formulae

# Administrative information

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**Superclass:** QA

## History of changes to National Unit Specification

| Version | Description of change | Authorised by | Date |
|---|---|---|---|
| 2.0 | Added table detailing content to be covered. Transfer of evidence updated. | Qualifications Manager | April 2018 |
| 2.1 | Assessment standard thresholds added | Qualifications Manager | September 2018 |
| 3.0 | Unit code updated | Qualifications Manager | July 2019 |
| 4.0 | Refined guidance on Evidence Requirements; removed option for assessment-standard-specific evidence for Outcome 2. Added 'Assessment Standards thresholds' heading to existing information. Refined guidance on re-assessment.<br>Some changes made to the format throughout the document to improve accessibility.<br><br>**What you need to do differently**<br>♦ If you are already assessing outcome 2 holistically at the end of the unit, by using the assessment as a single test with marks and a cut-off score, you don't need to do anything differently.<br>♦ If you have been assessing outcome 2 atomistically, by assessing each key area and each problem-solving skill separately, you must change to using the holistic approach for outcome 2. You must do this by administering the test in a single sitting, at the end of the unit, and applying the marks and cut-off score in the unit assessment support pack. | Qualifications Manager | August 2025 |