

**Geography sample unit**

<b>Sustainable Biomes</b>	<b>Stage 5</b>
	<b>Duration:</b> One term (10 weeks – 25 hours)

Unit focus	Key inquiry questions
<p>Students examine the physical characteristics and productivity of biomes. Students examine the correlation between the world’s climatic zones and spatial distributions of biomes and their capacity to support food and non-food agricultural production. Students analyse the impact humans have on biomes in an effort to produce food and increase agricultural yields. They examine population trends and projections from Australia and across the world and forecast future food supply-and-demand issues. Challenges to food production are explored and management strategies investigated.</p>	<ul style="list-style-type: none"> <li>• What are the main characteristics that differentiate the world’s biomes?</li> <li>• How do people use and alter biomes for food production?</li> <li>• Can the world’s biomes sustainably feed the world’s population?</li> <li>• What strategies can be used to increase global food security?</li> </ul>

Outcomes
<p>A student:</p> <ul style="list-style-type: none"> <li>• explains the diverse features and characteristics of a range of places and environments <b>GE5-1</b></li> <li>• explains processes and influences that form and transform places and environments <b>GE5-2</b></li> <li>• analyses the effect of interactions and connections between people, places and environments <b>GE5-3</b></li> <li>• assesses management strategies for places and environments for their sustainability <b>GE5-5</b></li> <li>• acquires and processes geographical information by selecting and using appropriate and relevant geographical tools for inquiry <b>GE5-7</b></li> <li>• communicates geographical information to a range of audiences using a variety of strategies <b>GE5-8</b></li> </ul>

Geographical concepts	Geographical skills	Geographical tools
<p>The following <b>geographical concepts</b> have been integrated into the lesson sequences:</p> <p><b>Place:</b> <i>the significance of places and what they are like</i></p> <p><b>Space:</b> <i>the significance of location and spatial distribution, and ways people organise and manage spaces that we live in</i></p> <p><b>Environment:</b> <i>the significance of the environment in human life, and the important interrelationships between humans and the environment</i></p>	<p>The following <b>geographical skills</b> have been integrated into the lesson sequences:</p> <p><b>Acquiring geographical information</b></p> <ul style="list-style-type: none"> <li>• develop geographically significant questions and plan an inquiry that identifies and applies appropriate geographical methodologies and concepts (ACHGS063, ACHGS072)</li> <li>• collect, select, record and organise relevant data and geographical information, using ethical protocols, from a variety of appropriate primary data and secondary information sources (ACHGS064, ACHGS073)</li> </ul> <p><b>Processing geographical information</b></p> <ul style="list-style-type: none"> <li>• evaluate information sources for their reliability, bias and usefulness (ACHGS065, ACHGS074)</li> </ul>	<p>The following <b>geographical tools</b> have been integrated into the lesson sequences:</p> <p><b>Maps – M</b></p> <ul style="list-style-type: none"> <li>• relief maps, political maps, topographic maps, choropleth maps, flowline maps, cadastral maps, thematic maps, isoline maps, land use maps, précis maps, special-purpose maps, cartograms, synoptic charts</li> <li>• maps to identify direction, scale and distance, area and grid references, degrees and minutes of latitude and longitude, bearings, aspect, altitude, area, density, contour lines, gradient, local relief</li> </ul>

**Interconnection:** *no object of geographical study can be viewed in isolation*

**Scale:** *the way that geographical phenomena and problems can be examined at different spatial levels*

**Sustainability:** *the capacity of the environment to continue to support our lives and the lives of other living creatures into the future*

**Change:** *explaining geographical phenomena by investigating how they have developed over time*

- represent multi-variable data in a range of appropriate forms, with and without the use of digital and spatial technologies (ACHGS065, ACHGS074)
- represent the spatial distribution of geographical phenomena on maps that conform to cartographic conventions, using spatial technologies as appropriate (ACHGS066, ACHGS075)
- evaluate multi-variable data and other geographical information using qualitative and quantitative methods and digital and spatial technologies as appropriate to make generalisations and inferences, propose explanations for patterns, trends, relationships and anomalies, and predict outcomes (ACHGS067, ACHGS076)
- apply geographical concepts to synthesise information from various sources and draw conclusions based on the analysis of data and information, taking into account alternative perspectives (ACHGS068, ACHGS077)
- identify how geographical information systems (GIS) might be used to analyse geographical data and make predictions (ACHGS069, ACHGS078)

**Communicating geographical information**

- present findings, arguments and explanations in a range of appropriate communication forms selected for their effectiveness and to suit audience and purpose, using relevant geographical terminology and digital technologies as appropriate (ACHGS070, ACHGS079)
- reflect on and evaluate the findings of an inquiry to propose individual and collective action in response to a contemporary geographical challenge, taking account of environmental, economic and social considerations; and explain the predicted outcomes and consequences of their proposal (ACHGS071, ACHGS080)

**Fieldwork – F**

- observing, measuring, collecting and recording data, developing and conducting surveys and interviews
- fieldwork instruments such as weather instruments, vegetation identification charts, compasses, clinometers, GPS, GIS or remote sensing

**Graphs and statistics – GS**

- data tables, pie graphs, column graphs, compound column graphs, line graphs, scatter graphs, climate graphs, population profiles, multiple tables and graphs presented on a geographical theme, statistics to find patterns and trends, and to account for change

**Spatial technologies – ST**

- virtual maps, satellite images, global positioning systems (GPS), geographic information systems (GIS), remote sensing data, augmented reality

**Visual representations – VR**

- photographs, aerial photographs, illustrations, flow charts, annotated diagrams, multimedia, field and photo sketches, cartoons, mind maps, web tools

Content	Teaching, learning, assessment and resources	Adjustments
<p><b>Biomes</b> Students</p> <ul style="list-style-type: none"> <li>investigate the distribution and physical characteristics of biomes (ACHGK060)</li> </ul>	<ul style="list-style-type: none"> <li>Students participate in a discussion to distinguish between a biome and an ecosystem. <b>M</b></li> <li>Students use a stimulus such as <a href="http://www.youtube.com/watch?v=MdlwPtKg-VI">www.youtube.com/watch?v=MdlwPtKg-VI</a> to explain the essential biotic and abiotic components of biomes and ecosystems.</li> <li>Students use digital maps and other visual representations to identify and describe the spatial distributions of the Earth's major biomes. <b>M VR</b>  </li> <li>Using a stimulus such as <a href="http://www.climatemps.com">www.climatemps.com</a>, students work in groups to examine climatic graphs for one place in one biome and discuss the factors influencing the climate eg latitude, altitude, topography, location. Students investigate and assess the impact of climate on the characteristics of the biome eg biodiversity, soil, water. Each group prepares a 5-minute presentation of their findings for the class. <b>M GS</b>  </li> <li>Students determine the importance of ecosystem productivity for biodiversity eg food chains and food webs. <b>VR</b> </li> </ul>	<p>Students identify and represent the Earth's biomes and their characteristics using digital images or maps annotated with images.</p>

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<p><b>Changing biomes</b> Students</p> <ul style="list-style-type: none"> <li>investigate the human alteration of biomes to produce food, industrial materials and fibres and the environmental effects of these alterations (ACHGK061)</li> </ul>	<ul style="list-style-type: none"> <li>Students investigate and compare examples of sustainable biome use, including sustainable use of terrestrial or aquatic biomes by Aboriginal and/or Torres Strait Islander peoples. Students clarify and justify their own definition of 'sustainable'. 🖐️🌐</li> <li>Students analyse satellite and aerial photographs illustrating the extent of human changes to the Earth's biomes and ecosystems, including Australian examples. Students work collaboratively to determine if there are biomes unchanged by humans. <b>ST VR</b> ⚙️💻</li> </ul> <p><b>Group inquiry</b></p> <ul style="list-style-type: none"> <li>Students work in small groups to investigate human changes to biomes for food, fibres and industrial production and the environmental consequences of these changes. <b>VR</b> <a href="http://piefa.edu.au/units/index.html#910">piefa.edu.au/units/index.html#910</a></li> <li>Each group select ONE product from each category. For example, food (fruit/rice), fibre (cotton/paper), industrial (timber/rubber). For the chosen product, students create a map (local, national or global) showing the spatial distribution of production, annotated with notes and images depicting environmental effects and change in the area. <b>M</b></li> </ul> <p>Examples may include:</p> <table border="1" data-bbox="656 778 1563 1026"> <tbody> <tr> <td data-bbox="656 778 837 906">Change to the environment</td> <td data-bbox="837 778 1019 906"><u>Land/soil</u> terracing fertilising</td> <td data-bbox="1019 778 1200 906"><u>Water</u> irrigation drainage</td> <td data-bbox="1200 778 1382 906"><u>Biodiversity</u> clearing replacing</td> <td data-bbox="1382 778 1563 906"><u>Atmosphere</u></td> </tr> <tr> <td data-bbox="656 906 837 1026">Environmental effects</td> <td data-bbox="837 906 1019 1026">land and soil degradation</td> <td data-bbox="1019 906 1200 1026">pollution, depletion</td> <td data-bbox="1200 906 1382 1026">habitat and biodiversity loss</td> <td data-bbox="1382 906 1563 1026">air pollution, climate change</td> </tr> </tbody> </table> <ul style="list-style-type: none"> <li>Each group communicates the causes, consequences and possible solutions to one of the environmental effects they identified eg salinity. ⚙️🎓★</li> </ul>	Change to the environment	<u>Land/soil</u> terracing fertilising	<u>Water</u> irrigation drainage	<u>Biodiversity</u> clearing replacing	<u>Atmosphere</u>	Environmental effects	land and soil degradation	pollution, depletion	habitat and biodiversity loss	air pollution, climate change	<p><b>Extension</b> Students create an infographic that compares the extent of biome alteration across a range of scales.</p>
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<p><b>Food security</b></p> <p>Students</p> <ul style="list-style-type: none"> <li>investigate the capacity of the world's biomes to achieve sustainable food security for Australia and the world (ACHGK064)</li> </ul>	<p><i>Students are provided with some class time each week for an individual inquiry task undertaken concurrently with whole class activities.</i></p> <p><b>Individual inquiry (assessment)</b></p> <ul style="list-style-type: none"> <li>Students develop a feature article on food insecurity for an online magazine. Students decide on a country/region eg Chad, Haiti, South-East Asia etc for the focus of their article.  </li> </ul> <p>The article will address:</p> <ul style="list-style-type: none"> <li>the extent of food insecurity <b>M VR</b></li> <li>the factors influencing agricultural yields eg water scarcity, natural hazards <b>GS</b> </li> <li>two challenges reducing food scarcity eg climate change, population</li> <li>one successful strategy used to sustainably increase agricultural yields </li> </ul> <p>Students provide a personal reflection on the issue of future food security in the selected location.</p> <p><b>Class activities</b></p> <ul style="list-style-type: none"> <li>Students discuss the definition of food security <a href="http://www.fao.org/hunger/en/">www.fao.org/hunger/en/</a></li> <li>Students identify and suggest reasons for the spatial patterns of regions/countries experiencing food security issues. <b>M VR</b> </li> <li>Students define the terms 'biocapacity' and 'ecological footprint'; and explain the interrelationship between the terms. They analyse the effect of ecological footprints exceeding biocapacity and the implications for future food production. <b>M ST</b>  </li> <li>Students investigate the effect of population rates on global food shortages using stimulus material such as: Key factors in food shortages – <a href="http://www.nature.com/scientificamerican/journal/v300/n5/box/scientificamerican0509-50_BX1.html">www.nature.com/scientificamerican/journal/v300/n5/box/scientificamerican0509-50_BX1.html</a> Population projections – <a href="http://news.nationalgeographic.com/news/2014/09/140918-population-global-united-nations-2100-boom-africa/">news.nationalgeographic.com/news/2014/09/140918-population-global-united-nations-2100-boom-africa/</a></li> </ul> <p>Students create flow diagrams to illustrate direct and indirect links between population growth and food shortages. <b>GS VR</b>  </p>	<p><b>Extension</b></p> <p>Students prepare a written response to the question: Have humans exceeded the ability of Earth's biomes to continue supplying food, fibre and industrial materials with minimal environmental impact?</p>

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<p><b>Food security</b> (continued)</p> <p>Students</p> <ul style="list-style-type: none"> <li>investigate the capacity of the world's biomes to achieve sustainable food security for Australia and the world (ACHGK064)</li> </ul>	<ul style="list-style-type: none"> <li>As a whole class, students play the World Vision Global Food Inequality Simulation Game including the debrief activities.   </li> <li>Students use stimulus material to investigate how food waste in developed countries is connected to food security. They evaluate the information sources for reliability, bias and usefulness. Students propose an action plan for the class or school in response to the challenge to reduce food waste. They predict the outcomes and consequences of their proposal and they share the proposal with an appropriate audience at the school. Food waste – <a href="http://www.youtube.com/watch?v=Llz8TFawqz0">www.youtube.com/watch?v=Llz8TFawqz0</a> Ugly food campaign – <a href="http://theconversation.com/dont-knock-ugly-food-campaigns-they-help-the-fight-against-waste-37107">theconversation.com/dont-knock-ugly-food-campaigns-they-help-the-fight-against-waste-37107</a> VR   </li> </ul>	

Content	Teaching, learning, assessment and resources	Adjustments
<p><b>Biomes produce food</b> Students</p> <ul style="list-style-type: none"> <li>investigate environmental, economic and technological factors that influence agricultural yields in Australia and across the world (ACHGK062)</li> </ul> <p><b>Challenges to food production</b> Students</p> <ul style="list-style-type: none"> <li>investigate environmental challenges to food production for Australia and other areas of the world (ACHGK063)</li> </ul>	<ul style="list-style-type: none"> <li>Students use stimulus material to identify biomes used for pasture and cropland and to discuss factors that may influence agricultural activities in different places and why some biomes produce more food than others. Stimulus may include: <b>VR</b> ✨ ✨ Food for thought – <a href="https://www.oxfam.org.au/get-involved/how-schools-can-get-involved/classroom-resources/food-4-thought-2/food-4-thought-geography/worksheet-2-which-biomes-are-able-to-produce-food/">https://www.oxfam.org.au/get-involved/how-schools-can-get-involved/classroom-resources/food-4-thought-2/food-4-thought-geography/worksheet-2-which-biomes-are-able-to-produce-food/</a> Growing hay for the cattle in the USA – <a href="http://www.youtube.com/watch?v=47n6lbfDX7g">www.youtube.com/watch?v=47n6lbfDX7g</a></li> </ul> <p><b>Fieldwork/Investigative study</b></p> <ul style="list-style-type: none"> <li>Where fieldwork to a farm is possible, students undertake an investigation to gather primary data about: <ul style="list-style-type: none"> <li>environmental, economic, technological factors influencing farm yields <b>F</b> ✨</li> <li>environmental challenges to increasing farm production. <b>F</b></li> </ul>           Prior to the fieldwork, students develop inquiry questions and make decisions about appropriate fieldwork activities. ✨ ✨ Following the fieldwork, students work collaboratively to analyse the data collected, summarise using visual representations and statistical data, and report on the fieldwork results and findings. 🎓         </li> <li>Where farm-based fieldwork is not viable, students investigate one crop or livestock activity in Australia to determine: <ul style="list-style-type: none"> <li>environmental, economic, technological factors influencing farm yields <b>F</b> ✨</li> <li>environmental challenges to increasing farm production. <b>F</b></li> </ul>           The following stimulus may be useful: Primary Industries Education Foundation – <a href="http://www.primezone.edu.au">www.primezone.edu.au</a> Virtual farm visit – <a href="http://www.mla.com.au/Cattle-sheep-and-goat-industries">www.mla.com.au/Cattle-sheep-and-goat-industries</a> 🖥️         </li> </ul>	<p><b>Extension</b> Students examine the aims of the Food and Agriculture Organization (FAO). They select one of the aims and explain one of its activities or programs. Students propose how they may be able to support the aim. <a href="http://www.fao.org/about/what-we-do/en/">www.fao.org/about/what-we-do/en/</a></p>

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<p><b>Challenges to food production</b> (continued)</p> <p>Students</p> <ul style="list-style-type: none"> <li>investigate environmental challenges to food production for Australia and other areas of the world (ACHGK063)</li> </ul>	<ul style="list-style-type: none"> <li>Students investigate developing countries in the Asia region, to explain environmental challenges to food production eg water scarcity, desertification, competing land use. Students debate the topic: <i>Australian farmers face the same challenges to food production as farmers in the Asia region.</i>   </li> <li>Students examine advances and innovations in technology to increase agricultural yields eg green revolution, genetic engineering and precision farming. <b>GS VR</b>    The following stimulus may be useful: Green Revolution infographic <a href="http://oecotextiles.files.wordpress.com/2011/06/6acc3b3a-3003-11dd-86cc-000077b076582.gif">oecotextiles.files.wordpress.com/2011/06/6acc3b3a-3003-11dd-86cc-000077b076582.gif</a> Helping feed a nation: Indonesia <a href="http://splash.abc.net.au/home#!/media/1245224/poorest-indonesians-help-feed-a-nation">http://splash.abc.net.au/home#!/media/1245224/poorest-indonesians-help-feed-a-nation</a> Potato farming Bangladesh <a href="http://www.youtube.com/watch?v=HeZq9aLhsik">www.youtube.com/watch?v=HeZq9aLhsik</a> Gene technology <a href="http://splash.abc.net.au/home#!/media/1239506/breeding-tolerance">http://splash.abc.net.au/home#!/media/1239506/breeding-tolerance</a> Spatial technologies (space to village) <a href="http://www.youtube.com/watch?v=dWgPM87LrLM">www.youtube.com/watch?v=dWgPM87LrLM</a></li> <li>Students discuss options for increasing global food security eg urban agriculture, aquaculture, development assistance, empowering women, land tenure. <b>VR</b>   The following stimulus may be useful: Land tenure animation (animation) <a href="http://www.youtube.com/watch?v=EVEkF411iak">www.youtube.com/watch?v=EVEkF411iak</a> Women in agriculture (animation) <a href="http://www.youtube.com/watch?v=uDM828TpVpY">www.youtube.com/watch?v=uDM828TpVpY</a> Growing out of poverty <a href="http://www.youtube.com/watch?v=46ySNz5iCEA">www.youtube.com/watch?v=46ySNz5iCEA</a></li> <li>Students examine Australia's role in reducing food scarcity using stimulus such as: Food security in Australia – <a href="http://splash.abc.net.au/home#!/media/526919/food-security-in-australia">splash.abc.net.au/home#!/media/526919/food-security-in-australia</a> <b>VR</b> </li> <li>Students reflect on their learning to respond to the statement – <i>The Earth's biomes can sustainably feed future world populations.</i> Students brainstorm and mind map ideas to develop and justify their personal response. Students work collaboratively in small groups to debate the statement using students' personal responses.    </li> </ul>	

**Sample assessment activity**

**Outcomes assessed: GE5-3, GE5-5, GE5-7, GE5-8**

Students produce a feature article in which they examine the extent of food insecurity, factors influencing agricultural yields, challenges to reducing food scarcity and strategies used to sustainably increase agricultural yields. Students also make a personal comment about future food security.