Unit 1 Environmental Science learning context examples

The overarching Unit 1 question, ‘How are Earth’s dynamic systems interconnected to support life?’ enables teachers to design teaching and assessment programs that are tailored to meet the needs of their cohort, and the contexts in which their schools are placed and in which students are learning, including resources. These programs must be aligned to the *VCE Environmental Science Study Design* and comply with the VCE assessment principles.

The mandated assessment task for this unit is the report of a student-adapted or student-designed scientific investigation, presented using an appropriate format as outlined on page 23 of the study design. Teachers should ensure that the investigation activities and report are scaffolded carefully for students in this unit. It is appropriate to modify the requirements of the report and assessment for Unit 1 in order to allow students time to develop specific skills; for example, designing an investigation, the generation, analysis and evaluation of primary data, and the communication of findings.

The following tables provide examples of learning contexts relevant to the key knowledge for Unit 1 on pages 20–21 of the *VCE Environmental Science Study Design* aligned with the outcome for the unit. Teachers should select relevant key science skills on pages 8–10 of the study design as appropriate to the learning contexts.

Unit 1 Area of Study 1: Investigation of local ecosystems

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| **Key knowledge point** | **Examples of learning contexts** |
| the range of biotic and abiotic components that determine the environmental conditions of varied habitats within aquatic and terrestrial ecosystems | * biotic components: the variety, relative abundance and functional roles (ecological niches) of species, particularly keystone species and top-order predators * abiotic components: water availability, light intensity, nutrients * environmental monitoring: temperature, pH, salinity, turbidity, dissolved oxygen * availability of rock, soil and sand substrates * natural forces of tides, currents, waves, wind and rain |
| interrelationships within ecological communities as represented by food chains, food webs, energy and biomass pyramids | * symbiosis * mutualism * commensalism * competition * predation, parasitism, herbivory |

Unit 1 Area of Study 1: Earth systems thinking

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| **Key knowledge point** | **Examples of learning contexts** |
| natural interactions between Earth’s four systems – the atmosphere, biosphere, hydrosphere and lithosphere – that support and are affected by the movement of energy and matter within and between local and global ecosystems | * biogeochemical cycle * hydrological cycle * photosynthesis * chemosynthesis * aerobic respiration * anaerobic respiration |
| systems thinking as a way of exploring relationships in environmental systems by identifying inputs, outputs, components and processes that may be visible or invisible to the human eye, including representation of a local and regional environmental system | * modelling data using a systems model (theory) * local systems: home, school or community garden; fish tank/aquarium/fish pond/lake/reach of a stream * regional systems: National Park, coastal environment, river, mountains * local or regional: soils, reef system, forest/ woodland/grassland * comparison of a systems approach to studying the environment with an Aboriginal and Torres Strait Islander understanding of the environment; for example, Traditional Ecological Knowledge * system boundaries: open and closed systems, boundaries as hard lines or changing characteristics of a system |

Unit 1 Area of Study 2: Earth’s dynamic systems

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| **Key knowledge point** | **Examples of learning contexts** |
| transformative processes occurring during Earth’s deep history that shaped the formation of Earth’s four interrelated systems | * Milankovitch cycles * geomagnetic reversals * plate tectonics * the Great Oxidation * mass extinction of species |
| changes and disruptions to landscapes, ecosystems and biomes that influence their distribution and ecological characteristics | * daily, diurnal, nocturnal, circadian, seasonal and tidal rhythms * natural events: volcanic activity, earthquakes, glacial melting, El Niño Southern Oscillation * climate effects: fire, drought, flood, desertification * species interactions: invasive species, migration/dispersal, disease, the loss or reduction in numbers of keystone species * urbanisation, industrialisation and/or globalisation * monoculture cropping * infrastructure development |

Unit 1 Area of Study 2: Data and modelling

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| **Key knowledge point** | **Examples of learning contexts** |
| ways of using data and models to study Earth’s systems and changes in Earth over time | * evidence of Earth’s age as 4.5 billion years * Earth’s layered structure * existence of a geomagnetic field * thermohaline circulation * the decay of radioisotopes in rocks and minerals * the study of seismic waves, meteorites and deep sediment cores * natural greenhouse effect * satellite measurement techniques |

Unit 1 Area of Study 2: Managing environmental challenges

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| **Key knowledge point** | **Examples of learning contexts** |
| the role of innovation and science in responding to challenges as a result of environmental change and disruption | * the design and construction of earthquake-resistant buildings * technological developments: site-specific weed management, recording animal movements using sensors, making improvements to tsunami warning systems * public participation in scientific research and citizen science projects: mapping migratory pathways of birds, frog calls, butterflies, monitoring of waterways, monitoring of air quality * application of Aboriginal and Torres Strait Islander peoples’ ecological knowledge * use of remote laboratories to explore housing responses to extreme weather events such as cyclones |
| the contribution of scientific data, regulatory frameworks and diverse stakeholder values, knowledge and priorities in managing environmental challenges of regional relevance | * the culling of invasive species * use of shark nets * intensification of agriculture * use of groundwater/water from aquifers * damming of waterways * mining * controlled burning for fuel reduction * clear cutting of old growth forests |

Unit 1 Area of Study 3: Investigation design, scientific evidence and science communication

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| **Key aspects of the student investigation** | **Examples of learning contexts** |
| * environmental science concepts relevant to the student investigation * selection and approval of methodology and method * techniques of primary data generation * analysis and evaluation of data * science communication | Content of the student investigation may relate to Area of Study 1 and/or Area of Study 2 and may involve one of seven practical scientific methodologies:   * classification and identification * controlled experiment * correlational study * fieldwork * modelling * product, process or system development * simulation |