

Mathematics Level 7

Chapter 3 — Landforms and landscapes

This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. To view a copy of this license, visit <http://creativecommons.org/licenses/by-nc-nd/4.0/> or send a letter to Creative Commons, PO Box 1866, Mountain View, CA 94042, USA.

Attribution: Classbasics Pty Ltd, vwx.au

Curriculum codes refer to the *Victorian Curriculum F–10 Version 2.0*, published by the Victorian Curriculum and Assessment Authority (VCAA). Classbasics is not affiliated with the VCAA; the VCAA does not endorse this resource and makes no warranties regarding it.

Distribution note: this document may be distributed, and whole pages may be removed from it, provided only WHOLE pages are removed (never part of a page). This allows teachers to remove tests, exams and subtopics they do not want to issue.

Aboriginal and Torres Strait Islander content has been excluded as accuracy cannot be guaranteed, and it is better to be respectful than cover the entire curriculum inaccurately.

Significant effort has been made to ensure this content is legal. Please send any areas of concern to admin@vwx.au with appropriate document/legal references so errors can be verified and changes be made.

Contents

Section	Page
Australia's landscapes: types, features and where each type is found	2
Why people value landscapes and landforms: spiritual, aesthetic and cultural meaning	14
How landforms are made: geomorphological processes, with a local landform study	28
How people change and manage landforms: causes, responses and a local study	42
Geomorphological hazards: causes, impacts and responses	56
Understanding environmental phenomena through interconnection and change	69

Australia's landscapes: types, features and where each type is found

For the teacher — VC2 codes: VC2HG8K12; tasks in this section draw on elaborations

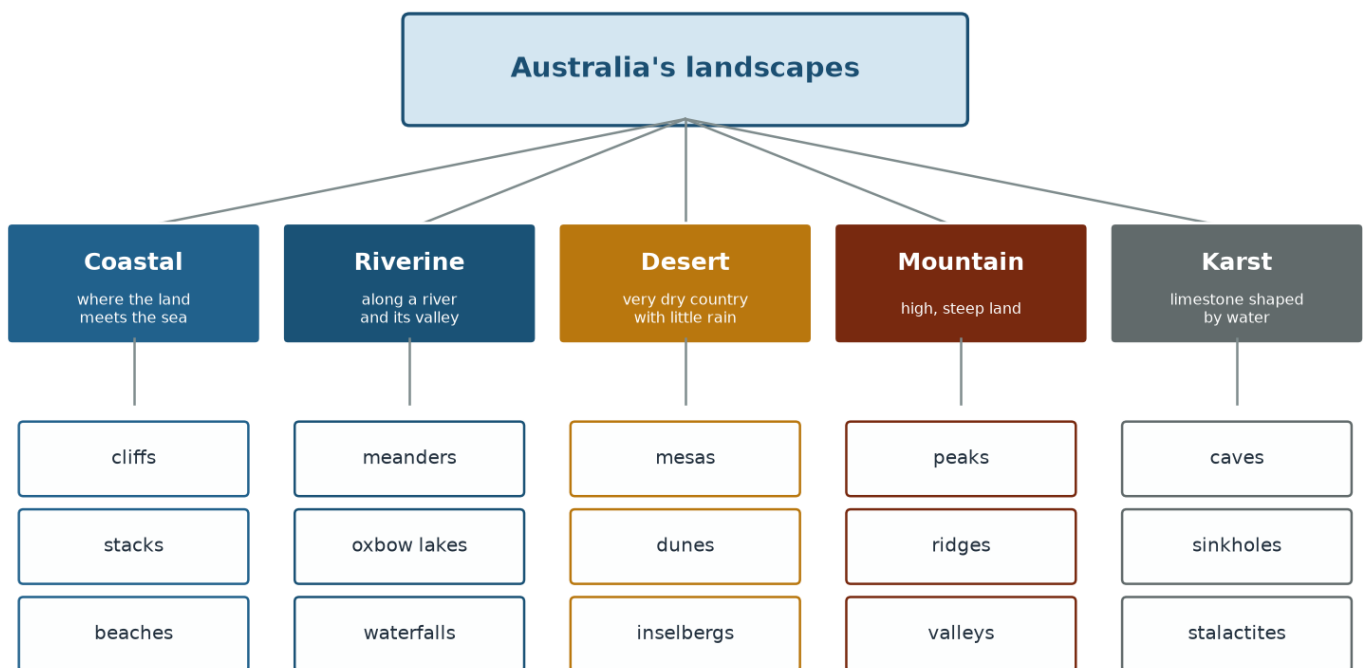
VC2HG8K12.E01, .E02, .E03, .E04 and .E05. This is the first section of Chapter 3, *Landforms and landscapes*: here we **describe** Australia's landscapes; later sections ask what they mean to people (3B), how they were made (3C), how people change them (3D), the hazards found in them (3E) and how to explain them using geographical concepts (3F).

Key ideas

Landscape and landform — not the same word. A **landscape** is the whole scene you see across a wide area of land — all of its natural features together. A **landform** is one single natural feature of the Earth's surface, such as a cliff, a sand dune or a mountain peak. So a desert *landscape* (the whole dry scene) can contain many desert *landforms* (dunes, mesas, isolated rocks). Geographers sort landscapes into **types** that share the same kind of features.

Five landscape types. The curriculum names five example types: **coastal**, **riverine**, **desert**, **mountain** and **karst** (limestone country shaped by slowly dissolving water). These are examples, not a full list — Australia has others. Figure 1 links each type to some of its landforms.

Five landscape types and some of their landforms



The five types and their landforms are examples from the curriculum — Australia has others.

Concept map linking Australia's five example landscape types (coastal, riverine, desert, mountain, karst) to example landforms such as cliffs, meanders (river bends), mesas (flat-topped hills), peaks and caves

Distribution means *where something is found*. When a geographer describes the distribution of a landscape type, they say where on the map it occurs and in what pattern — for example, “around the edge” or “in the inland centre”. Figure 2 shows where Australia's landscape types are found.

Where Australia's landscape types are found



Simplified outline. Zones placed by their real locations (Geoscience Australia), retrieved 25 Aug 2026.

- | | |
|---|--|
| ■ Coastal (fringe of the continent) | ■ Karst |
| ■ Riverine | ■ Tropical savanna and grassland |
| ■ Desert | ■ Rainforest (Wet Tropics) |
| ■ Mountain | |

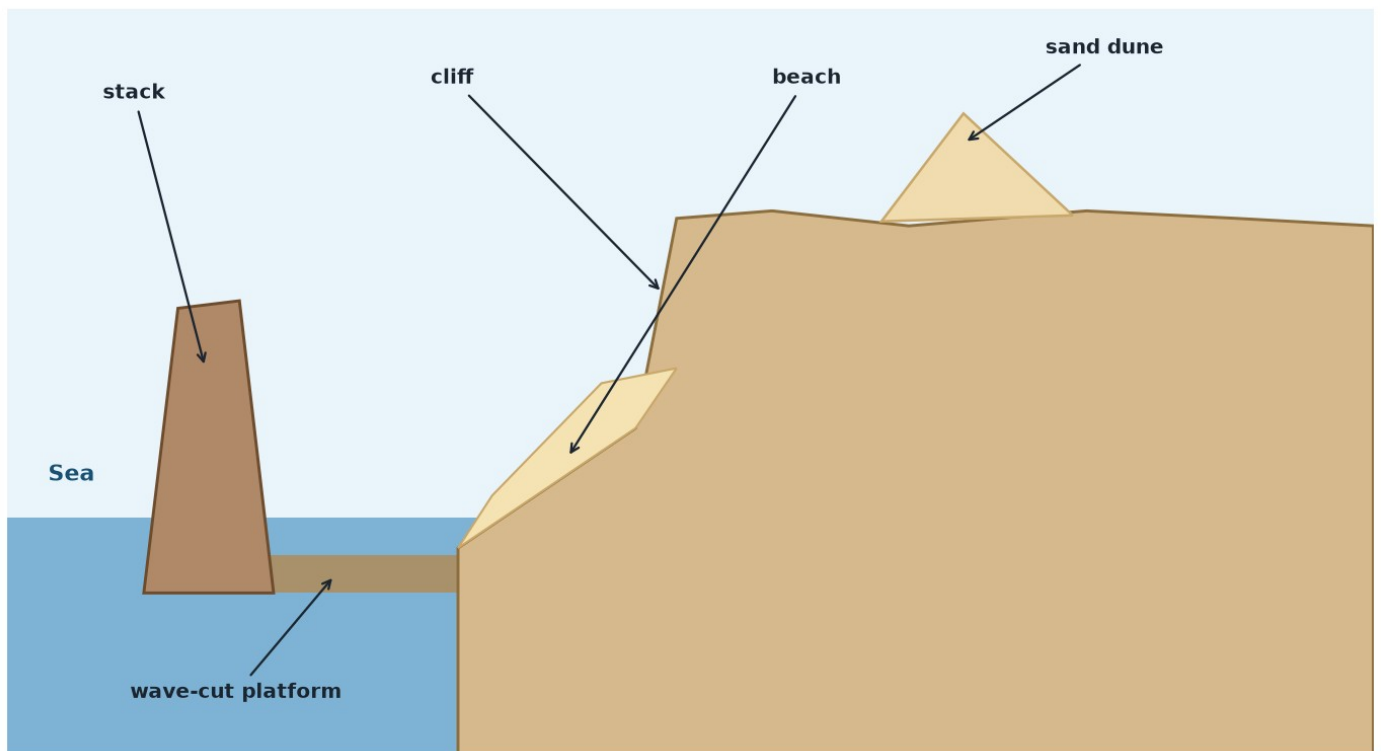
Simplified map of Australia showing where each landscape type is found: a coastal fringe around the whole continent, desert landscapes across the centre and west, mountain landscapes along the Great Dividing Range in the east, tropical savanna and grassland across the north, the Wet Tropics rainforest in north Queensland, riverine landscapes along the Murray and Darling rivers, and karst at the Nullarbor Plain

Table 1 — Australia's five example landscape types.

Landscape type	What it is	Where it is found in Australia	Example landforms
Coastal	where the land meets the sea	as a fringe around the whole continent	cliffs, stacks (isolated rock pillars), beaches, sand dunes
Riverine	along a river, its valley and its floodplain (flat land beside the river, covered when it floods)	e.g. the Murray–Darling river system in the south-east	meanders (bends), oxbow lakes (cut-off bends), waterfalls
Desert	very dry country with little rain	across the inland centre and west	mesas and buttes (flat-topped rock hills), dunes, inselbergs (isolated rock hills)
Mountain	high, steep land	along the Great Dividing Range in the east, from Cape York to Victoria	peaks, ridges, valleys
Karst	land shaped by water slowly dissolving limestone rock	the Nullarbor Plain across WA and SA; Jenolan Caves (NSW); Naracoorte Caves (SA)	caves, sinkholes, stalactites (mineral spikes hung from cave ceilings)

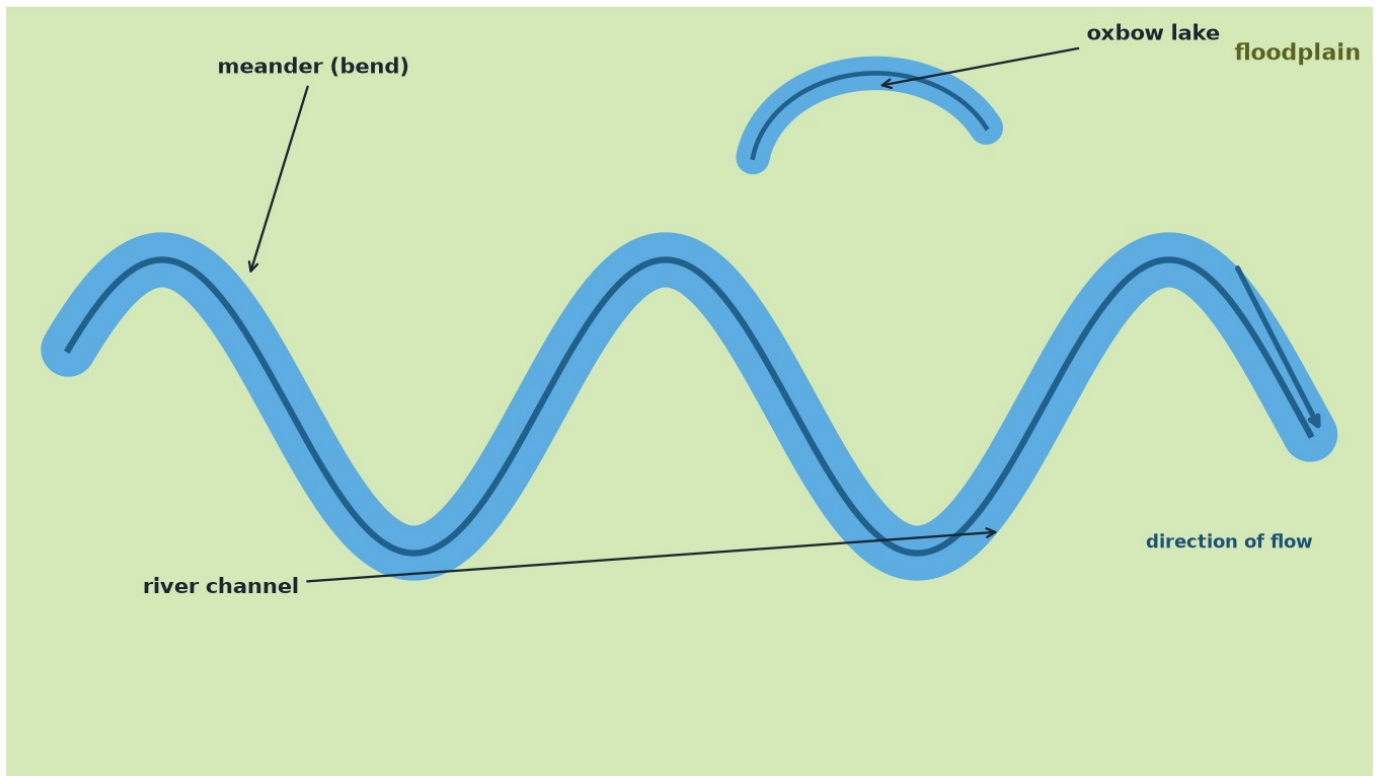
Landforms inside each landscape. Figures 3–6 are simple cross-sections and a map view of four of the types, with their landforms labelled.

Cross-section of a coastal landscape (not to scale)



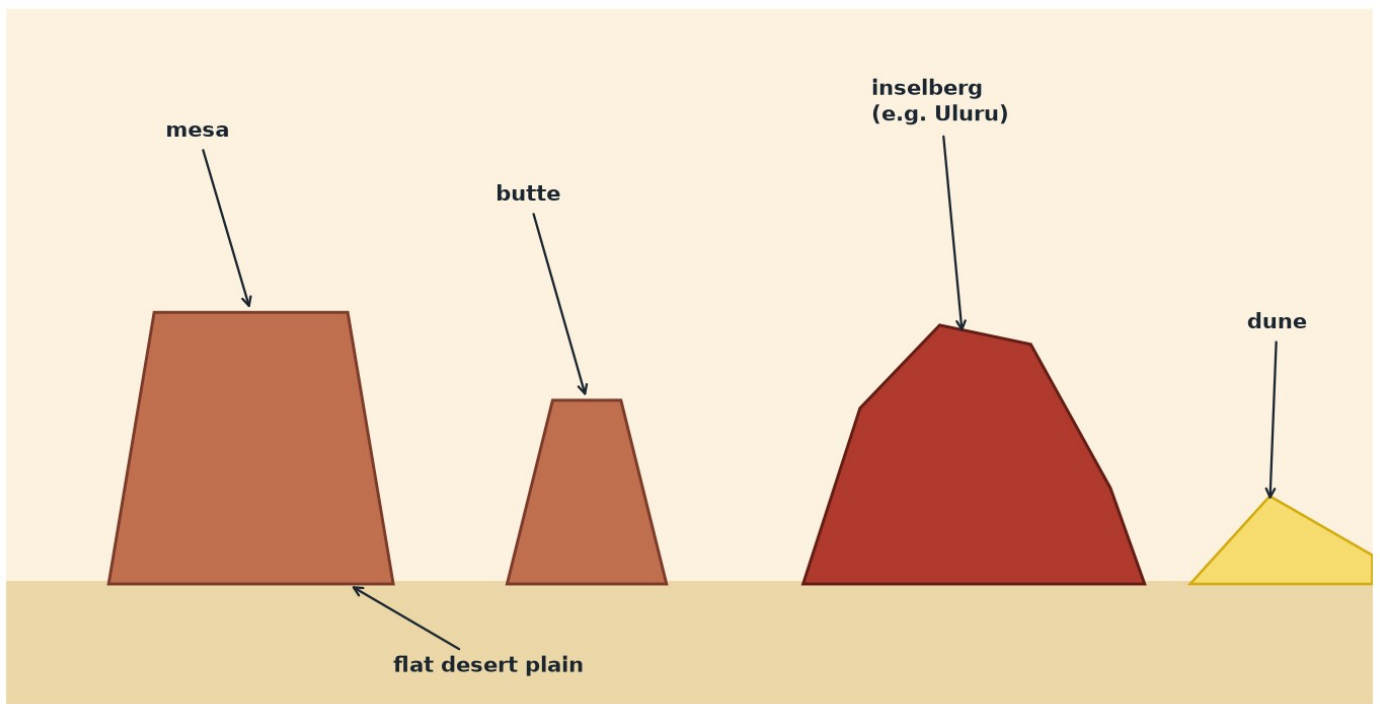
Labelled cross-section of a coastal landscape showing a stack standing in the sea, a cliff, a beach, a sand dune and a wave-cut platform

A riverine landscape from above (not to scale)



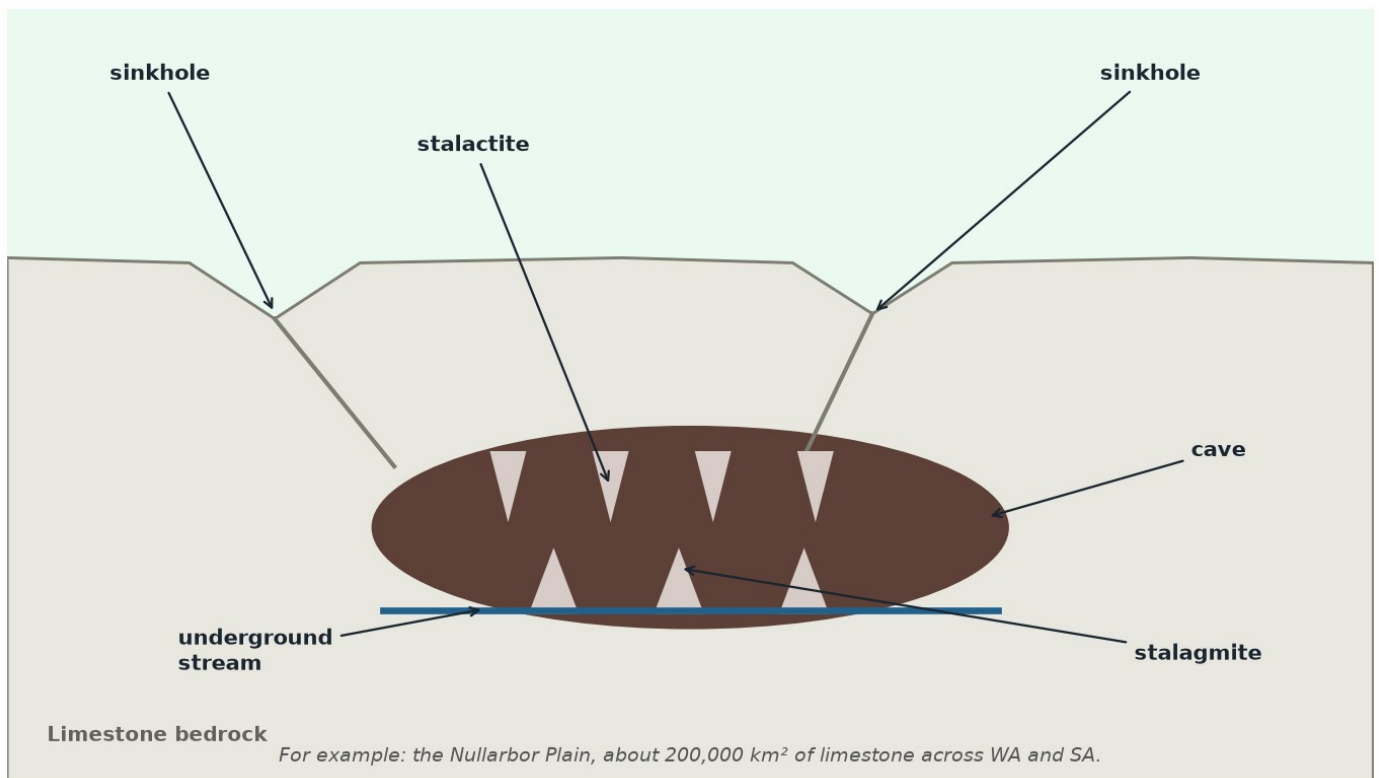
Labelled map view of a riverine landscape showing a meander bend, the river channel, an oxbow lake and the floodplain

Desert landforms in cross-section (not to scale)



Labelled cross-section of desert landforms: a mesa, a butte, an inselberg such as Uluru, and a dune on a flat desert plain

Cross-section of a karst landscape (not to scale)



Labelled cross-section of a karst landscape: sinkholes at the surface, a cave below with stalactites hanging down and stalagmites built up from the floor, and an underground stream, in limestone bedrock such as the Nullarbor Plain

In Figure 6, notice the pair built by dripping water in karst caves: **stalactites** hang down from the ceiling, and **stalagmites** build up from the floor.

The desert landscape, in more detail. Deserts are Australia's biggest landscape type by area. You met these landforms in Figure 5: mesas and buttes are flat-topped rock hills (a butte is the smaller of the two), and an inselberg is a single rock hill standing alone on a flat plain. Australia has ten named deserts, and together they cover about 18% of the mainland (Geoscience Australia, retrieved 25 August 2026). The largest is the Great Victoria Desert (about 348,750 km²) and the smallest is the Pedirka Desert (about 1,250 km²). Figure 7 maps their distribution, with Uluru — one of the world's largest single rocks, an **inselberg** rising 348 m above the plain and 863 m above sea level (Geoscience Australia) — marked in Central Australia.

The distribution of Australia's ten named deserts



Simplified outline. Desert areas: Geoscience Australia, compiled by ClassBasics, retrieved 25 Aug 2026.
Australia's deserts together cover about 18% of the mainland.

Simplified map of Australia showing the distribution of the ten named deserts (Great Victoria, Great Sandy, Tanami, Simpson, Gibson, Little Sandy, Strzelecki, Sturt Stony, Tirari and Pedirka) with Uluru marked in Central Australia

Table 2 — The ten named deserts of Australia.

Desert	Area (km ²)	Desert	Area (km ²)
Great Victoria	348,750	Little Sandy	111,500
Great Sandy	267,250	Strzelecki	80,250
Tanami	184,500	Sturt Stony	29,750
Simpson	176,500	Tirari	15,250
Gibson	156,000	Pedirka	1,250

Areas: Geoscience Australia, retrieved 25 August 2026.

Iconic landforms. Some landforms are famous around the world. The Victorian Curriculum uses the word *iconic* but does not define it, so this section states its meaning up front: here, **iconic** means *widely known and treated as a symbol of a place*. “Iconic” is a response-reporting word — it reports how people respond to a place, so which landforms count as iconic is a judgement people make, not a fact written into the rock. A landform usually becomes iconic

because of its size, its shape, its beauty, or how often it is used in photos and films to stand for a country. Figure 8 lists iconic landforms in Australia and in other countries.

Iconic landforms: Australia and the wider world

Landform	Kind of landform	Where	Why it is iconic
Uluru	inselberg (rock)	central Australia (NT)	one of the world's largest single rocks; rises 348 m above the plain
Great Barrier Reef	coral reef	Coral Sea, off QLD	the largest coral reef system on Earth (over 2,300 km long)
Twelve Apostles	limestone stacks	Great Ocean Rd, VIC	tall rock pillars standing in the sea, up to 50 m high
Mt Kosciuszko	mountain peak	Snowy Mtns, NSW	highest peak on the Australian mainland (2,228 m)
Nullarbor Plain	karst (limestone)	across WA and SA	the largest limestone plain in the world
Mt Everest	mountain peak	Nepal/China	the highest mountain on Earth (8,849 m)
Grand Canyon	river gorge	Arizona, USA	a gorge 446 km long cut by the Colorado River
Mt Fuji	volcano	Honshu, Japan	a near-perfect volcanic cone; the symbol of Japan

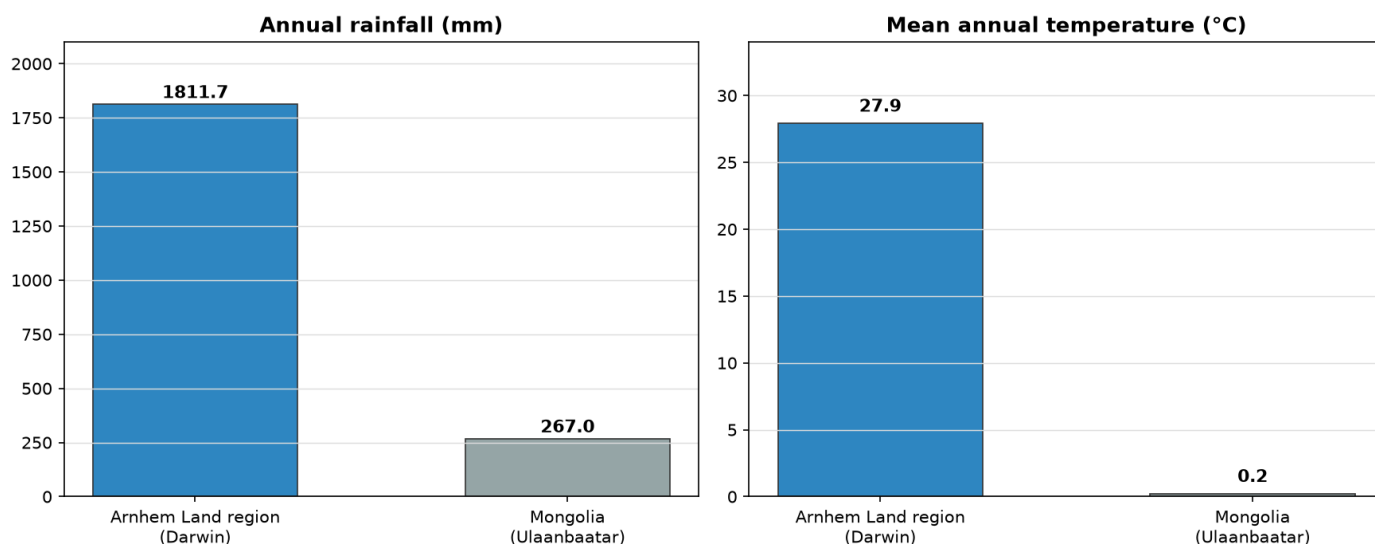
Heights and lengths from the primary sources cited in the workbook body; retrieved 25 Aug 2026.

Table of iconic landforms: Australia and the wider world — Uluru, the Great Barrier Reef, the Twelve Apostles, Mount Kosciuszko and the Nullarbor Plain in Australia, and Mount Everest, the Grand Canyon and Mount Fuji overseas, each with its kind, location and why it is iconic

A few of the facts behind that table, with sources (all retrieved 25 August 2026): the Great Barrier Reef is the largest coral reef system on Earth, over 2,300 km long, in the Coral Sea off Queensland (Great Barrier Reef Marine Park Authority); Mount Kosciuszko (2,228 m) in the Snowy Mountains of NSW is the highest peak on the Australian mainland (Geoscience Australia); the Twelve Apostles are limestone stacks up to 50 m high beside the Great Ocean Road in Victoria (Parks Victoria). Around the world, Mount Everest is the highest mountain on Earth at 8,849 m (Nepal–China joint survey, 2020), and the Grand Canyon in Arizona, USA, is a river gorge about 446 km long cut by the Colorado River (US National Park Service).

Comparing Australia's landscapes with another country. Landscape types are not unique to Australia — but their **distribution** is different from country to country. Compare grasslands: northern Australia (the Arnhem Land region) is covered by tropical grasslands and **savanna** (hot grassland with scattered trees), while Mongolia's grasslands are part of the cold Mongolian–Manchurian **steppe** (a vast, dry grassland), about 887,300 km² across Mongolia, China and Russia (WWF grassland-region data, retrieved 25 August 2026). Same landscape type, very different climates (Figure 9).

Two grassland landscapes, two very different climates

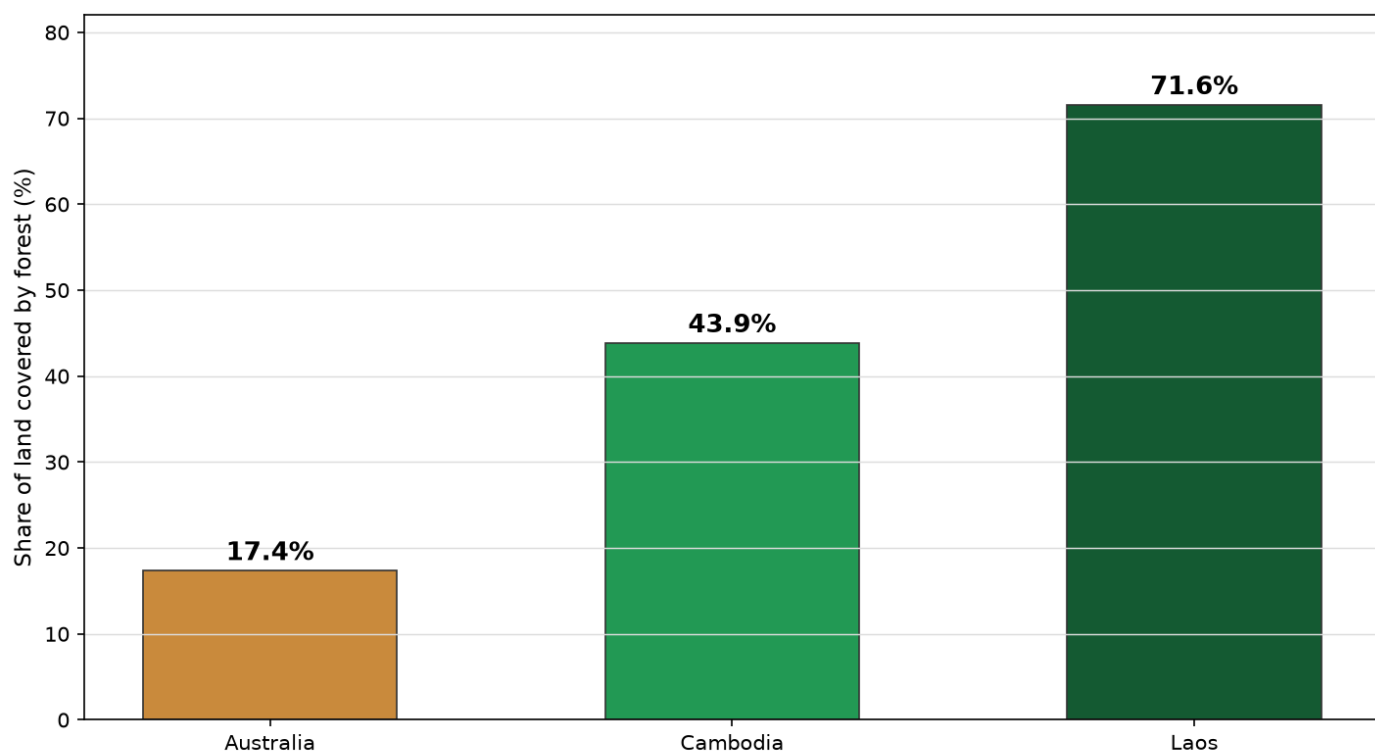


Darwin: Bureau of Meteorology climate statistics (mean of daily maxima 32.4 °C and minima 23.3 °C = 27.9 °C). Ulaanbaatar: WMO normals; the coldest capital city on Earth. Retrieved 25 Aug 2026.

Bar chart comparing the Arnhem Land grassland region (Darwin) with Mongolia (Ulaanbaatar): annual rainfall 1811.7 mm versus 267 mm, and mean annual temperature 27.9 degrees Celsius versus 0.2 degrees Celsius

The same is true of forest landscapes. Tropical rainforest grows in far north Queensland (the Wet Tropics World Heritage Area, about 893,453 ha — Australian Government, retrieved 25 August 2026), and forests cover very different shares of other countries (Figure 10).

Forest landscapes cover very different shares of each country



World Bank (FAO), Forest area (% of land area), 2022, retrieved 25 Aug 2026. 'Forest' counts every kind of tree cover, so most of Australia's share is open eucalypt woodland, while Laos and Cambodia include large areas of monsoon and tropical forest.

Bar chart comparing the share of each country's land covered by forest: Australia 17.4%, Cambodia 43.9% and Laos 71.6%

Worked examples

Worked example 1 — describing the distribution of Australia's deserts (map-led)

Use Figure 7 and Table 2 to describe the distribution of Australia's deserts.

How to answer a “describe the distribution” question: (1) say where the feature is, using map words (north, south, inland, coastal, central, western); (2) say the pattern (grouped together? spread out? along something?); (3) back it up with one or two named places or numbers.

Model answer. Australia's deserts lie in the **inland centre and west** of the continent — none of them touch the coastal fringe. They form **one grouped band** across the interior, from the Great Sandy Desert in the north-west through to the Strzelecki Desert in the south-east. The largest, the Great Victoria Desert (348,750 km²), sits across the WA–SA border in the south of the desert band, and the smallest, the Pedirka Desert (1,250 km²), sits in the centre. Uluru stands in this inland desert country, about mid-way across the continent. Together the deserts cover about 18% of the mainland.

Worked example 2 — comparing a landscape type in Australia and another country (data-led)

Compare the grassland landscapes of the Arnhem Land region (Australia) and Mongolia, using Figure 9.

Model answer. Both places are grassland landscapes, but they are found in very different climates. The Arnhem Land region's grasslands are tropical: Darwin's airport weather station records 1,811.7 mm of rain a year and a mean annual temperature of 27.9 °C (Bureau of Meteorology). Mongolia's steppe is cold and dry: Ulaanbaatar gets only 267 mm of rain a year, and its mean annual temperature is 0.2 °C — it is the coldest capital city on Earth (World Meteorological Organization). So the **same landscape type is distributed in opposite kinds of climate**: hot and wet-season-driven in northern Australia, cold and dry in Mongolia. That is why a distribution comparison needs climate evidence, not just a map.

Practice questions

Scaffolded

Q1. In your own words, state the difference between a *landscape* and a *landform*.

Q2. List the five example landscape types named in this section.

Q3. Copy the table and match each landform to its landscape type: cliff, meander, mesa, cave, peak. (Types: coastal, riverine, desert, mountain, karst.)

Q4. Using Table 2: (a) which is the largest desert in Australia, and what is its area? (b) which is the smallest? (c) about what share of the mainland do the ten deserts cover together?

Q5. Using Figure 7, complete the sentence starters: “Australia's deserts are found in the ...”, “The desert closest to the WA–SA border in the south is ...”, “Uluru is located in ...”.

Q6. Look at Figure 3 (the coastal cross-section). Name the landform that: (a) stands alone in the sea; (b) is the steep rock face; (c) is the flat rock ledge under the water.

Q7. Karst country is made of one kind of rock. (a) Name it. (b) From Figure 6, name the landform that hangs from the cave ceiling and the one that grows up from the cave floor. (c) Name Australia's largest karst area.

Q8. Choose two landforms from Figure 8. For each, use this sentence starter: “_____ is iconic because _____.” Make sure your reason uses a fact from the table (size, kind, or where it is).

Un scaffolded

Q9. Using Figure 2, compare the distribution of mountain landscapes and desert landscapes in Australia.

Q10. The Murray is Australia's longest river at 2,508 km (Geoscience Australia). Explain why the Murray and its floodplain are a *riverine* landscape, and name two landforms you would expect to find there.

Q11. Using Figure 9 and Worked example 2, explain how two grassland landscapes on opposite sides of the world can have such different climates. Use both the rainfall and temperature numbers in your answer.

Q12. Describe the pattern shown in Figure 10 (forest cover in Australia, Cambodia and Laos). Which country has forest on most of its land, and what does the footnote warn about comparing these numbers?

Extend — evidence-based response

E1. Choose **one** iconic Australian landform from Figure 8. Write a short paragraph (60–80 words) that: names the landform and its landscape type; gives its location using a state or territory; includes at least one number from this section as evidence; and explains, in your own words, why people treat it as a symbol of Australia. Underline your evidence.

Answers

Q1. A landscape is the whole scene across a wide area of land; a landform is one single natural feature within it. **Q2.** Coastal, riverine, desert, mountain, karst. **Q3.** Cliff → coastal; meander → riverine; mesa → desert; cave → karst; peak → mountain. **Q4.** (a) Great Victoria Desert, 348,750 km². (b) Pedirka Desert. (c) About 18% of the mainland. **Q5.** ...inland centre and west of the continent; ...the Great Victoria Desert; ...Central Australia, in the inland desert country. **Q6.** (a) The stack. (b) The cliff. (c) The wave-cut platform. **Q7.** (a) Limestone. (b) Stalactite (ceiling); stalagmite (floor). (c) The Nullarbor Plain. **Q8.** Answers vary. **Q9.** Answers vary (see solutions). **Q10.** Answers vary. **Q11.** Answers vary. **Q12.** Answers vary. **E1.** Answers vary.

Fully-worked solutions

Q1. A **landscape** is everything you see across a wide area of land — the whole scene and its mix of features. A **landform** is one single natural feature of the surface, like a cliff or a dune. Landforms are the parts; a landscape is the whole.

Q2. Coastal, riverine, desert, mountain and karst.

Q3. Cliff → coastal; meander → riverine; mesa → desert; cave → karst; peak → mountain.

Q4. (a) The Great Victoria Desert, about 348,750 km². (b) The Pedirka Desert, about 1,250 km². (c) About 18% of the mainland.

Q5. Australia's deserts are found in the **inland centre and west** of the continent. The desert closest to the WA–SA border in the south is the **Great Victoria Desert**. Uluru is located in **Central Australia**, inside the inland desert country.

Q6. (a) Stack. (b) Cliff. (c) Wave-cut platform.

Q7. (a) Limestone. (b) The stalactite hangs down; the stalagmite builds up. (c) The Nullarbor Plain.

Q8. Example: “The Great Barrier Reef is iconic because it is the largest coral reef system on Earth, over 2,300 km long — no other country has anything like it.” Example: “Mount Kosciuszko is iconic because at 2,228 m it is the highest peak on the Australian mainland.”

Q9. Mountain landscapes run in a **long narrow band down the east**, along the Great Dividing Range from Cape York to Victoria. Desert landscapes form a **broad block across the inland centre and west**. Both stay away from the coastal fringe, but the mountains hug the eastern side while the deserts fill the interior and west.

Q10. A riverine landscape is the land along a river and its valley and floodplain, and the Murray — with its bends, floodplain and wetlands — is exactly that. Landforms expected there include meanders, oxbow lakes, floodplains and (in its upper reaches) waterfalls.

Q11. The Arnhem Land region's grasslands get 1,811.7 mm of rain a year and average 27.9 °C, so they are hot tropical grasslands with a wet season. Mongolia's steppe gets only 267 mm and averages 0.2 °C, so it is a cold, dry grassland. Same type of landscape, opposite climates — distribution is about climate as well as position on the map.

Q12. The share of land covered by forest rises from Australia (17.4%) to Cambodia (43.9%) to Laos (71.6%), so forest landscapes dominate Laos and are a minority of Australia's land. The footnote warns that “forest” counts every kind of tree cover, so most of Australia's share is open eucalypt woodland while Laos and Cambodia include large areas of tropical and monsoon forest — the same word hides different landscapes.

E1. Example response (74 words): “*Uluru* is a desert landscape landform — an inselberg in Central Australia, in the Northern Territory. The evidence I used: it rises *348 m above the plain* and stands *863 m above sea level*. People treat Uluru as a symbol of Australia because its smooth red shape, standing alone on a flat plain, appears in photos, films and logos that mean ‘Australia’ to viewers around the world.”

Teaching sequence (teacher)

1. **Hook (5 min):** show two photos (a coast, a desert). Ask “same country?” — surface the idea that one continent holds many landscapes.
2. **Direct teaching (10 min):** landscape vs landform; the five types; Table 1; Figure 1. Define *distribution* and *iconic* explicitly (the iconic box is a worked example of defining an undefined curriculum word).
3. **Map work (10 min):** Figures 2 and 7 with the sentence starters of Q5; model the three-step “describe the distribution” method from Worked example 1.
4. **Data work (10 min):** Worked example 2 and Figures 9–10 — the E05 comparison with Mongolia, Laos and Cambodia (Asia engagement).
5. **Practice (10 min):** Q1–Q8 scaffolded; set Q9–Q12 and E1 for homework or a second lesson.
6. **Check for understanding:** exit card — “one landscape type, one landform inside it, one map word describing where it is found.”

This section teaches physical geography only: place names such as Uluru and Arnhem Land are used as examples of landforms and landscape distribution, with no cultural content attached.

Sources (retrieved 25 August 2026 unless stated)

- Geoscience Australia — desert list and areas, the 18% figure, Uluru heights, Murray River length, Great Dividing Range, Mount Kosciuszko.
- Bureau of Meteorology — Darwin Airport climate statistics (rainfall 1,811.7 mm; mean of daily maxima 32.4 °C and minima 23.3 °C).
- World Meteorological Organization — Ulaanbaatar climate normals (267 mm; 0.2 °C mean annual).
- WWF — extent of the Mongolian–Manchurian grassland region.
- Australian Government — Wet Tropics of Queensland World Heritage Area extent.
- World Bank (FAO) — forest area as a share of land area, 2022.
- Great Barrier Reef Marine Park Authority; Parks Victoria; US National Park Service; Nepal–China joint survey (2020) — iconic landform facts.

All maps in this section are simplified outlines drawn from primitives for this workbook; region shapes show real locations schematically.

Why people value landscapes and landforms: spiritual, aesthetic and cultural meaning

Curriculum focus — Victorian Curriculum 2.0, Geography, Levels 7 and 8, strand *Geographical Knowledge and Understanding*, sub-strand *Landforms and landscapes*. Content description VC2HG8K13. Elaborations drawn on: VC2HG8K13.E03 (why two famous Asian landscapes — Mount Fuji in Japan and China’s Yellow Mountains — are treasured), VC2HG8K13.E04 (how art, literature, music and film represent landscapes and landforms), VC2HG8K13.E07 (what landscapes and landforms contribute to tourism — the Alps in Switzerland, the Great Barrier Reef and Uluru in Australia).

In this section

In Section 3A you mapped Australia’s landscapes and landforms: what they are and where they are. This section asks a different question: **why do people care?** Some landscapes are loved, celebrated in art, visited by millions, or held sacred. Geographers say these landscapes have **value** — and they sort that value into three kinds: **spiritual, aesthetic and cultural**.

In this section you will learn:

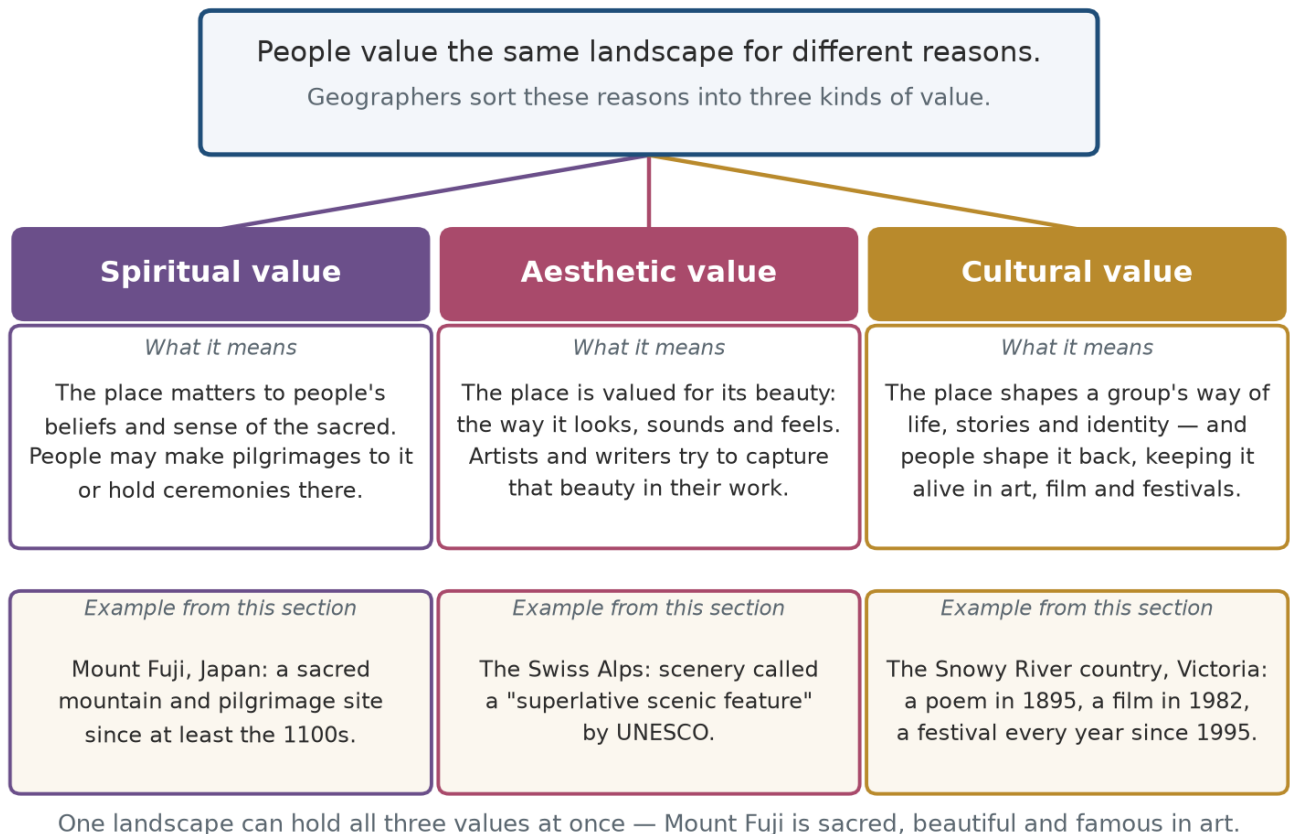
- what spiritual, aesthetic and cultural value mean, and how one landscape can hold all three at once;
- how the world records that value on the **World Heritage List**, and how to read its **selection criteria**;
- how people value **Mount Fuji** (Japan) and the **Yellow Mountains** (China);
- how **art, literature, music and film** represent landscapes, from Banjo Paterson’s Snowy River country to the English Lake District;
- how landscapes and landforms work in **tourism**, using the **Swiss Alps**, the **Great Barrier Reef** and **Uluru**.

Key words to learn: landform, landscape, spiritual value, aesthetic value, cultural value, sacred, pilgrimage, shrine, World Heritage List, selection criteria, tourism.

1. Three kinds of value

A **landform** is a natural physical feature of the Earth’s surface — a mountain, a reef, a gorge, a volcano. A **landscape** is the bigger picture: the landforms, water and living things you see when you look at a place, **and** the meanings people attach to it. Two people can look at the same landform and value it for completely different reasons. Geographers group those reasons into three kinds of value.

Three kinds of value that landscapes and landforms hold for people



Concept map with one central idea, that people value the same landscape for different reasons, branching to three boxes: spiritual value, with beliefs, sacred places and pilgrimages, example Mount Fuji; aesthetic value, with beauty, example the Swiss Alps; and cultural value, with way of life, stories and identity shaped back into art, film and festivals, example the Snowy River country of Victoria

Spiritual value means a landscape is tied to people's beliefs and to what they hold **sacred** (set apart and treated with great respect). Places with spiritual value are often visited on a **pilgrimage** — a journey made as part of someone's faith.

Aesthetic value is value that comes from beauty — how a place looks, sounds and feels. The word *aesthetic* simply means "to do with beauty".

Cultural value means a landscape is part of a group's way of life, stories and identity. A landscape with cultural value often gets shaped back into the group's poems, paintings, films and festivals.

And one landscape can hold all three values at once — as the places in this section will show.

2. How the world records value: the World Heritage List

When a landscape is so valuable that the whole world should help look after it, it can be placed on the **World Heritage List**. The List is kept by UNESCO, the United Nations organisation for education, science and culture. A listed place can be **cultural** (made by people), **natural** (made by nature) or **mixed** (both).

To get on the List, a place must pass at least one of ten official **selection criteria** — the tests a place must meet to be listed. The criteria include tests for great natural beauty, for living traditions and beliefs, and for ties to famous works of art. So the List is, in effect, the world's written record of spiritual, aesthetic and cultural value.

What UNESCO's selection criteria record about each place

Place	Inscribed	Criteria met	What the criteria record
Mount Fuji, Japan	2013	(iii) (vi)	A living tradition of pilgrimage and training, and ties to famous art
Mount Huangshan, China	1990	(ii) (vii) (x)	Exceptional beauty, influence on landscape art, homes for rare life
Swiss Alps Jungfrau-Aletsch	2001	(vii) (viii) (ix)	Superb scenery, mountain-building history, living ecosystems
Great Barrier Reef, Australia	1981	(vii) (viii) (ix) (x)	Beauty under the sea, Earth history, ecosystems and habitats
English Lake District, England	2017	(ii) (v) (vi)	Ideas about beauty, over 1,000 years of hill farming, art and writing

What the criteria mean (shortened from UNESCO's official wording):

(ii)	an important interchange of human values	(iii)	exceptional testimony to a cultural tradition
(v)	traditional land use — people and their environment	(vi)	ties to traditions, ideas, beliefs, famous art
(vii)	superlative natural beauty, aesthetic importance	(viii)	major stages of Earth's history, landforms
(ix)	on-going ecological and biological processes	(x)	most important natural habitats for life

Uluru is not shown: the part of its World Heritage listing that recognises its traditional owners is outside the scope of this series.

Criteria and inscription years: UNESCO World Heritage List, retrieved 25 Aug 2026.

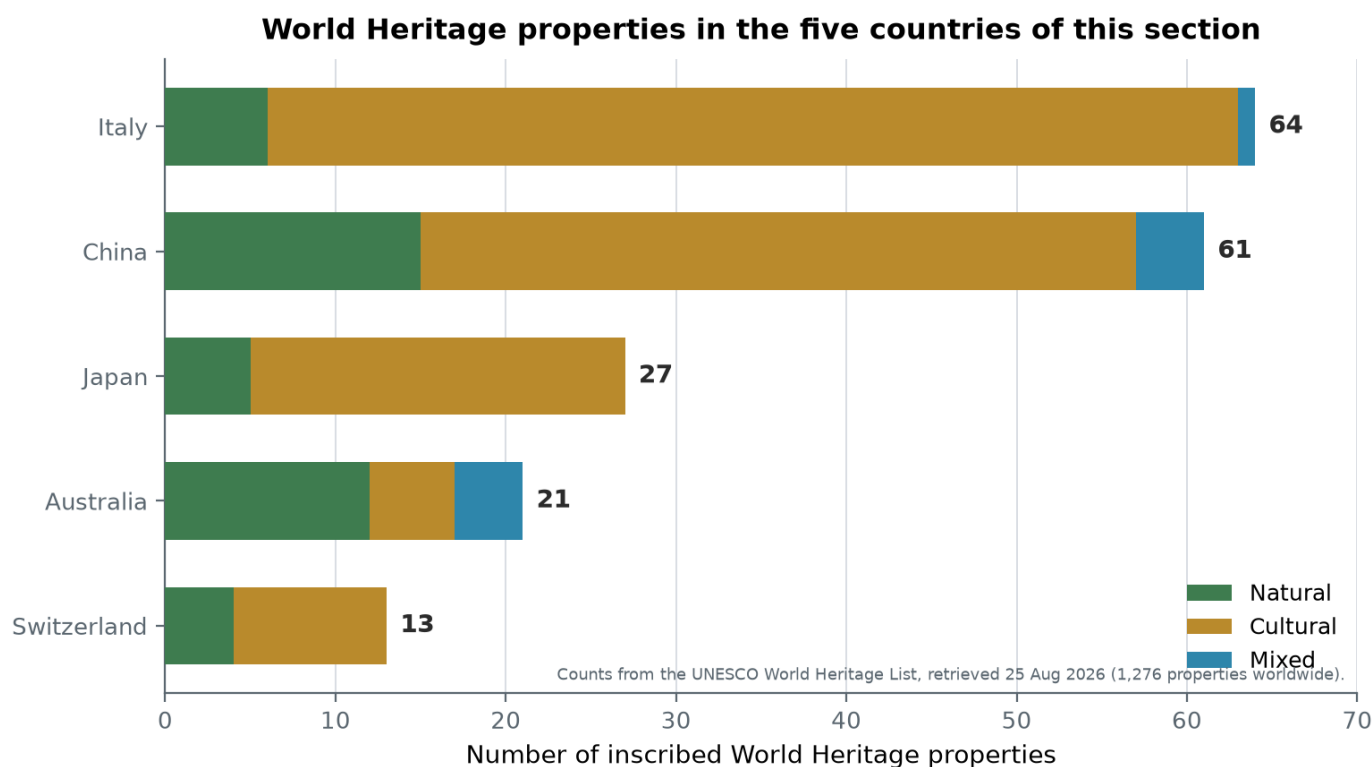
Table of five World Heritage places with their listing year, the criteria they pass and what those criteria record: Mount Fuji Japan 2013 criteria three and six, a living tradition of pilgrimage and ties to famous art; Mount Huangshan China 1990 criteria two, seven and ten; Swiss Alps Jungfrau-Aletsch 2001 criteria seven, eight and nine; Great Barrier Reef Australia 1981 criteria seven, eight, nine and ten; English Lake District 2017 criteria two, five and six; with a key explaining each criterion in shortened official wording

Source: criteria and inscription years, UNESCO World Heritage List, retrieved 25 August 2026.

Read the criteria column and you can see *what kind* of value the world records for each place. Criteria (iii) and (vi) are the cultural and spiritual ones; criterion (vii) is the beauty one.

You may wonder why **Uluru** — one of the world's most famous landforms — is not in that table. The part of its World Heritage listing that names its traditional owners is outside the scope of this series (see the notice at the front of this book). In this section Uluru appears exactly as the curriculum's examples use it: as a remarkable **landform** and a major **tourism** place.

The List also tells us what different countries are famous for valuing.



Stacked bar chart of World Heritage properties in five countries, split into natural, cultural and mixed: Italy 64 total (6 natural, 57 cultural, 1 mixed); China 61 (15 natural, 42 cultural, 4 mixed); Japan 27 (5 natural, 22 cultural); Australia 21 (12 natural, 5 cultural, 4 mixed); Switzerland 13 (4 natural, 9 cultural)

Source: counts from the UNESCO World Heritage List, retrieved 25 August 2026 (1,276 properties around the world).

Look at the pattern: Australia's list is mainly **natural** (12 of 21), while Italy's is mainly **cultural** (57 of 64). The List holds up a mirror to what each country's landscapes are valued for.

Worked demonstration 1 — Reading what the List records: Mount Fuji versus the Swiss Alps

Let us use the criteria table to reason like geographers. Two famous mountain places, listed thirteen years apart — what does the world value in each?

Step 1 — Read Mount Fuji's criteria. Fuji (Japan, listed 2013) passes (iii) and (vi). Criterion (iii) records an outstanding cultural tradition; criterion (vi) records ties to living traditions, beliefs and famous art. *Conclusion:* the world values Fuji mainly for its **spiritual and cultural** value — for the beliefs and pilgrimages attached to it, and for the famous art it inspired.

Step 2 — Read the Swiss Alps' criteria. The Swiss Alps Jungfrau-Aletsch (listed 2001) passes (vii), (viii) and (ix): great natural beauty, a record of how mountains were built, and living ecosystems. *Conclusion:* the world values this place mainly for its **aesthetic** value and its natural story.

Step 3 — Compare. Both are mountain landscapes on the same List, yet the criteria tell us they are valued for different reasons: one for what people *believe and make* there, the other for what nature *built and grows* there.

Geographer's conclusion: the World Heritage List does not just name beautiful places — it records *the kind of value* a place holds, and two landforms of the same type can carry very different values.

3. Spiritual and cultural value in Asia: Mount Fuji and China's Yellow Mountains

Our curriculum gives two Asian landscapes as the leading examples of valued places: **Mount Fuji** in Japan and the **Yellow Mountains** (Mount Huangshan) in China.

Place data card — Mount Fuji (Fujisan), Japan

World Heritage cultural property, inscribed 2013 under criteria (iii) and (vi)

3,776 m summit height	25 inscribed sites on and around the mountain	20,702 ha inscribed area	12th century became a centre of ascetic training
Why it is valued	A sacred place and the object of pilgrimages; an inspiration to artists and poets		
Beliefs	Centre of training for ascetic Buddhism, which included Shinto elements		
Sacred features	Pilgrim routes, crater shrines, Sengen shrines and volcanic features such as lava tree moulds		
Art	Its form was a key motif in art from the 17th to the 19th century		
Famous artwork	Katsushika Hokusai's wood block prints, <i>Thirty-Six Views of Mount Fuji</i>		
Reach of the art	The prints had a profound impact on Western art in the 19th century		

Source: UNESCO World Heritage List, Fujisan, Sacred Place and Source of Artistic Inspiration, retrieved 25 Aug 2026.

*Place data card for Mount Fuji, Japan: 3,776 metres high; 25 listed sites; 20,702 hectares; pilgrimage tradition from at least the 12th century; rows for why it is valued, its beliefs, its sacred features, and its place in art, including Hokusai's *Thirty-Six Views of Mount Fuji**

Source: UNESCO World Heritage List, Mount Fuji, retrieved 25 August 2026.

Fuji is a volcano rising 3,776 m above the plains near Tokyo. From at least the 1100s, people made pilgrimages up it as part of their religious training and belief, in a form of Buddhism that also included Shinto elements. Its **shrine** buildings (small sacred buildings) — the Sengen shrines — the pilgrim routes and the crater shrines on its summit are all part of its 25 listed sites. That is spiritual value, recorded as criterion (iii).

Fuji also carries cultural and aesthetic value. In the early 1800s the Japanese artist Katsushika Hokusai made his print series *Thirty-Six Views of Mount Fuji*, which changed Western art a great deal later that century. The same mountain is sacred, beautiful **and** famous in art — all three values at once.

Place data card — Mount Huangshan (the Yellow Mountains), China

World Heritage property in Anhui Province, inscribed 1990 under criteria (ii), (vii) and (x)

16,060 ha inscribed area	1,000 m+ many granite peaks rise above this height	AD 747 date of the legend that gave the mountain its name	16th century the Shanshui school of landscape painting
Landscape	Numerous granite peaks emerging through a perpetual sea of clouds		
Nickname	Often described as the "loveliest mountain of China"		
Legend	A Tang-dynasty legend told of the discovery of the long-sought elixir of immortality here		
Beliefs	The legend gave the mountain its name and assured its place in Chinese history		
Visitors	A magnet for hermits, poets and landscape artists, who still come on pilgrimage today		
Art	Inspired the Shanshui ("Mountain and Water") school of landscape painting, famed worldwide from the 1500s		

Source: UNESCO World Heritage List, Mount Huangshan, retrieved 25 Aug 2026.

Place data card for Mount Huangshan, the Yellow Mountains, China: 16,060 hectares; many granite peaks above 1,000 metres; the legend of AD 747 that gave the mountain its name; and the 16th-century Shanshui school of landscape painting; rows for its sea-of-clouds scenery, its nickname the loveliest mountain of China, its legend, its poets and artists

Source: UNESCO World Heritage List, Mount Huangshan, retrieved 25 August 2026.

The Yellow Mountains in Anhui Province, China, are granite peaks that rise above a near-permanent sea of clouds. A Tang-dynasty legend told that a medicine said to give life forever was found here in AD 747; the legend gave the mountain its name and its place in Chinese history. Poets and landscape artists came for the beauty, and from the 1500s the **Shanshui** ("Mountain and Water") school of landscape painting, inspired by these peaks, became famed around the world. Huangshan is often called the "loveliest mountain of China" — aesthetic value (criterion vii) wrapped in cultural value (criterion ii).

4. Aesthetic value: landscapes in art, literature, music and film

Landscapes do not only sit there being beautiful — they get *represented*. Poems, music, films and paintings carry a landscape's beauty to people who will never stand in it, and in doing so they add cultural value to the aesthetic value.

The same idea in four art forms: landscapes and landforms represented in art

Art form	Work and creator	The landscape behind it	When
Literature — poem	'The Man from Snowy River' by Banjo Paterson	The Snowy River country of the Australian Alps	1895
Music — symphony	Symphony No. 6, the 'Pastoral', by Ludwig van Beethoven	The European countryside; first performed in Vienna	1808
Film	'The Man from Snowy River', an Australian film made from the poem	Filmed in the Victorian High Country near Mansfield	1982
Art — prints	'Thirty-Six Views of Mount Fuji' by Katsushika Hokusai	Mount Fuji, Japan	early 1800s
Art — painting	The Shanshui ('Mountain and Water') school of landscape painting	Mount Huangshan, China	from the 1500s
Literature — poetry	The Lake Poets: Wordsworth, Coleridge and Southey	The English Lake District	from 1799

One poem even became a film — and the film's location, the Victorian High Country, now hosts a yearly festival.

Sources: Project Gutenberg Australia; Wikipedia; UNESCO World Heritage List — all retrieved 25 Aug 2026.

Table of landscapes represented in four art forms: literature, the poem The Man from Snowy River by Banjo Paterson, Snowy River country of the Australian Alps, 1895; music, Symphony No. 6, the Pastoral, by Ludwig van Beethoven, the European countryside, first performed in Vienna, 1808; film, The Man from Snowy River, filmed in the Victorian High Country near Mansfield, 1982; art, prints, Thirty-Six Views of Mount Fuji by Katsushika Hokusai, early 1800s; art, painting, the Shanshui school, Mount Huangshan, from the 1500s; literature, poetry, the Lake Poets, Wordsworth, Coleridge and Southey, the English Lake District, from 1799

Sources: Project Gutenberg Australia; Wikipedia; UNESCO World Heritage List — all retrieved 25 August 2026.

Every row of that table is a real, named work. Read the last lines of Paterson's 1895 poem, where the wild colt is chased down a mountain slope:

But the man from Snowy River let the pony have his head, And swung his stock-whip round and gave a cheer, And raced him down the mountain like a torrent down its bed, While the others stood and watched in very fear.

(*A torrent is a fast, rushing stream of water.*) The poem made the Snowy River country of the Australian Alps a landscape of courage and beauty in the Australian imagination — and in 1982 the poem became a film, shot in the Victorian High Country near Mansfield.

Music does the same work. Beethoven's Symphony No. 6, the *Pastoral* (first performed in Vienna in 1808), represents the European countryside in sound; Beethoven himself said it was “more the expression of feeling than painting”.

No place shows aesthetic value better than the **English Lake District**.

Place data card — The English Lake District, north-west England

World Heritage cultural property, inscribed 2017 under criteria (ii), (v) and (vi)

2,292 km² protected area	16 major lakes	978 m Scafell Pike, England's highest mountain	17.73 million tourist visitors in 2024
Beauty	Narrow glaciated valleys and slender lakes in "extraordinary beauty and harmony"		
Art movements	Celebrated from the 18th century by the Picturesque and Romantic movements in paintings, drawings and words		
The Lake Poets	William Wordsworth lived at Grasmere from 1799; Coleridge and Southey lived at Keswick		
Why it matters	Love of this landscape triggered the first efforts to protect beautiful places		
Records	Windermere is England's longest and largest lake; Wast Water is its deepest		
Farming	Over 1,000 years of hill farming shaped this landscape — and it continues today		

Source: UNESCO World Heritage List, The English Lake District; Wikipedia, Lake District, retrieved 25 Aug 2026.

Place data card for the English Lake District, north-west England: 2,292 square kilometres; 16 major lakes; Scafell Pike 978 metres, England's highest mountain; 17.73 million tourist visitors in 2024; rows for its extraordinary beauty and harmony, the Picturesque and Romantic movements from the 18th century, the Lake Poets with Wordsworth at Grasmere from 1799, its role in triggering the first efforts to protect beautiful places, and over 1,000 years of hill farming

Sources: UNESCO World Heritage List, The English Lake District; Wikipedia, Lake District — retrieved 25 August 2026.

From the 1700s, the **Picturesque** and **Romantic** movements in art and writing celebrated the Lake District's narrow valleys and slender lakes as a picture of "extraordinary beauty and harmony". The **Lake Poets** — Wordsworth, Coleridge and Southey — lived among its lakes (Wordsworth at Grasmere from 1799) and wrote them into English literature. Love of this landscape even triggered some of the first efforts to protect beautiful places. In 2017 the Lake District joined the World Heritage List for, among other things, its ideas about beauty — criterion (vi), ties to famous art and writing.

5. Landscapes and landforms in tourism

A landscape's value also shows in what people will travel to see. Tourism is one of the clearest measures of how much a landscape is valued — and our curriculum names three leading examples: the **Alps in Switzerland**, and, in Australia, the **Great Barrier Reef** and **Uluru**.

Place data card — Swiss Alps Jungfrau-Aletsch, Switzerland

World Heritage property, first inscribed 2001 under criteria (vii), (viii) and (ix)

82,400 ha inscribed area	809–4,274 m lowest to highest point of the property	Eiger, Mönch, Jungfrau peaks of the famous north wall	Aletsch the largest and longest glacier in Europe
Beauty (criterion vii)	A superlative scenic feature; globally recognised as one of the most spectacular mountain regions to visit		
Art and tourism	An important role in European art, literature, mountaineering and alpine tourism		
Mountain building	The High Alps formed by uplift and compression that began 20–40 million years ago		
Glacial landforms	U-shaped glacial valleys, cirques, horn peaks, valley glaciers and moraines		
Ancient rock	400-million-year-old crystalline rocks thrust over younger carbonate rocks		
Living change	Retreating glaciers show on-going change, which scientists study closely		

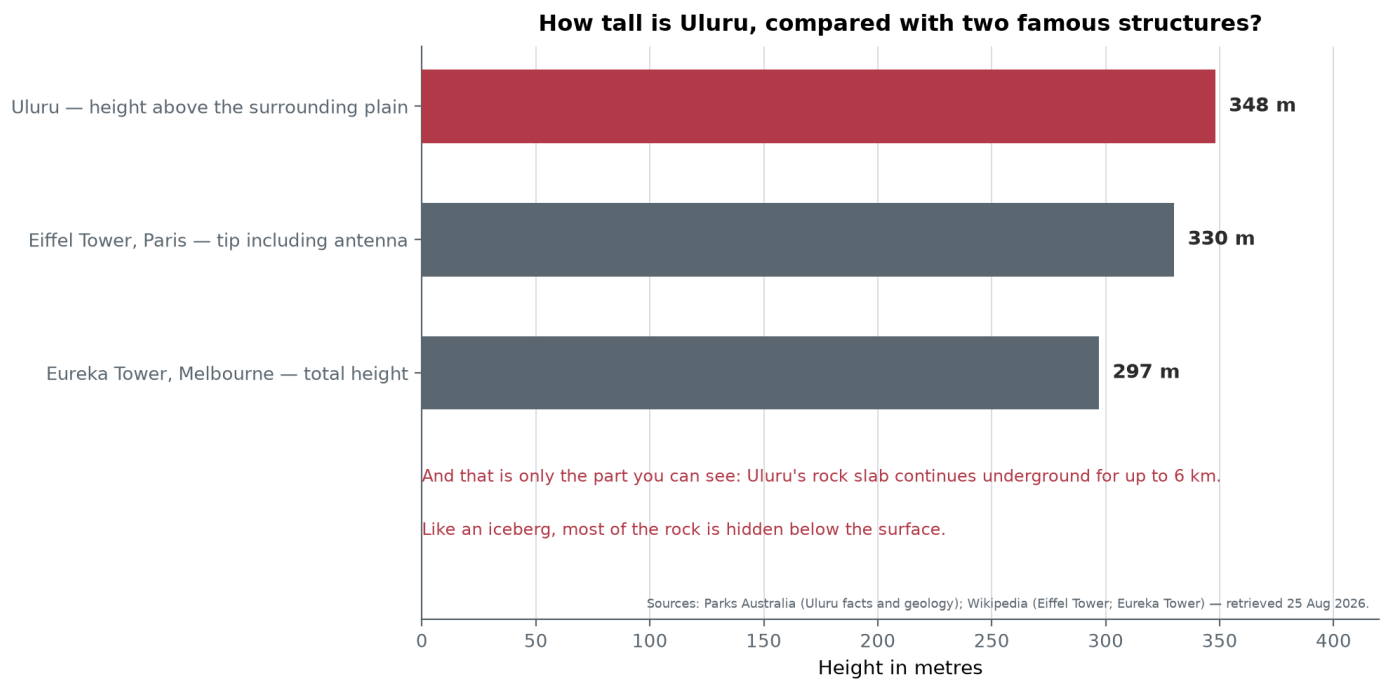
Source: UNESCO World Heritage List, Swiss Alps Jungfrau-Aletsch, retrieved 25 Aug 2026.

Place data card for the Swiss Alps Jungfrau-Aletsch, Switzerland: 82,400 hectares; from 809 to 4,274 metres; the Eiger, Monch and Jungfrau peaks of the famous north wall; the Aletsch, the largest and longest glacier in Europe; rows for its superlative scenery, its role in European art, literature, mountaineering and alpine tourism, its mountain-building history, its glacial landforms and its retreating glaciers

Source: UNESCO World Heritage List, Swiss Alps Jungfrau-Aletsch, retrieved 25 August 2026.

The Swiss Alps Jungfrau-Aletsch is listed for beauty (criterion vii) *and* for “an important role in European art, literature, mountaineering and alpine tourism” — the UNESCO entry itself ties aesthetic value to tourism. The Aletsch glacier, the largest and longest in Europe, and the famous north wall of the Eiger, Mönch and Jungfrau have drawn climbers and visitors for over a century.

Australia's two named examples are just as clear — starting with how remarkable Uluru is as a landform.



Horizontal bar chart comparing heights: Uluru, 348 metres above the surrounding plain; the Eiffel Tower, Paris, 330 metres tip including antenna; Eureka Tower, Melbourne, 297 metres; with a note that Uluru's rock slab continues underground for up to 6 kilometres, so like an iceberg most of the rock is hidden

Sources: Parks Australia (Uluru facts and geology); Wikipedia (Eiffel Tower; Eureka Tower) — retrieved 25 August 2026.

Uluru is a single slab of sandstone rising 348 m above the plain — taller than the Eiffel Tower — with more of the rock hidden underground, like an iceberg. More than 250,000 people a year travel to the centre of Australia to see it: a landform of huge tourism value.

The Australian places of this section



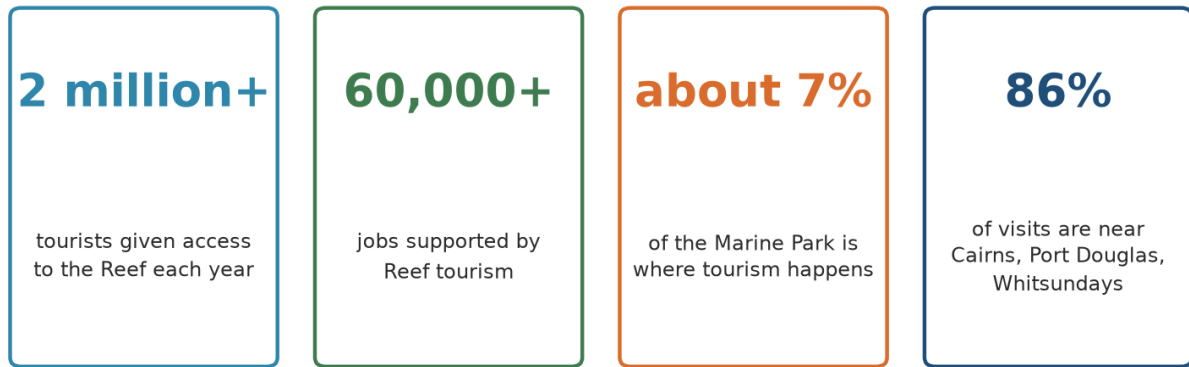
Simplified outline drawn by ClassBasics. Reef band is schematic. Approximate coordinates shown for map-skills practice.
Map drawn for the ClassBasics Geography 7-8 workbook, retrieved data 25 Aug 2026.

Map of Australia with labelled markers: Uluru at about 25 degrees south 131 degrees east; Cairns at about 17 degrees south 146 degrees east; the Whitsundays at about 20 degrees south 149 degrees east; Mansfield and the Victorian High Country at about 37 degrees south 146 degrees east; Corryong at about 36 degrees south 148 degrees east; the Snowy River country; and a dashed band along the Queensland coast marking the Great Barrier Reef, about 348,000 square kilometres and some 2,500 reefs

Sources: Parks Australia; Great Barrier Reef Marine Park Authority; Project Gutenberg Australia — retrieved 25 August 2026. Simplified outline drawn by ClassBasics; reef band schematic; coordinates approximate.

The map places this section's Australian examples. The **Great Barrier Reef** — about 348,000 km² and some 2,500 individual reefs — is the biggest living structure on Earth, and tourism is one of the ways it is most clearly valued.

Tourism on the Great Barrier Reef in four numbers



Tourism depends on a healthy Reef — and careful management keeps visits concentrated so most of the Reef stays undisturbed.

Source: Great Barrier Reef Marine Park Authority, *Tourism on the Great Barrier Reef*, updated 22 Nov 2024, retrieved 25 Aug 2026.

Four statistic tiles for tourism on the Great Barrier Reef: 2 million plus tourists given access to the Reef each year; 60,000 plus jobs supported by Reef tourism; about 7 percent of the Marine Park is where tourism happens; 86 percent of visits are near Cairns, Port Douglas and the Whitsundays

*Source: Great Barrier Reef Marine Park Authority, *Tourism on the Great Barrier Reef*, updated 22 November 2024, retrieved 25 August 2026.*

Worked demonstration 2 — Tourism on the Great Barrier Reef in four numbers

Let us read the Reef tourism figure the way a geographer reads data: one number at a time, then joined up.

Step 1 — How many people? More than 2 million tourists are given access to the Reef each year. *Conclusion:* this is a landscape the world travels to see — its aesthetic and natural value is enormous.

Step 2 — How many jobs? Reef tourism supports more than 60,000 jobs. *Conclusion:* the Reef's value is not only beauty; it is also the living of tens of thousands of Australians.

Step 3 — Where does tourism happen? In only about 7% of the Marine Park, and 86% of visits cluster near Cairns, Port Douglas and the Whitsundays. *Conclusion:* the value is concentrated — careful management keeps tourism in a small part so most of the Reef stays quiet and healthy.

Step 4 — Join it up. Tourism depends on a healthy Reef, and the Reef stays healthy in part because tourism is managed into a small share of it.

Geographer's conclusion: tourism is a measure of a landscape's value *and* a responsibility: the things that make people visit (a living reef, a standing Uluru, a white Alps glacier) are the very things the visitors must not damage.

Practice — scaffolded

Q1. In your own words, define **aesthetic value** and **spiritual value**.

Q2. Look at the concept map in Section 1. (a) Name the three kinds of value. (b) Match each example — Mount Fuji, the Swiss Alps, the Snowy River country of Victoria — to the value it is used to show.

Q3. Use the World Heritage bar chart. (a) Which country has the most *natural* properties? (b) Which has the most *cultural* properties? (c) What does a *mixed* property mean?

Q4. Use the Mount Fuji card. (a) From which century does Fuji's pilgrimage tradition date, at least? (b) Name two sacred features listed on the card. (c) Which artist made Fuji famous in prints?

Q5. Use the Mount Huangshan card. (a) What does the legend of AD 747 say was found on the mountain? (b) Which school of painting did the mountain inspire?

Q6. Use the arts table. Name the art form behind each work: (i) the *Pastoral* by Beethoven; (ii) *Thirty-Six Views of Mount Fuji*; (iii) the 1982 work about the Snowy River; (iv) the work of Wordsworth, Coleridge and Southey.

Q7. Use the Lake District card. (a) Which two art movements celebrated the Lake District from the 1700s? (b) Which poet lived at Grasmere from 1799?

Q8. Use the map of Australia. Give the place that sits at: (a) about 25°S, 131°E; (b) about 20°S, 149°E; (c) about 36°S, 148°E — and say what each place is famous for in this section.

Practice — unscaffolded

Q9. “One landscape can hold all three values at once.” Use Mount Fuji to show this is true, giving one piece of evidence for each kind of value.

Q10. Use the World Heritage bar chart. Explain why Australia’s listed places are mainly natural while Italy’s are mainly cultural, and what that tells you about the landscapes each country is famous for.

Q11. Use the four tourism numbers for the Great Barrier Reef. Explain how tourism both *shows* the Reef’s value and *forces* careful management of it.

Q12. The poem (1895) and the film (1982) both represent the same landscape. Explain how they gave cultural value to the Victorian High Country, and name the tradition that began there in 1995.

Extended response

Q13. “People value landscapes for what they mean, not only for what they are made of.” Do you agree? Write a short evidence-based response (about 150–200 words) using at least **two** places and **one** figure from this section. Refer to your sources.

Tip: a good response states a clear position, uses data as evidence (for example a criterion, a height, a visitor number or a year), and keeps the three kinds of value — spiritual, aesthetic and cultural — separate while showing how one place can hold more than one.

Teaching notes (for the teacher)

This section delivers VC2HG8K13 through its three retained elaborations: .E03 (Asia priority live: Mount Fuji and China’s Yellow Mountains), .E04 (representation through art, literature, music and film) and .E07 (tourism: the Swiss Alps, the Great Barrier Reef and Uluru). Sequence the lesson as: the three-values framework (§1) → the World Heritage List as the world’s record of value, with Worked demonstration 1 modelling criteria-reading (§2) → the Asian case studies (§3) → aesthetic value through the arts, with the Victorian link from poem to film to festival (§4) → tourism value with Worked demonstration 2 modelling data-reading (§5). The four excluded elaborations (.E01, .E02, .E05, .E06) are **not** taught here, and the CD’s First Nations clause is excluded from teaching in line with the series content policy; accordingly Uluru appears only as a landform and tourism place, never through its First Nations significance, and no Aboriginal and Torres Strait Islander content is included in this section. The UNESCO World Heritage List entries, Parks Australia, the Great Barrier Reef Marine Park Authority, Project Gutenberg Australia and Wikipedia figures named above were all retrieved 25 August 2026; every figure is computed from the values shown with its source line. Map coordinates are approximate and offered for map-skills practice; the reef band on the Australia map is schematic.

Glossary

Landform — a natural physical feature of the Earth's surface, such as a mountain, reef, gorge or volcano. **Landscape** — the whole picture of a place: its landforms, water and living things, and the meanings people attach to it. **Spiritual value** — value a place has because it is tied to people's beliefs and to what they hold sacred. **Aesthetic value** — value a place has because of its beauty. **Cultural value** — value a place has because it is part of a group's way of life, stories and identity. **Sacred** — set apart and treated with great respect. **Pilgrimage** — a journey made to a sacred place as part of someone's faith. **Shrine** — a small sacred building. **World Heritage List** — the list, kept by UNESCO, of places of such value that the whole world should help look after them. **Selection criteria** — the official tests a place must pass to be listed on the World Heritage List. **Tourism** — the activity of travelling to see places, and the jobs and spending that follow.

How landforms are made: geomorphological processes, with a local landform study

Curriculum links: VC2HG8K14 (Levels 7 and 8, Geographical Knowledge and Understanding — Landforms and landscapes). Elaborations VC2HG8K14.E01–VC2HG8K14.E06 (mapped to the teaching steps below).

How this section fits in the book: Section 3D looks at how *people* change and manage landforms; this section is about the *natural* processes that make them. The fieldwork methods you use here are taught in Section 5B, and the final report writing is taught in Section 6C — this section gives you a real place to apply both.

Teaching sequence (teacher notes):

1. Start with the words: landscape vs landform; introduce *geomorphological* (to do with how the land gets its shapes).
2. Tour the world's landscapes (E01) using the landscape table figure; locate each named example on a world map.
3. Introduce the two process families (E02) with the families figure; stress the power sources (Earth's heat vs the Sun and gravity).
4. Work through the inside-Earth processes — folding (MacDonnell Ranges), faulting (Great Sumatran Fault), volcanism (Krakatoa) — per E03.
5. Work through the surface processes — weathering, then erosion, transportation and deposition by water and wind — and apply them at the local scale to K'gari and the Twelve Apostles (E04).
6. Teach contour-map and cross-section skills on the model map (E05), then name Vicmap Topographic Maps as the real-world tool.
7. Run the local landform study as the application task (E06), feeding fieldwork methods from 5B and the reporting format from 6C.

For the teacher — VC2 codes: VC2HG8K14; elaborations drawn on .E01, .E02, .E03, .E04, .E05, .E06. The teaching sequence above maps each elaboration to its step; every case-study example the elaborations name is taught in this section's body and figures.

Theory

Landscapes and landforms. A **landscape** is everything you can see across an area of land — the hills, plains, water, plants and rock, all together. A **landform** is one single shape in the land, such as a hill, a valley, a beach or a gorge (a deep, narrow valley with steep sides). The processes that build and shape landforms are called **geomorphological** processes (“geo” = Earth, “morph” = shape).

Landscapes of the world: five types and a named example of each

Landscape type	Named example	Where	Key figure
Mountains	Himalayan Mountains	Nepal and China	Mount Everest reaches 8,848.86 m (2020 survey); the range is still being pushed up as plates collide
Grasslands	The Steppe	Central Asia	A vast band of temperate grassland running from Mongolia and China across to eastern Europe
Forests	Daintree rainforest	Queensland, Australia	About 180 million years old — one of the oldest rainforests on Earth
Hot deserts	Gobi Desert	China and Mongolia	About 1,295,000 square km; hot in summer but cold and snowy in winter
Wetlands	Barmah Forest	Victoria, Australia	River red gum forest and wetland on the Murray River floodplain; the world's largest red gum forest

Source: Wikipedia — "Mount Everest", "Eurasian steppe", "Daintree rainforest", "Gobi desert", "Barmah Forest" (all retrieved 25 August 2026).
 Examples named by the Victorian Curriculum (VC2HG8K14.E01).

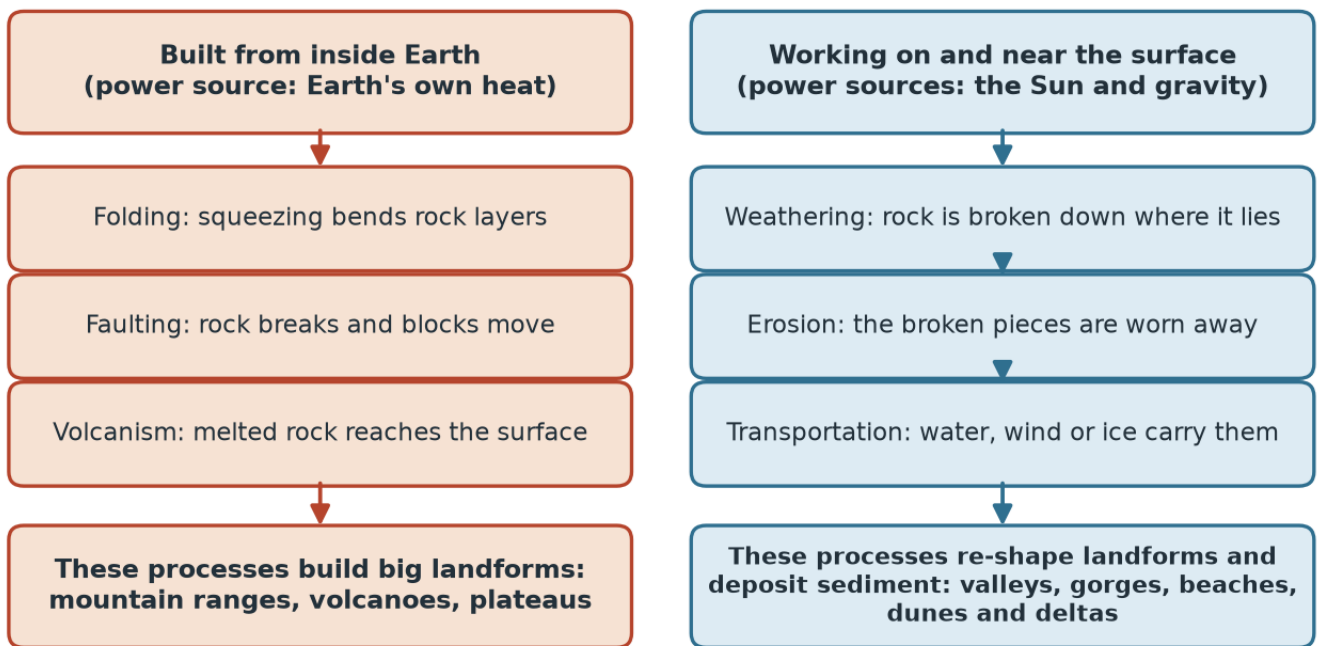
Table listing five landscape types with a named example and key figure for each: mountains (Himalayan Mountains, Nepal and China), grasslands (the Steppe of Central Asia), forests (Daintree rainforest, Queensland), hot deserts (Gobi Desert, China and Mongolia) and wetlands (Barmah Forest, Victoria)

Landscapes come in many types. The curriculum names one example of each: mountains in the Himalayan Mountains of Nepal and China (Mount Everest reaches 8,848.86 m, measured in a 2020 survey, and the range is still being pushed up a little more each year as two of Earth's great plates collide); grasslands on the Steppe, a vast band of grassland running from Mongolia and China across to eastern Europe; forests such as the Daintree rainforest in Queensland, about 180 million years old and one of the oldest rainforests on Earth; hot deserts such as the Gobi Desert of China and Mongolia, about 1,295,000 square km, hot in summer but cold and snowy in winter; and wetlands such as Barmah Forest in Victoria, river red gum forest and wetland on the flat land beside the Murray River that floods most years — the largest river red gum forest in the world.

Source: Wikipedia — "Mount Everest", "Eurasian steppe", "Daintree rainforest", "Gobi desert", "Barmah Forest" (all retrieved 25 August 2026); examples named by VC2HG8K14.E01.

Two families of processes. Every landform on Earth is the work of one or both of two families of processes.

Two families of geomorphological processes



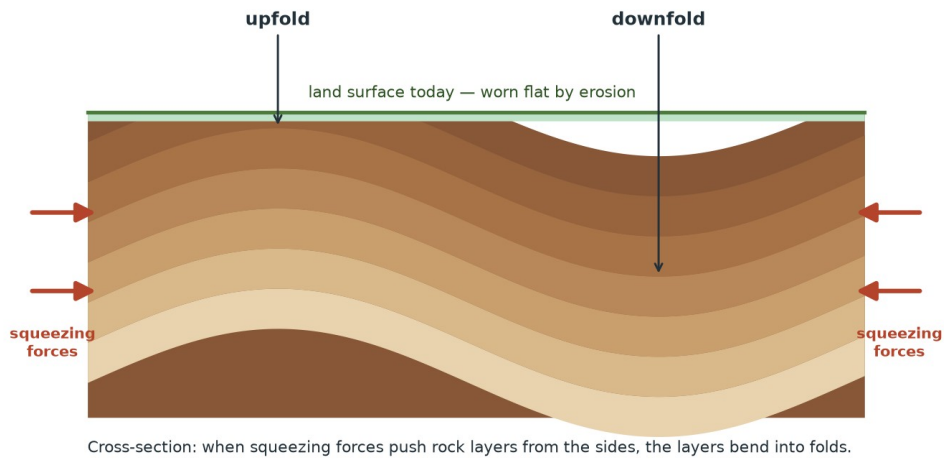
Most real landforms show the work of both families: inside forces lift the rock, surface forces then cut and re-shape it.

Flow chart of the two families of geomorphological processes: the left family (built from inside Earth, powered by Earth's own heat) contains folding, faulting and volcanism and builds big landforms such as mountain ranges, volcanoes and plateaus; the right family (working on and near the surface, powered by the Sun and gravity) runs weathering, then erosion, then transportation, and re-shapes landforms into valleys, gorges, beaches, dunes and deltas

- **Family 1 — built from inside Earth.** The power source is Earth's own heat. These processes push land *up*: they fold rock, break rock, and pour melted rock onto the surface.
- **Family 2 — working on and near the surface.** The power sources are the Sun and gravity. These processes wear land *down*, move the broken pieces, and drop them somewhere new.

Most real landforms show the work of both families: inside forces lift the rock up, and surface forces then cut and re-shape it.

Folding — squeezing bends rock. Deep inside Earth, huge slabs of rock called **plates** make up the surface. When plates squeeze together, rock **layers** (the banded sheets that many rocks are built from) can bend instead of break. A bend that arches up is an **upfold**; a bend that dips down is a **downfold**. This bending process is called **folding**.



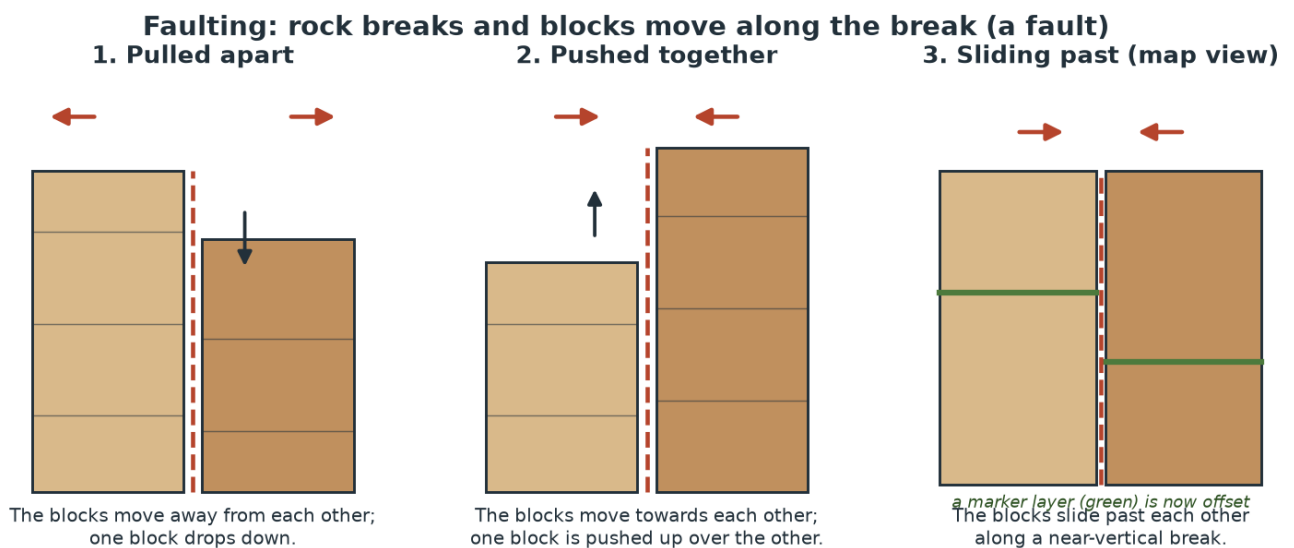
Real example: the MacDonnell Ranges (Northern Territory) were folded about 300–350 million years ago; erosion has since worn them into the ranges and gorges seen today.

Labelled cross-section of folded rock layers: squeezing forces from both sides bend the layers into an upfold and a downfold, with the top worn flat by erosion at today's land surface

The **MacDonnell Ranges** in the Northern Territory are a real example: their hard red rock layers were folded about 300–350 million years ago, and erosion has since worn the folds into the ranges and gorges seen today (the ranges run about 644 km long, and their highest point, Mount Zeil, reaches 1,531 m).

Source: Wikipedia — “MacDonnell Ranges” (retrieved 25 August 2026); example named by VC2HG8K14.E03.

Faulting — rock breaks and blocks move. If the squeezing or stretching is too strong, the rock snaps. A **fault** is a big crack in Earth's crust (the rocky outer shell of Earth) where one block of rock has moved past another — up, down or sideways. When blocks move along many faults, they can build mountain ranges and deep valleys. This process is called **faulting**.



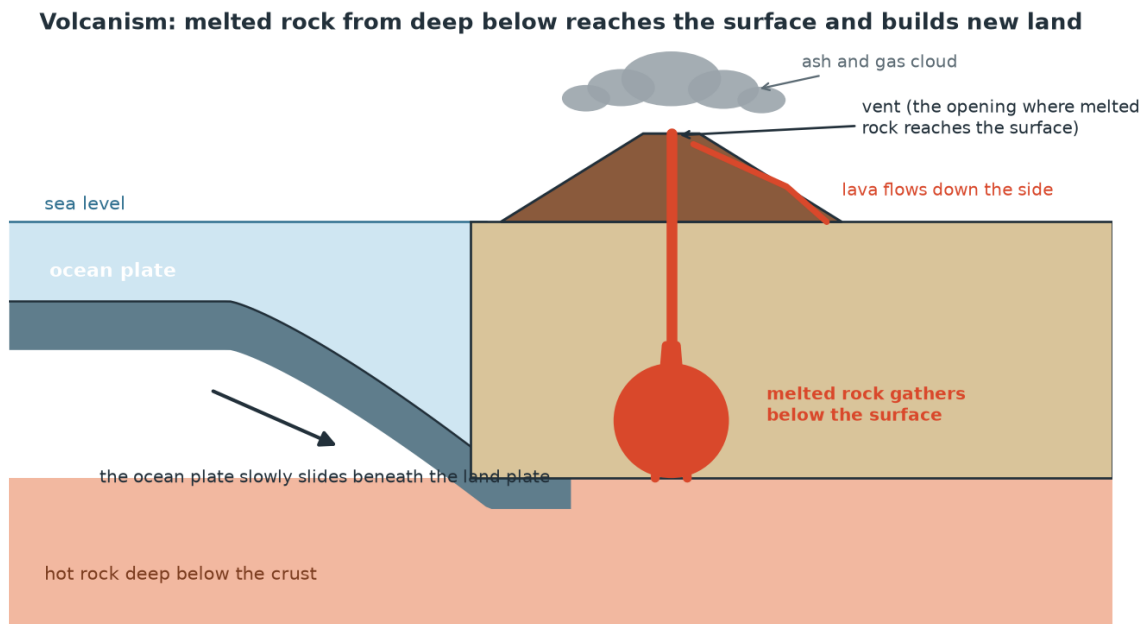
Real example: the Great Sumatran Fault in Indonesia is a sliding-past fault about 1,650–1,900 km long, running the length of Sumatra.

Labelled block diagram of a fault: rock layers on one side of the crack have slipped down relative to the other side, leaving a steep slope at the surface

The **Great Sumatran Fault** (Semangko Fault) in Indonesia is a famous example — a crack about 1,650–1,900 km long where the island's rock is sliding sideways as the Indo-Australian plate presses into the Eurasian plate.

Source: Wikipedia — “Great Sumatran Fault” (retrieved 25 August 2026); example named by VC2HG8K14.E03.

Volcanism — **melted rock reaches the surface.** Far below the crust, rock can melt. Where one plate slides beneath another, the melted rock can gather, rise and erupt (burst out) through an opening called a **vent**. Melted rock flowing on the surface is called **lava**. Layer after layer of lava and ash (the fine rocky powder blown out in an eruption) builds a **volcano** — brand-new land. This process is called **volcanism**.



Real example: Krakatau in Indonesia sits above a plate boundary like this one. Its 1883 eruption was one of the most deadly in recorded history.

Labelled cross-section of a volcano above a plate boundary: an ocean plate slides beneath a land plate, melted rock gathers below the surface and rises through a vent, lava flows down the side, and an ash and gas cloud rises above

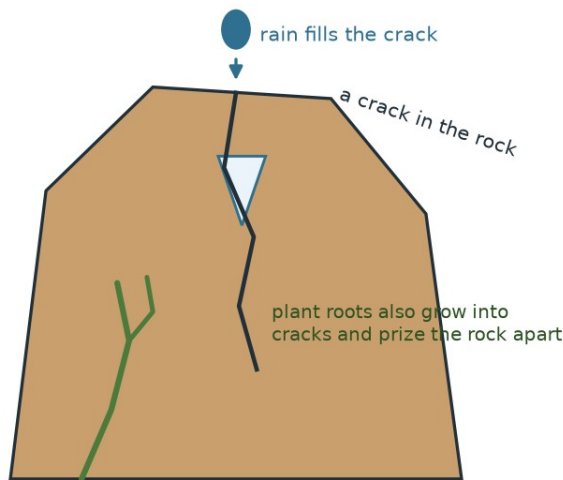
Krakatau in Indonesia sits above a plate boundary like this. Its 1883 eruption was one of the deadliest in recorded history: about two-thirds of the island was destroyed and at least 36,417 people died, most of them killed by giant sea waves called **tsunamis**. From 1927, a new volcano, Anak Krakatau, began growing where the old one stood. Indonesia has more than 130 active volcanoes — more than any other country.

Source: Wikipedia — “Krakatoa” (retrieved 25 August 2026); example named by VC2HG8K14.E03.

Weathering — **rock is broken down where it lies.** Before erosion can move rock, something has to break it up in place. That breaking-down is called **weathering**.

Weathering: the breakdown of rock where it lies

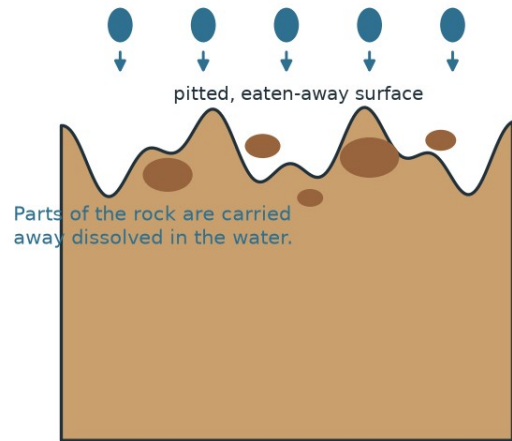
Physical weathering —
rock is broken, not changed



Result: one big rock becomes smaller pieces of the same rock

On cold nights the water freezes. Ice needs more space than water, so it pushes the crack wider, little by little.

Chemical weathering —
rock is changed into new substances



Result: the rock is changed into different substances

Rainwater is very slightly acidic. Over long stretches of time it slowly dissolves some rocks, such as limestone.

Weathering loosens the rock; erosion then takes the pieces away.

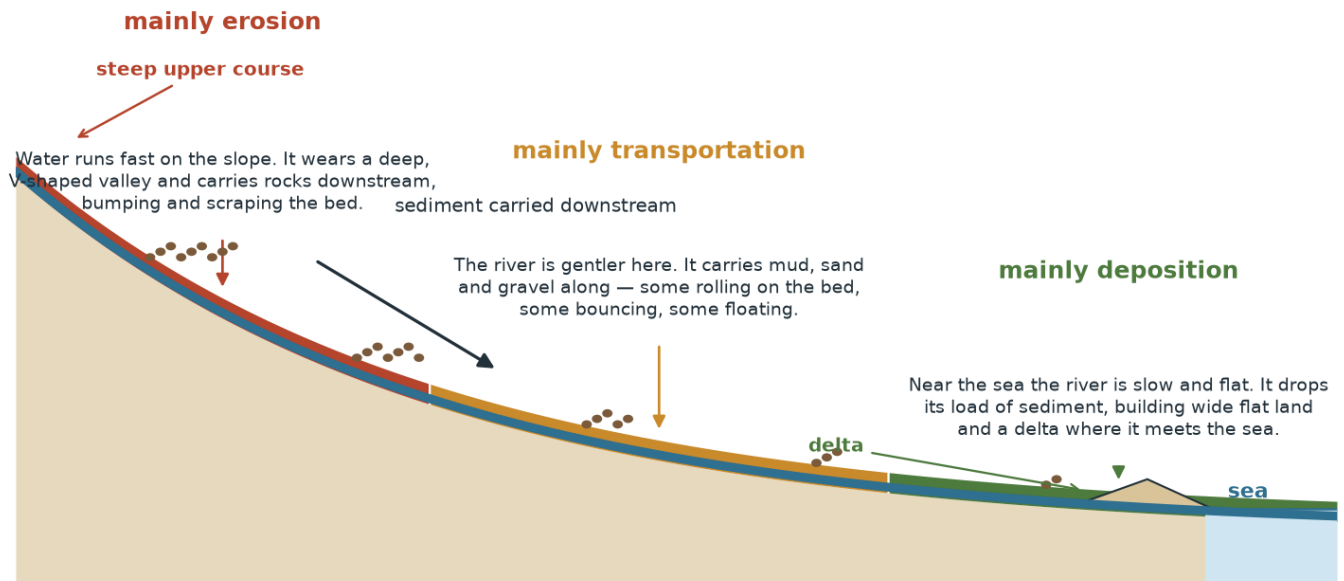
Two-panel diagram of weathering. Left: physical weathering, where rain fills a crack in a boulder, freezing on cold nights pushes the crack wider, and plant roots prize the rock apart; the rock is broken into smaller pieces of the same rock. Right: chemical weathering, where slightly acidic rainwater slowly dissolves a limestone block, leaving a pitted, eaten-away surface; the rock is changed into new substances

- **Physical weathering** breaks rock into smaller pieces of the *same* rock. Water freezes in cracks: ice needs more space than water, so each cold night the ice pushes the crack a little wider. Plant roots grow into cracks and prize the rock apart.
- **Chemical weathering** changes rock into *new* substances. Rainwater is very slightly acidic, and over long time it slowly dissolves some rocks, such as limestone (a soft rock made mainly from old sea shells and mud). Parts of the rock are carried away dissolved in the water.

Weathering loosens the rock; **erosion** then takes the pieces away. Erosion is the wearing away and removal of rock and soil by moving water, wind or ice. The moving water, wind or ice then carries the broken pieces — that carrying is called **transportation**. Where the water or wind slows down, the pieces are dropped — that dropping is called **deposition**, and the dropped material is **sediment**.

Water: erode, transport, deposit. Running water is one of the busiest land-shapers on Earth.

What running water does to the land: erode, transport, deposit

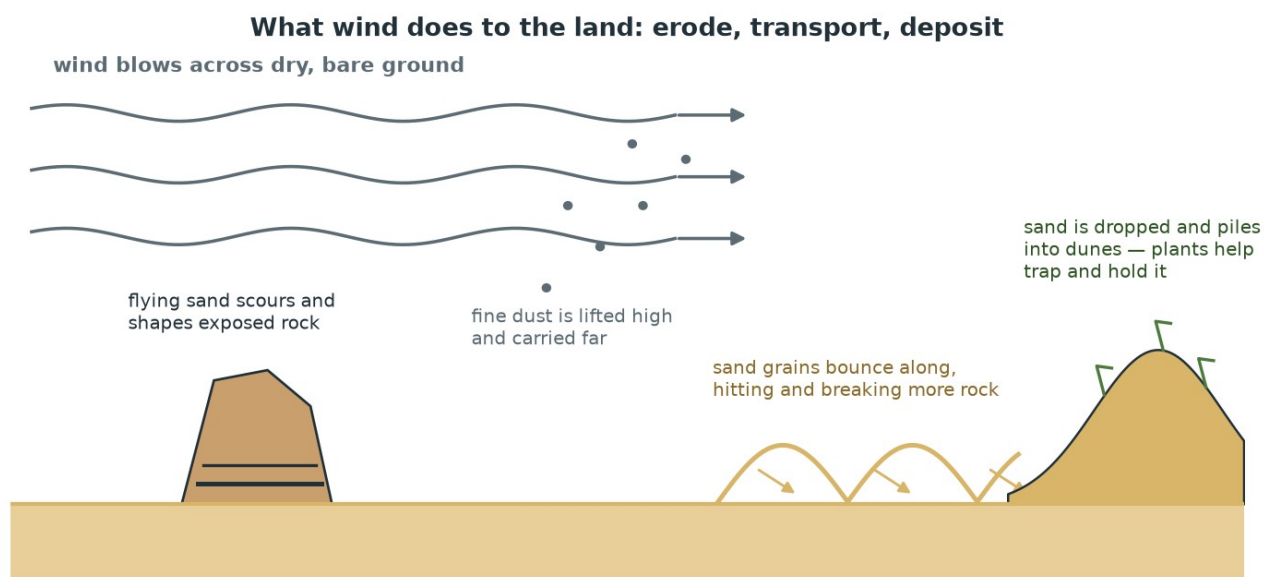


Read from left (high land) to right (sea): the same river erodes on the slope, transports in its middle course and deposits near its mouth.

Cross-section of a river's course from high land to the sea: the steep upper course is mainly erosion (deep V-shaped valley), the middle course is mainly transportation, and near the sea the slow river is mainly deposition, building wide flat land and a delta

- **Higher up, on steep ground,** water runs fast and erodes: it wears a deep, V-shaped valley and bumps and scrapes rocks along the bed, breaking more rock loose.
- **In the middle course,** the river mainly transports its load of mud, sand and gravel — some rolling on the bed, some bouncing, some floating, and some dissolved in the water.
- **Near the sea,** the river is slow and flat, and mainly deposits: it drops its sediment, building wide flat land beside the river and a **delta** (a fan of deposited sediment where a river meets the sea).

Wind: erode, transport, deposit. In dry places with bare ground, wind can pick up and move sediment too.



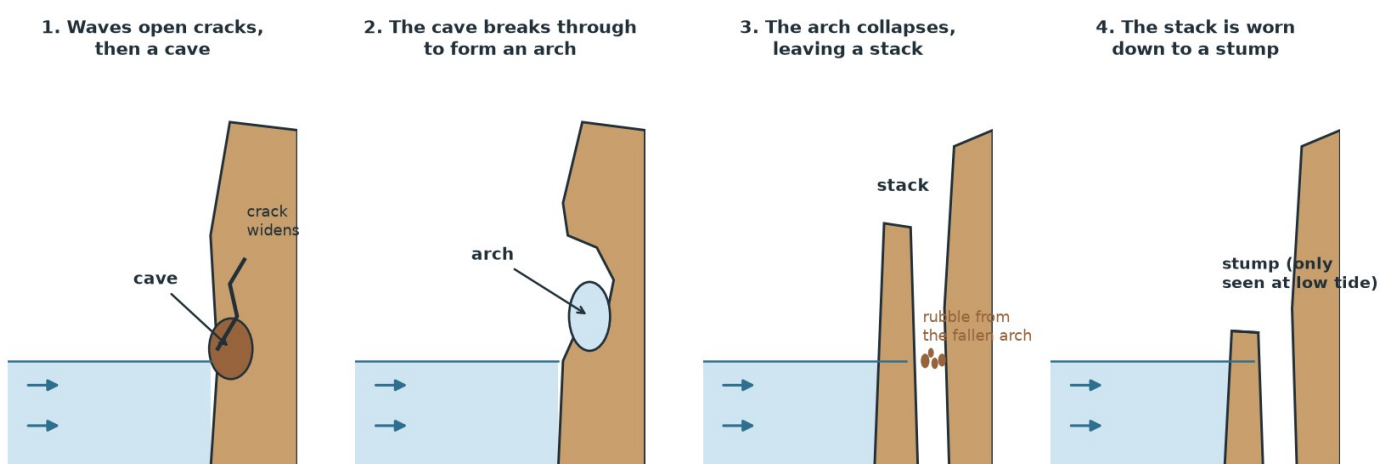
Wind-built land on a huge scale: the sand of K'gari (Queensland) was moved by winds, waves and ocean currents over about 750,000 years.

Diagram of wind at work over dry, bare ground: flying sand scours and shapes exposed rock, fine dust is lifted high and carried far, sand grains bounce along and break more rock, and dropped sand piles into dunes that plants help trap and hold

Flying sand scours (wears) exposed rock, fine dust is lifted high and carried many kilometres, and sand grains bounce along the ground. Where the wind slows or meets plants, the sand is dropped and piles into **dunes** (hills of sand).

At the coast: waves build and waves destroy. On rocky coasts, waves attack cracks in the headland (a point of land sticking out into the sea) and carve a **cave**; a cave that breaks through becomes an **arch**; a collapsed arch leaves a pillar of rock called a **stack**; and a stack worn down to a low pillar is a **stump**.

How a rocky coast is worn back by waves: the cave-arch-stack-stump sequence



Real example: the Twelve Apostles in Victoria are limestone stacks carved by waves; one stack fell in 2005 and another in 2009.

Four-panel diagram of the cave–arch–stack–stump sequence on a rocky coast: waves open cracks and carve a cave; the cave breaks through to form an arch; the arch collapses, leaving a stack; the stack is worn down to a stump, only seen at low tide

On sandy coasts, waves and ocean currents *deposit* sand. **K'gari** (formerly Fraser Island) in Queensland is the largest sand island in the world: about 1,840 square km, built up over about 750,000 years as wind, waves and ocean currents moved sand north along the coast and piled it onto the solid rock underneath. Its oldest dunes are about 700,000 years old, and it has more than 100 freshwater lakes — including about 40 **perched** lakes (lakes held up in the sand, above the level of the underground water), about half of all the perched lakes in the world.

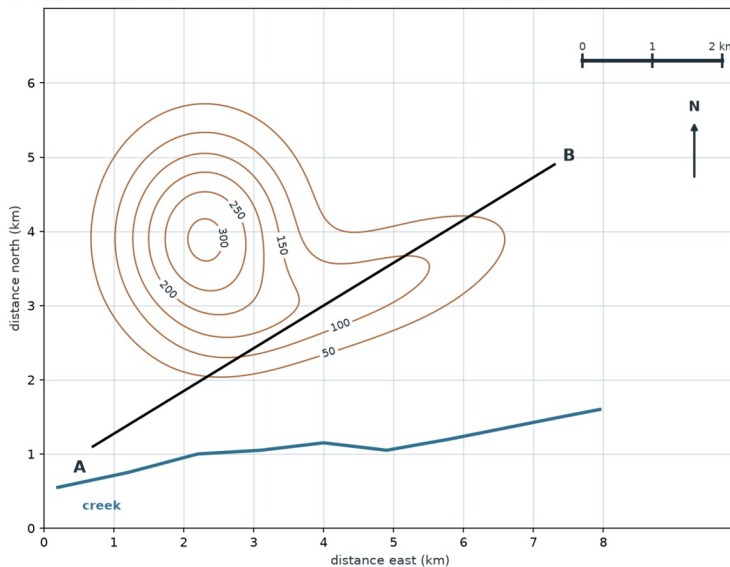
Source: Wikipedia — “K’gari” (retrieved 25 August 2026); example named by VC2HG8K14.E04.

The Twelve Apostles, Victoria — erosion at the local scale. The Twelve Apostles are limestone stacks off the coast of Port Campbell National Park, on Victoria’s Great Ocean Road. The rock is Port Campbell Limestone, laid down under an ancient sea about 15 to 5 million years ago; the sea floor was later slowly pushed up, and waves began cutting into the soft limestone along cracks. The stacks stand up to about 50 m tall — but they are always changing. Of the nine stacks first counted, seven still stand today: one stack collapsed in July 2005 and another in 2009, and nearby London Arch (a natural arch of the same limestone) collapsed on 15 January 1990, leaving two people stranded on its outer half until they were rescued by helicopter.

Source: Wikipedia — “Twelve Apostles” and “London Arch” (retrieved 25 August 2026); examples named by VC2HG8K14.E04.

Reading the shape of the land: contour maps and cross-sections. Geographers record the shape of the land on **topographic maps** (maps that show the shape of the land) using **contours** — lines joining points of equal height above sea level, drawn at a fixed **contour interval** (the height step between one contour and the next). In Victoria, real topographic maps are produced by the Victorian Government as **Vicmap Topographic Maps**. For practice we use a model map (a made-up place) with the same rules.

Model contour map — contour interval 50 metres (heights in metres above sea level)



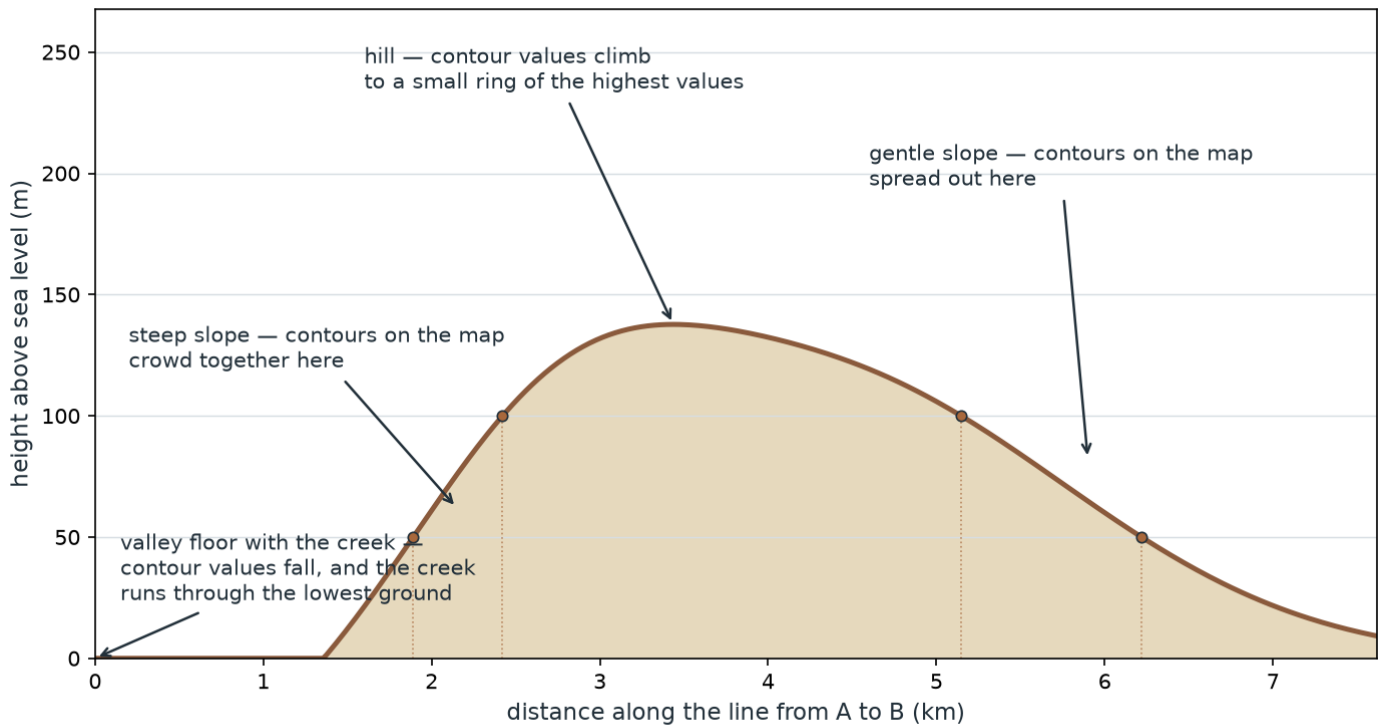
Model contour map with a contour interval of 50 metres: closed rings of contours climb to a 300 m hill in the north-west, a spur runs out to the north-east, a creek runs through low ground in the south, and a straight cross-section line A–B crosses the map from south-west to north-east

Rules for reading contours:

- Contours that form closed rings mark a **hill**; the smallest ring has the highest values.
- Contours that crowd together mark a **steep slope**; contours that spread out mark a **gentle slope**.
- Contours that bend into a V pointing uphill often mark a **valley** with a creek; contours bulging out from a hill mark a **spur** (a short ridge sticking out from a hill).

A **cross-section** is a side-on slice of the land along a line, like cutting a cake and looking at the cut face. To draw one: mark every point where the line crosses a contour, plot each crossing at its height, and join the dots.

Cross-section along line A-B — each dot marks where the line crosses a 50 m contour



Cross-section along line A–B of the model map: dots mark where the line crosses each 50 m contour; the profile shows the valley floor with the creek at the low end, a steep slope where contours crowd, the hill at about 140 m, and a gentle slope where contours spread out

Worked examples

Example 1 — scaffolded (worked demonstration with real data)

How were the Twelve Apostles stacks produced? Use the cave–arch–stack–stump sequence and the real data from the Theory notes.

Working	Comment
Step 1. About 15 to 5 million years ago, mud and shells settled on an ancient sea floor and hardened into Port Campbell Limestone.	Limestone is soft, so waves can cut it. The sea floor was later slowly pushed up above the waves.
Step 2. Waves attacked cracks at the edge of the limestone cliff, carving caves.	Erosion by waves, tides and ocean currents (VC2HG8K14.E04).
Step 3. Caves broke through the headland to form arches; arches collapsed, leaving stacks up to about 50 m tall.	Each collapse moves the coastline a little further inland.
Step 4. The stacks keep wearing: one stack fell in July 2005, another in 2009, and nine have become seven. Nearby London Arch collapsed on 15 January 1990.	Real, dated events show the process is still working today.
Conclusion. The Apostles were produced by deposition (building the limestone), then by the sea floor rising, and are now being re-shaped by wave erosion and deposition of the rubble at their base.	Both process families at work over millions of years.

Source: Wikipedia — “Twelve Apostles” and “London Arch” (retrieved 25 August 2026).

Example 2 — scaffolded (worked demonstration with real data)

How was K’gari, the world’s largest sand island, produced? Use the water and wind figures and the real data from the Theory notes.

Working	Comment
Step 1. Waves and ocean currents wore sand loose from the sea floor and moved it north along the coast.	Erosion and transportation by water (VC2HG8K14.E04).
Step 2. Onshore wind blew the sand into dunes on top of the solid rock below — deposition by wind.	Sand has been building up for about 750,000 years; the oldest dunes are about 700,000 years old.
Step 3. The dunes kept growing until they formed an island of about 1,840 square km — the largest sand island in the world.	Deposition building a landform, grain by grain.
Step 4. Rain filled low spots in the sand; about 40 perched lakes now sit in the dunes, above the level of the underground water.	Fresh water held up in sand is evidence the island is piled-up sediment, not solid rock.
Conclusion. K’gari was produced by the surface family: erosion, transportation and deposition by water and wind.	Family 2 at work on a huge scale.

Source: Wikipedia — “K’gari” (retrieved 25 August 2026).

Example 3 — unscaffolded

Now you try the map skill from the Theory notes, on the model map: work out the cross-section along line A–B. List the contour heights the line crosses (climbing, then descending), say what shape the profile has — valley floor, steep slope, hill, gentle slope — and then check your description against the cross-section figure.

Example 4 — unscaffolded

Name the process family (inside Earth / surface) and the exact process for each scene: (a) layers of red rock in a range are bent into an upfold; (b) a block of rock slips down along a crack after an earthquake; (c) rainwater slowly dissolves a limestone block; (d) a river drops a fan of sediment where it meets the sea.

Practice questions

Scaffolded

- Q1.** In your own words, say what the difference is between a **landscape** and a **landform**, and give one example of each from the landscape table figure. (*Hint: a landscape is the whole scene; a landform is one shape in it.*)
- Q2.** Put each process into its family (built from inside Earth / working at the surface): folding, weathering, volcanism, erosion by water, faulting, deposition by wind. (*Hint: ask where the power comes from — Earth’s heat, or the Sun and gravity.*)
- Q3.** Put the freeze–thaw steps in the right order: (a) the ice pushes the crack wider; (b) rain fills a crack in the rock; (c) the rock breaks into smaller pieces of the same rock; (d) on a cold night the water freezes. (*Hint: water has to get in first.*)
- Q4.** The model contour map has a contour interval of 50 m. (a) What height is the smallest closed ring? (b) Between which two heights does the hilltop lie? (*Hint: read the labels, then add one interval.*)
- Q5.** Using the river figure, match each course (upper / middle / lower) with its main work (erosion / transportation / deposition), and say what landform the river builds where it meets the sea. (*Hint: fast water erodes; slow water deposits.*)
- Q6.** Using the coast figure, put these in order: arch, stump, stack, cave. (*Hint: waves start with a crack.*)

Q7. On the model map, the contours are crowded on the south-west side of the hill and spread out on the north-east side. Which side is steeper? How do you know? (*Hint: crowded = steep.*)

Q8. Name two things that break rock up *in place*, before erosion moves the pieces. (*Hint: one is physical, one is chemical.*)

Un scaffolded

Q9. Explain, step by step, how a limestone stack such as those at the Twelve Apostles is produced from a headland, and why the number of stacks keeps changing. Quote one real dated event in your answer.

Q10. The cross-section along A–B shows the land rising from about 0 m to about 140 m over roughly 2 km on the steep side, then falling back to about 10 m over roughly 4.5 km on the gentle side. Use these figures to explain how the cross-section and the contour map show the *same* shape in two different ways.

Q11. A farmer on the Steppe in Central Asia sees dust storms some years, after the grass has been overgrazed until the ground is bare. Using the wind figure, explain what the wind can now do to the bare ground, and what role plants normally play.

Q12. Krakatoa's 1883 eruption destroyed about two-thirds of the island, yet by 1927 new land (Anak Krakatau) was growing in the same spot. Explain how one process can both destroy and build land, and name the process family it belongs to.

Q13 — extended response (evidence-based). Study a local landform and explain the geomorphological processes that produced it.

- **Choice of landform:** your school's nearest local landform is the default (a hill, a creek valley, a coastal stack or dune, a gorge, a plain edge). If none is reachable, use the Twelve Apostles.
- **What to include:** (1) a labelled sketch or photograph of the landform; (2) its shape described from a contour map or topographic profile (use the 5B and E05 methods — on real terrain, Vicmap Topographic Maps); (3) an explanation of the processes that produced it, naming the process family for each; (4) at least two sources for your evidence, listed with the date you retrieved them.
- **Format:** a one-page written report, or a poster/multimodal piece. Use the fieldwork methods taught in Section 5B for any data you collect yourself, and the report structure taught in Section 6C.
- **Checklist for evidence:** every claim about a process is tied to something you observed, measured, or sourced; sources are named and dated.

Fieldwork application: studying your local landform

This section's local landform study is an *application* task: the methods (observing, sketching, photographing, measuring, recording) are taught in Section 5B, and the final report writing in Section 6C. A simple field record for your chosen landform:

What we did (method from 5B)	What we found	Which process does it point to?
e.g. sketched the landform from a high point	e.g. steep side and gentle side; a creek at the low end	e.g. water erosion cutting the valley; deposition on the flat

Remember: record the date, the weather, and the exact place; take permission before going onto land; leave everything as you found it.

Answers

Q1. A landscape is the whole scene you see across an area; a landform is one single shape in it. Example: the Gobi Desert landscape contains dune landforms; the Daintree landscape contains valley landforms. **Q2.** Inside Earth: folding, volcanism, faulting. Surface: weathering, erosion by water, deposition by wind. **Q3.** b, d, a, c. **Q4.** (a) 300 m; (b) between 300 and 350 m. **Q5.** Upper: erosion; middle: transportation; lower: deposition; a delta at the mouth. **Q6.** Cave, arch, stack, stump. **Q7.** The south-west side; crowded contours mean a steep slope. **Q8.** Physical weathering (freeze–thaw, roots) and chemical weathering (slightly acidic rainwater dissolving rock). **Q9.** Waves open cracks → cave → arch → stack → stump; collapses keep moving the coast; e.g. a stack fell in July 2005 (or London Arch collapsed 15 January 1990). **Q10.** The cross-section plots height against distance; the map shows the same steepness as crowding of contours — the 2 km climb matches the crowded contours, the 4.5 km fall matches the spread contours. **Q11.** With no plants to hold it, wind erodes the bare soil, transports dust far away, and deposits it as dunes in a new place; plants normally trap and hold the sand. **Q12.** Volcanism builds the volcano from lava and ash; the same erupting volcano blew the old island apart in 1883; family: built from inside Earth. **Q13.** Answers vary; see the checklist — the explanation must name processes and families, describe the shape from contours, and name at least two sources with their dates.

Fully-worked solutions

Q3. Water enters first: (b) rain fills a crack. Then (d) on a cold night the water freezes. Ice needs more space than water, so (a) the ice pushes the crack wider. After many cycles, (c) the rock breaks into smaller pieces of the same rock. Order: **b, d, a, c.**

Q5. In the upper course the ground is steep, so water runs fast and its main work is **erosion** (deep V-shaped valley). In the middle course the slope is gentler and the river mainly **transports** mud, sand and gravel. In the lower course the land is flat and the slow river mainly **deposits** sediment, building wide flat land; where it meets the sea it builds a **delta**.

Q9. Waves attack cracks in a limestone headland and carve a **cave** (erosion). A cave that breaks through forms an **arch**. The arch's roof collapses (the rock is transported away as rubble and deposited at the base), leaving a pillar — a **stack**. The stack is worn down to a **stump**. Because erosion never stops, the number of stacks keeps changing: of the nine first counted at the Twelve Apostles, one fell in July 2005 and another in 2009, leaving seven. (London Arch, of the same limestone, collapsed on 15 January 1990.)

Q10. On the cross-section, the line climbs from about 0 m to about 140 m in roughly 2 km — a fast climb, i.e. a steep slope; then it falls to about 10 m over roughly 4.5 km — a slow fall, i.e. a gentle slope. On the map, the *same* steep slope appears where the 50 m and 100 m contours crowd together, and the gentle slope where the contours spread out. So one shape, two views: the map shows *where* the height changes (crowded vs spread contours), the cross-section shows *how much and how fast* it changes (a steep vs gentle line).

Q12. The process is **volcanism** (family: built from inside Earth). Melted rock reaching the surface built Krakatau up, layer by layer, over hundreds of years of eruptions. In 1883 the same process — a violent eruption — blew about two-thirds of the island apart. From 1927, lava and ash from continued eruptions began piling up again as Anak Krakatau. So volcanism builds land (lava, ash) and can destroy it (explosive eruptions), which is why the inside-Earth family both makes and re-makes landforms.

Q13. A strong response: (1) names and locates the landform; (2) describes its shape using contour evidence (e.g. “the contours crowd on the north side, so that side is steep”); (3) explains its production process by process, naming each family — e.g. for a creek valley: weathering loosens rock, water erosion cuts the valley, transportation carries the sediment, deposition builds the flat beside the creek; (4) names at least two sources with retrieval dates (e.g. a Vicmap Topographic Map sheet and one other source). Marks reward evidence tied to claims, not just a description.

Example 3. Climbing from A, the line crosses the 50 m contour, then the 100 m contour; descending on the far side it crosses 100 m again, then 50 m. So the profile is: a flat valley floor (about 0–50 m) with the creek near A; a steep slope where the 50 m and 100 m contours crowd together; a rounded hill topping out at about 140 m (below the 150 m that would be the next contour); then a long gentle slope where the contours spread out, falling back towards about 10 m at B. That description should match the cross-section figure dot for dot.

Example 4. (a) Folding — inside-Earth family (squeezing bends the layers). (b) Faulting — inside-Earth family (rock breaks and blocks move; earthquakes are the shaking this causes). (c) Chemical weathering — surface family (rainwater changes the rock into new substances). (d) Deposition by water — surface family (the river drops its sediment where it slows at the sea).

Sources for this section (all retrieved 25 August 2026): Wikipedia — “Twelve Apostles”, “London Arch”, “K’gari”, “MacDonnell Ranges”, “Great Sumatran Fault”, “Krakatoa”, “Mount Everest”, “Eurasian steppe”, “Daintree rainforest”, “Gobi desert”, “Barmah Forest”. Real topographic mapping named per VC2HG8K14.E05: Vicmap Topographic Maps (Victorian Government). All figures in this section are original model diagrams drawn for this workbook; the contour map and cross-section use model data (a made-up place), not real terrain.

How people change and manage landforms: causes, responses and a local study

Section 3D · Victorian Curriculum 2.0, Levels 7 and 8 Geography · Content description VC2HG8K15 · Draws on elaborations VC2HG8K15.E01, .E02, .E03, .E04 and .E05 (as trimmed per the recorded scope decision at the foot of this section).

In 3C you saw how nature builds landforms — folding, faulting, volcanoes, weathering, **erosion** (the picking up and carrying away of rock and soil by water, wind or ice) and **deposition** (the dropping of that material somewhere else when the water or wind slows down). This section asks the other half of the question: **how do people change landforms, and what do we do about it?** People are now one of the strongest landform-shaping forces on Earth, and the same words — erosion, deposition, **sediment** (the sand, silt, mud and gravel that eroded rock is broken into) — do the work here too.

Teaching sequence (for the teacher)

1. **Hook — people as a landform force.** Start from somewhere every student knows: a worn shortcut across a park, a deepened track on a walking trail, a sandy bank churned up near a boat ramp. Ask: *who made this shape?* Section 3C’s vocabulary (erosion, deposition, sediment) is assumed and is revised in the first theory block.
2. **Causes (VC2HG8K15.E01).** Work through Figure 3D.1, the six-cause map. Students sort a set of local photographs or their own observations into the six activity groups.
3. **Chains (VC2HG8K15.E02).** Figure 3D.2 teaches the cause → change chain structure (tourist track; land clearing). The palm-oil case (Figure 3D.3) carries the Asia priority — Indonesia and Malaysia — and supplies Worked Example 3.
4. **Mining and new land (VC2HG8K15.E03).** Two contrasted real cases: the Ranger uranium mine dug into the land beside Kakadu (Figure 3D.4), and Singapore building new land out from the sea (Figure 3D.5).
5. **River regulation (VC2HG8K15.E04).** The Murray weir staircase (Figure 3D.6) and Hume Dam’s inflow record (Figure 3D.7) make *why* and *how* concrete; the Three Gorges Dam (Figure 3D.8) supplies the Asia case. Impacts on riverine and wetland environments are named explicitly.
6. **Management (VC2HG8K15.E05 as trimmed).** Figure 3D.9 matches responses to causes. The short “two fair views” box models balanced argument before the evaluate-style questions.
7. **Local landform study and fieldwork cycle.** Figure 3D.10 gives the five-step cycle, generic to any Victorian locality (3C hosts the same study from the natural-processes side; 6C hosts the reporting). The section closes with the evidence-based proposal task.

Worked Examples 1 and 2 are the two data demonstrations (MDBA weir and inflow data); the practice set is source- and figure-led throughout.

Theory

People change landforms too (VC2HG8K15.E01)

A **landform** is a natural feature of the Earth’s surface — a hill, a dune, a river bank, a beach, a gorge. 3C covers the natural processes that make them. Here we add the human ones. Almost everything people do on the land changes a landform a little: ploughs break up soil, feet crush the plants that hold a track together, shovels and machines move rock and sand, and walls built across rivers change where sediment can go. Figure 3D.1 groups the human causes into six.

Six ways people change landforms

What we do on the land - and the change it sets in motion

Farming and grazing

Ploughing and hooves loosen soil; clearing removes the roots that hold it.

Recreation and tourism

Foot traffic crushes plants; vehicles and boats wear down banks and dunes.

Mining and quarrying

Rock and soil are dug out, leaving pits, tunnels and waste dumps.

Each of these can speed up erosion, build up sediment, or reshape the land directly.

River regulation

Dams, weirs and channels hold back water, trap sediment and change flows.

Urban development

Land is levelled and sealed over; new land is even built out to sea.

Introduced species

Rabbits and wild pigs dig up soil; plants are eaten down to bare ground.

Original figure for this workbook. The six activity groups follow VC2HG8K15.E01.

Figure 3D.1 — Six ways people change landforms: farming and grazing, recreation and tourism, mining and quarrying, river regulation, urban development, and introduced plants and animals, each with the change it sets in motion. Original figure for this workbook; the six activity groups follow VC2HG8K15.E01.

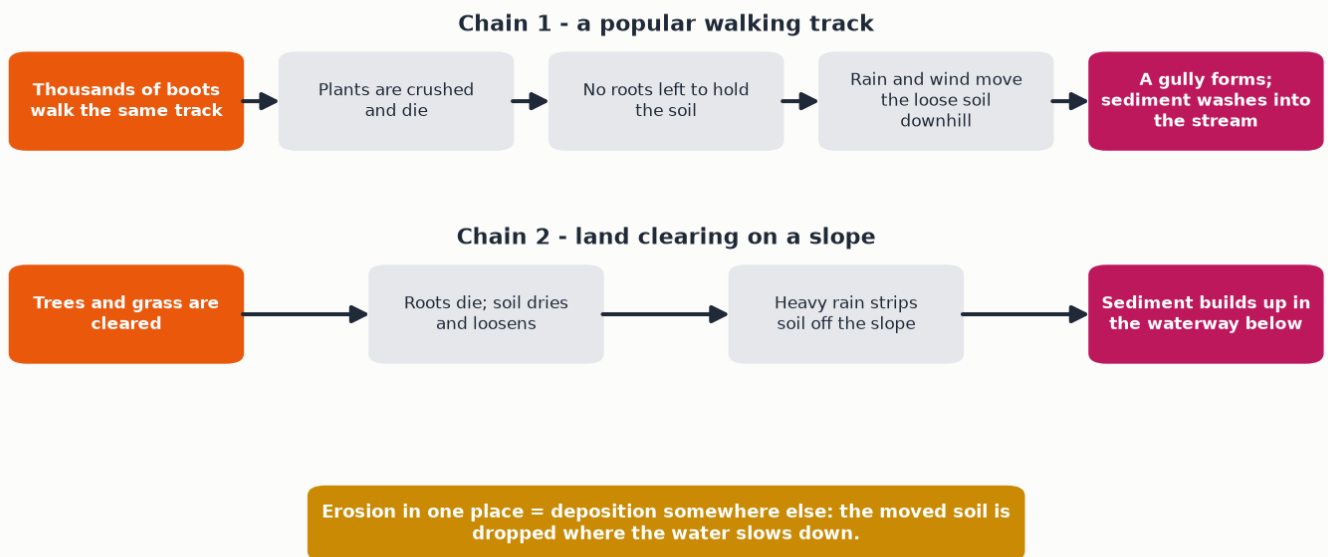
Notice the pattern in Figure 3D.1: most human causes work by **removing protection** (plants and roots that hold soil), **loosening material** (soil and rock that water or wind can then move), or **blocking and diverting** (structures that change where water and sediment travel). People rarely move a hill by hand; people change the rules, and water, wind and gravity do the moving.

One cause, two chains: erosion and deposition (VC2HG8K15.E02)

Erosion and deposition are two ends of one journey: material picked up in one place is dropped in another. When people speed up erosion somewhere, they also cause deposition somewhere else — often where it is not wanted, such as in a stream, a wetland or a harbour.

One cause, two chains: how people start erosion

Orange = what people do. Grey = what follows. Red = the changed landform.



Original figure for this workbook; chain examples follow VC2HG8K15.E02.

Figure 3D.2 — Two erosion chains started by people: a worn walking track and land clearing on a slope. Both chains run from a human activity, through the loss of plant cover and roots, to erosion, and end with a changed landform plus sediment deposited in a waterway. Original figure for this workbook; the chain examples follow VC2HG8K15.E02.

The same chain runs at a much bigger scale in South-East Asia. **Palm oil** is the vegetable oil used in many packaged foods and soaps. To grow more of it, growers in Indonesia and Malaysia cleared large areas of forest and drained and levelled the land beneath the palms. With the forest gone, rain strikes bare soil, erosion speeds up, and the washed soil is deposited in streams and rivers, clouding the water and raising the beds.

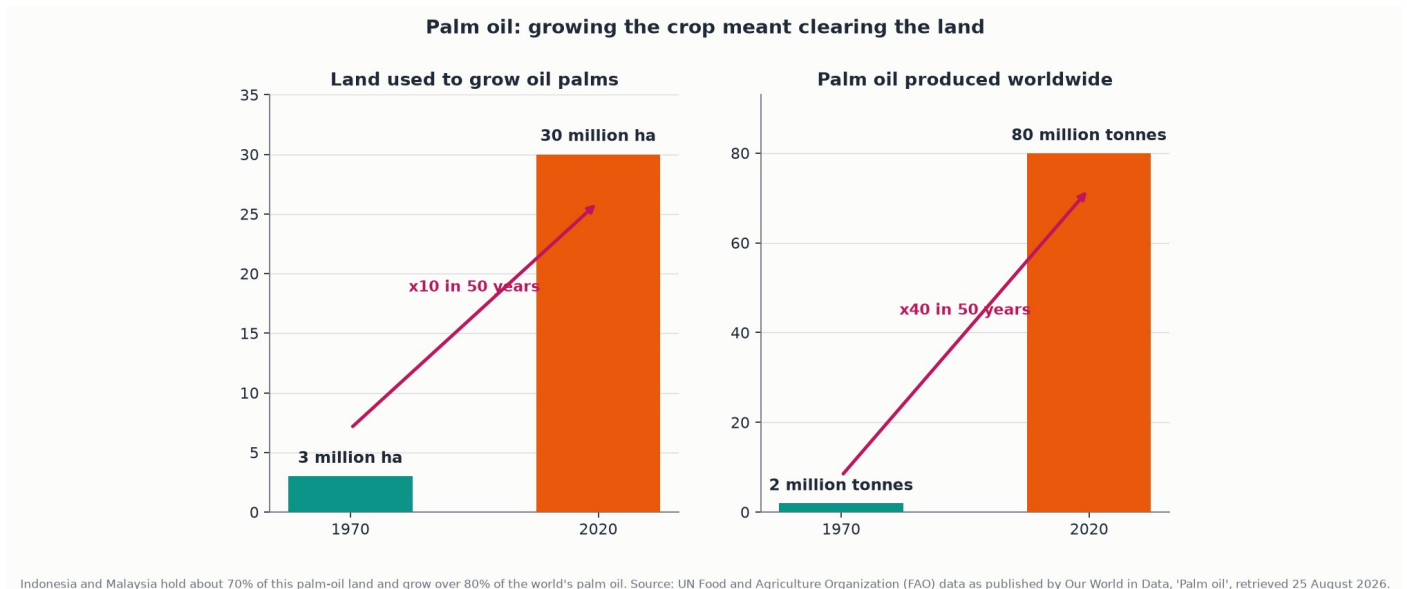


Figure 3D.3 — Palm oil, 1970 to 2020: land used to grow oil palms rose about tenfold (about 3 million hectares to almost 30 million hectares) while world production rose about fortyfold (about 2 million tonnes to around 80 million tonnes). Indonesia and Malaysia hold about 70 per cent of the palm-oil land and grow over 80 per cent of the oil. Source: UN Food and Agriculture Organization (FAO) data as published by Our World in Data, 'Palm oil', retrieved 25 August 2026.

Mining, quarrying and building new land (VC2HG8K15.E03)

Mining and quarrying are the most direct human landform changes: rock and soil are simply dug out, leaving open pits, tunnels and waste dumps, and the dug-out ground is a new, human-made landform. The **Ranger uranium mine** in the Northern Territory shows both the change and the management response.

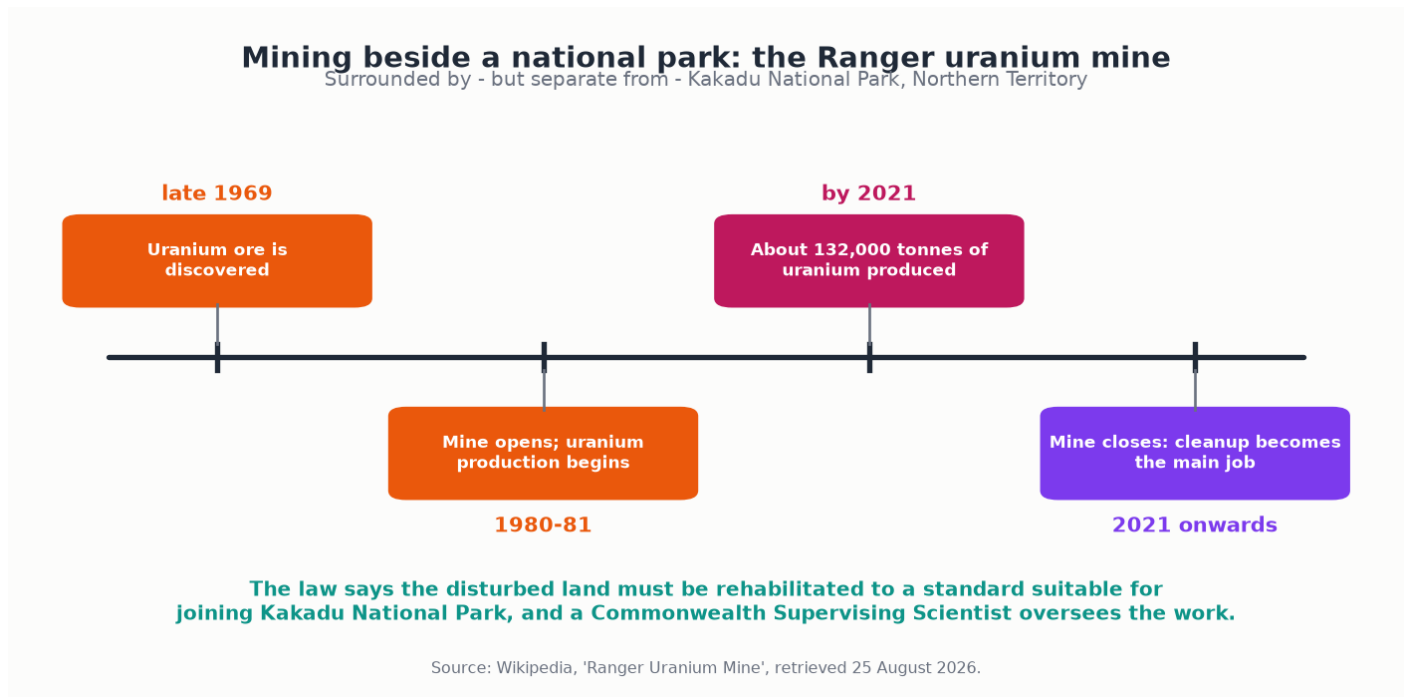


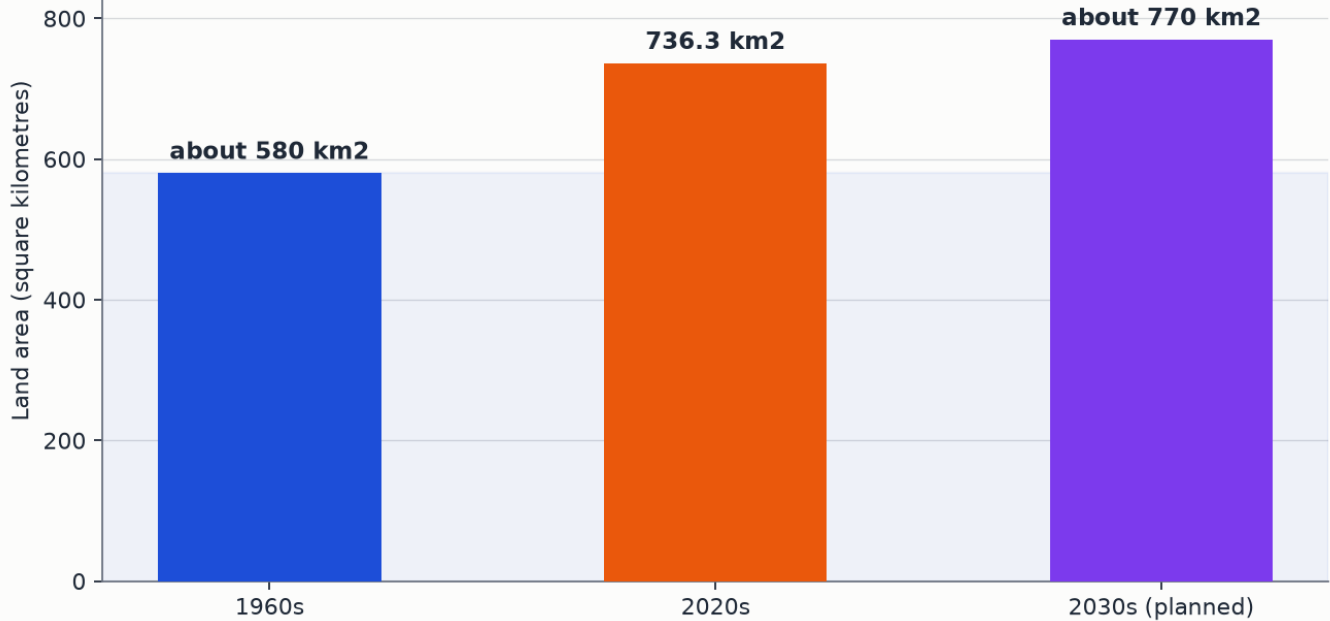
Figure 3D.4 — The Ranger uranium mine beside Kakadu National Park: discovered late 1969, opened 1980, about 132,000 tonnes of uranium produced by 2021, then closure with rehabilitation as the main job. The disturbed land must by law be rehabilitated (returned to a safe, stable condition) to a standard suitable for joining Kakadu National Park, overseen by a Commonwealth Supervising Scientist. Source: Wikipedia, 'Ranger Uranium Mine', retrieved 25 August 2026.

Urban development changes landforms too — including, in some cities, building brand-new land. **Land reclamation** is the building of new land from the sea by filling shallow water with sand and rock. Singapore has done this on a large scale.

Singapore is building itself bigger - land made from the sea

The growth is reclaimed land - new land built from the sea.

Marina Bay, Changi Airport and Jurong Island (seven small islands joined into one)
all stand on reclaimed land.



Source: Department of Statistics Singapore land-area figures, as published in Wikipedia, 'Singapore' and 'Land reclamation in Singapore', retrieved 25 August 2026.

Figure 3D.5 — Singapore's land area: about 580 square kilometres in the 1960s, 736.3 square kilometres in the mid-2020s, and about 770 square kilometres planned by the 2030s. The growth is reclaimed land; Marina Bay, Changi Airport and Jurong Island all stand on it. Source: Department of Statistics Singapore land-area figures, as published in Wikipedia, 'Singapore' and 'Land reclamation in Singapore', retrieved 25 August 2026.

In both cases the quality of the environment is the issue: a mine leaves disturbed ground and waste rock behind, and reclamation changes coastlines and the shallow sea environments beside them. That is why both come with rules — rehabilitation duties for the mine, and planning controls over what may be reclaimed and where.

River regulation: holding a river in a staircase (VC2HG8K15.E04)

River regulation is the managing of a river's flow and level with built structures. A **weir** is a low wall across a river that holds the water level up behind it, on the **upstream** side (the direction the river comes from); a **lock** is a water lift beside the weir that lets boats climb from one level to the next; a **dam** stores water in a **reservoir** (an artificial lake) for later release. Australia's rivers are famously "boom and bust", and storage is the response to that: Figure 3D.7 shows how much the River Murray's flow can swing at Hume Dam.

Weirs 2, 4, 6, 7, 9 and 10 (unlabelled) step the crowded middle reach between Renmark and Mildura.

The River Murray held in a staircase: 14 weirs and locks, 1922-1939

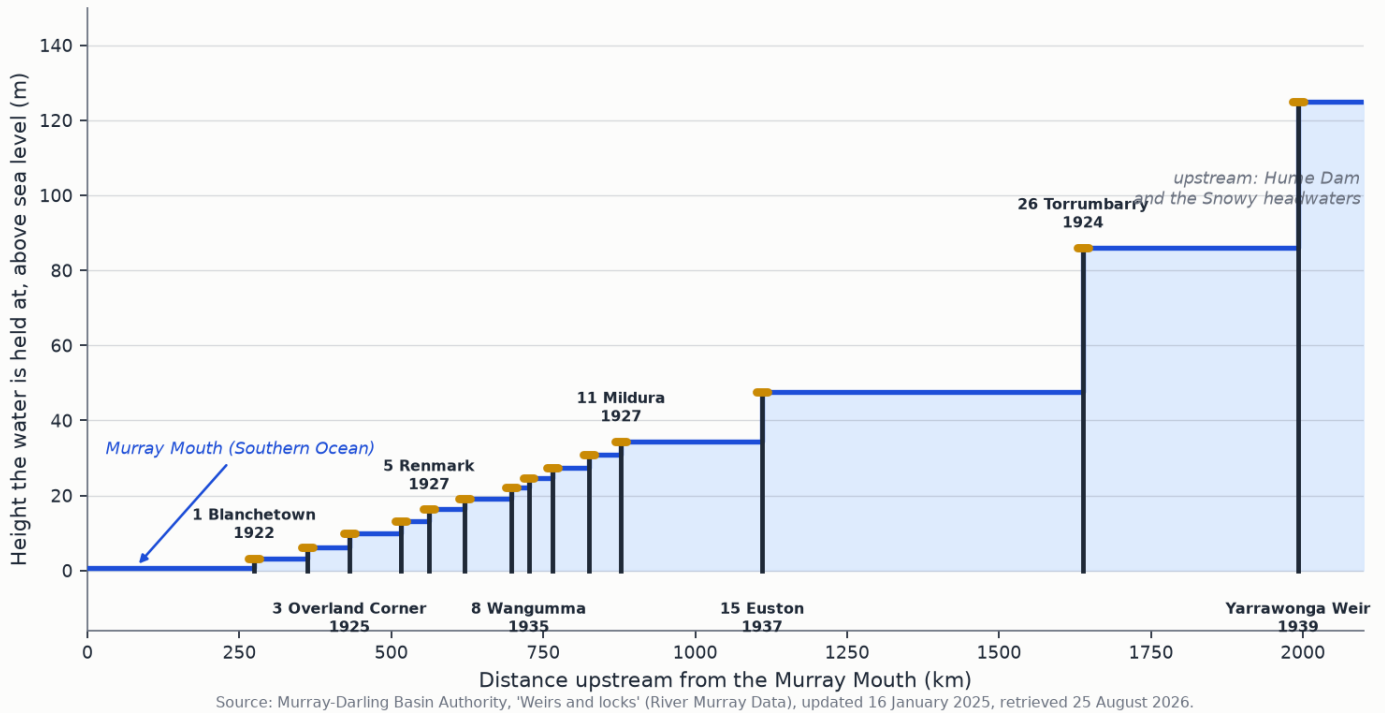


Figure 3D.6 — The River Murray held in a staircase: 14 weirs and locks built between 1922 and 1939 hold the river as a series of flat steps climbing from the Murray Mouth to Yarrowong. Labelled weirs give their distance upstream and the height the water is held at; weirs 2, 4, 6, 7, 9 and 10 step the crowded middle reach. Source: Murray-Darling Basin Authority, 'Weirs and locks' (River Murray Data), updated 16 January 2025, retrieved 25 August 2026.

Why store water? The River Murray's flow changes hugely from year to year

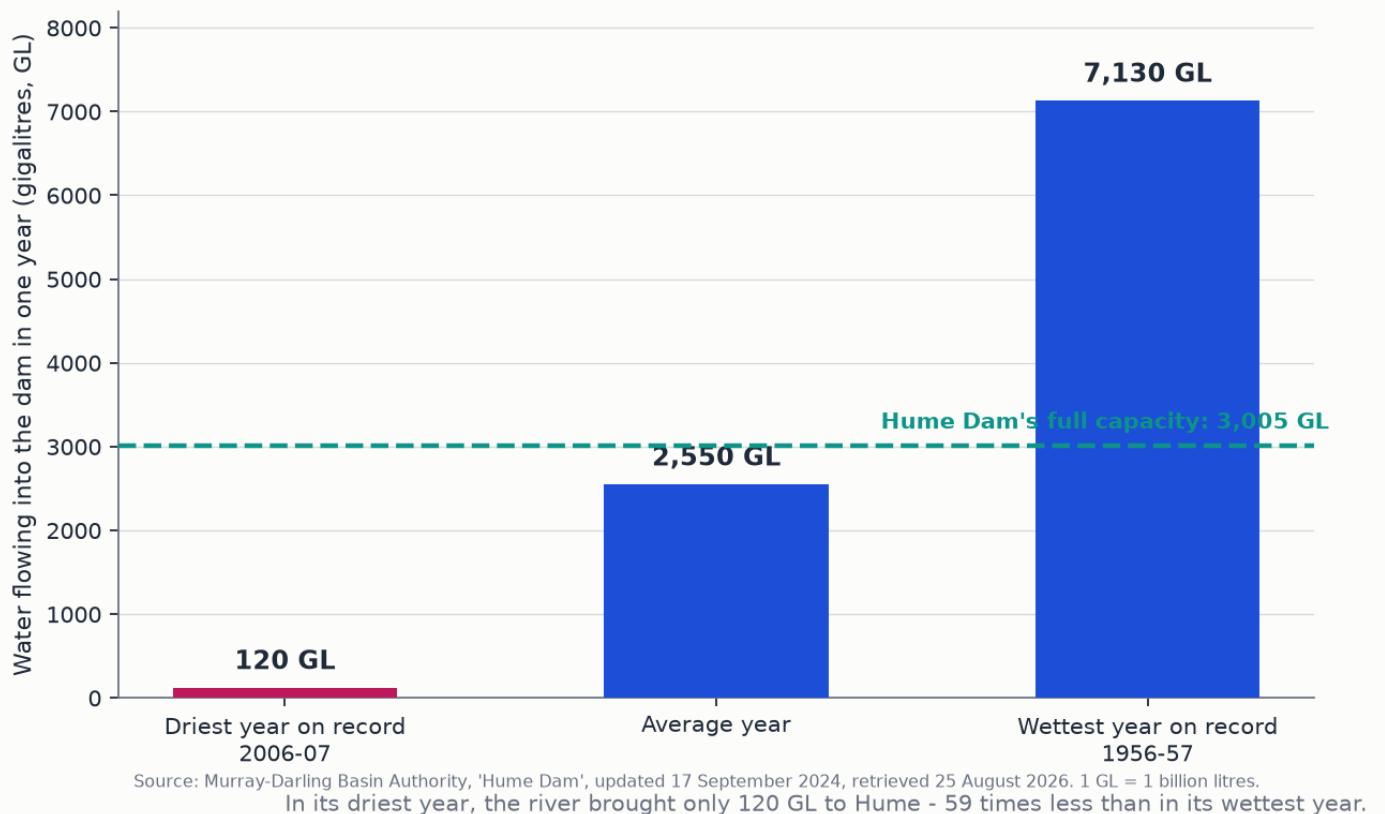


Figure 3D.7 — Water flowing into Hume Dam in one year: 120 gigalitres in the driest year on record (2006–07), 2,550 gigalitres in an average year, and 7,130 gigalitres in the wettest (1956–57), against a full capacity of 3,005 gigalitres. Source: Murray-Darling Basin Authority, 'Hume Dam', updated 17 September 2024, retrieved 25 August 2026. 1 GL = 1 billion litres.

Regulation is useful — towns, farms and boats depend on it — but it changes riverine (river) and wetland environments. Behind a weir the river becomes a chain of still pools, so species that need flowing water lose their home; sediment drops to the bed of the pool instead of travelling downstream; and the wall itself blocks fish that must move upstream to breed. Below the dams, the natural pattern of floods and low flows is flattened, and wetlands that relied on floods can dry out. The same list of impacts appears at the world's biggest scale on China's Yangtze River.

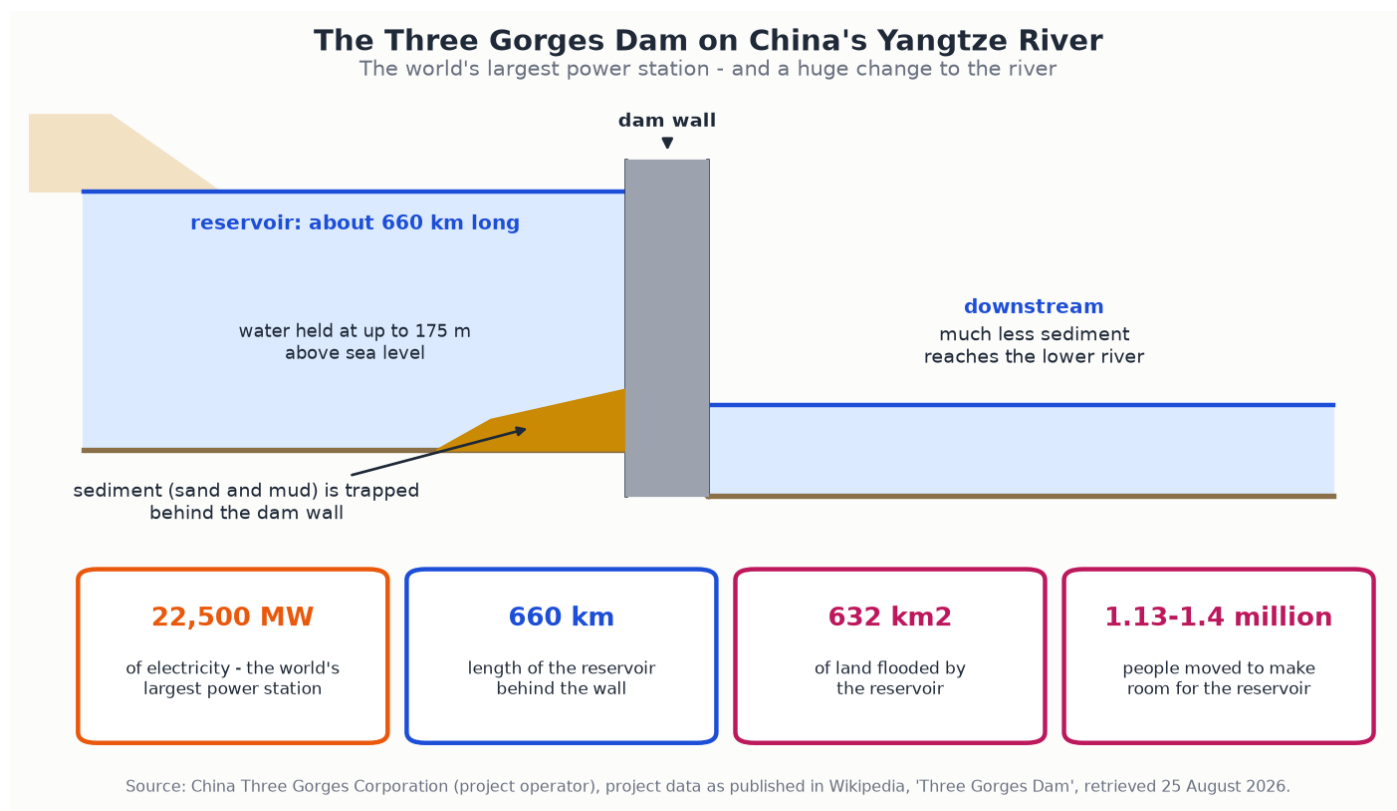


Figure 3D.8 — The Three Gorges Dam on China's Yangtze River: the world's largest power station (22,500 megawatts — a megawatt is a unit of power), with a reservoir about 660 kilometres long held at up to 175 metres above sea level; 632 square kilometres of land were flooded and between 1.13 million and about 1.4 million people were moved. Sediment is trapped behind the wall, so much less reaches the lower river. Source: China Three Gorges Corporation (project operator), project data as published in Wikipedia, 'Three Gorges Dam', retrieved 25 August 2026.

Managing and protecting landforms (VC2HG8K15.E05 as trimmed)

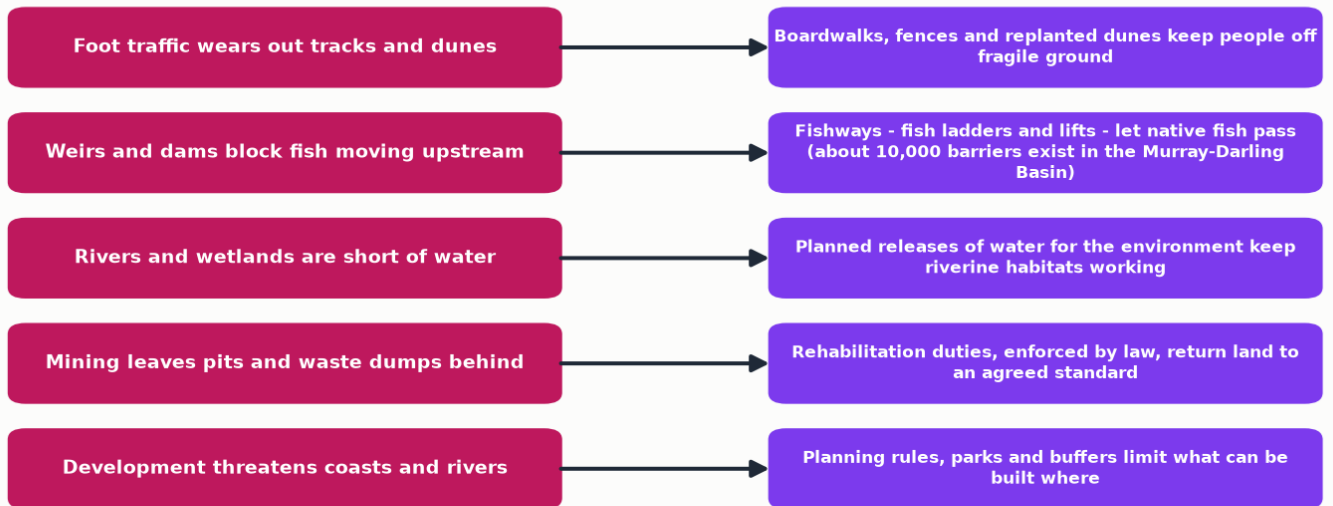
Every cause in Figure 3D.1 has a matching management response. Some responses repair damage; others stop it happening; others share a place out between uses so that damage stays small.

Managing the change: problems and the responses used

Each cause can be met with management that slows or repairs the damage

PROBLEM

MANAGEMENT RESPONSE



Original figure for this workbook; response types follow VC2HG8K15.E05 (as trimmed). Barrier count: MDBA fishways material, retrieved 25 August 2026.

Figure 3D.9 — Problems matched to management responses: boardwalks, fences and replanted dunes for worn tracks; fishways (fish ladders and lifts) for weirs that block fish — about 10,000 barriers to fish movement exist in the Murray–Darling Basin; planned releases of water for the environment for short-of-water rivers and wetlands; rehabilitation enforced by law for mined land; and planning rules, parks and buffers (kept-clear strips of land) for coasts and rivers under development pressure. Original figure for this workbook; response types follow VC2HG8K15.E05 (as trimmed). Barrier count: Murray–Darling Basin Authority fishways material, retrieved 25 August 2026.

Two terms in that figure carry most of the weight. **Water for the environment** is water released from dams on purpose to keep rivers and wetlands alive — a small, planned flood when the natural one no longer comes. A **fishway** is a channel or lift built at a weir so native fish can pass the wall.

Two fair views. Weirs and dams are argued about, and the argument is worth hearing from both sides. *Keep them:* towns, farms and boats rely on stored water in a dry country whose rivers swing fifty-fold between wet and dry years (Figure 3D.7); removing a weir does not bring back the natural river straight away, and the sediment piled behind it can wash out and smother the lower river. *Change them:* regulated rivers lose their floods, their flowing-water habitats and their fish runs, and wetlands dry out; where a weir’s work can now be done another way, giving some water back — water for the environment, fishways, even removing old weirs — repairs environments that storage damaged. A good proposal listens to both sides before choosing.

Your local landform study (the required local study, shared with 3C)

The curriculum asks you to study a landform near you. 3C studies how your local landform was made; this section studies how **people** are changing it and how it might be managed. The cycle in Figure 3D.10 works for any Victorian locality — a creek bank, a coastal dune, a hillside, a reservoir shore, a quarry face.

Studying a local landform: five steps, any locality

The same cycle works for a creek bank, a dune, a hillside or a shoreline near your school

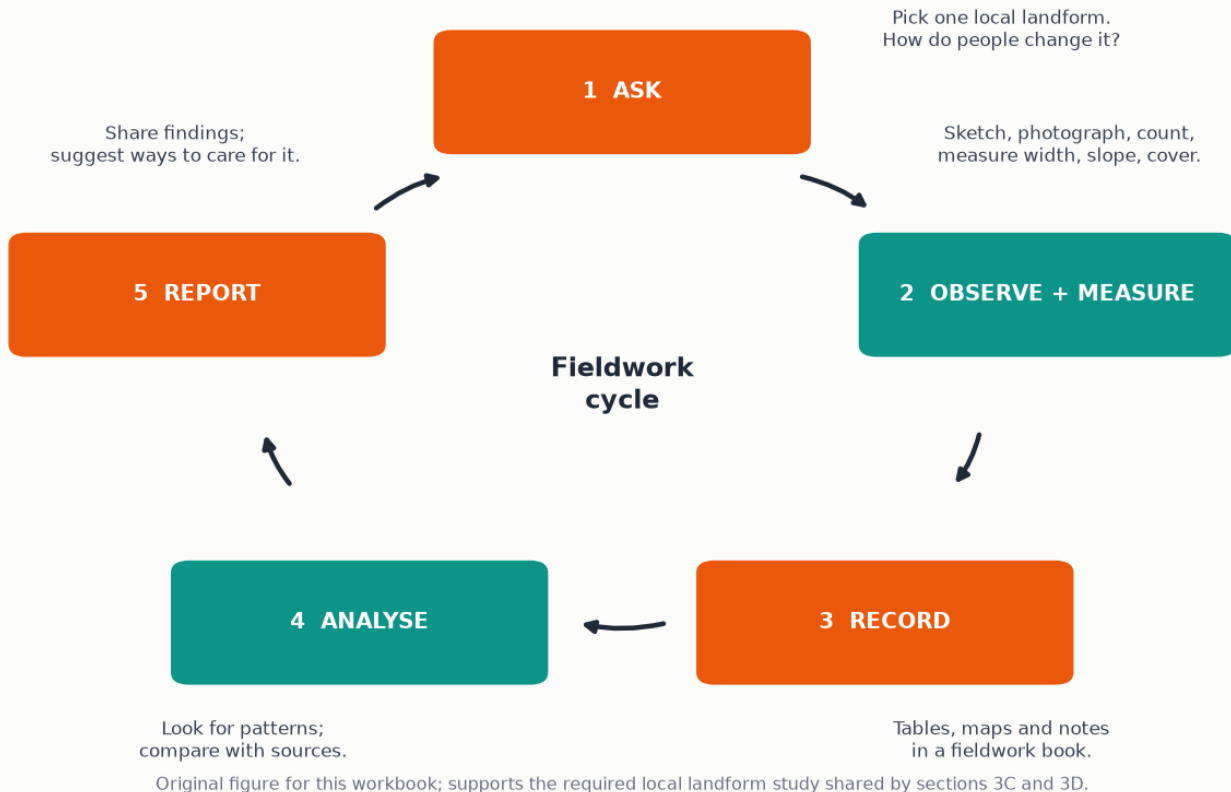


Figure 3D.10 — The fieldwork cycle: ask (pick one local landform and ask how people change it), observe and measure (sketch, photograph, count, measure width, slope and plant cover), record (tables, maps and notes in a fieldwork book), analyse (look for patterns and compare with sources), report (share findings and suggest ways to care for it). Original figure for this workbook; supports the required local landform study shared by 3C and 3D and the reporting taught in 6C.

Good fieldwork evidence is **specific**: “the track is 1.8 m wide where it crosses the slope and the soil is bare for 3 m downslope of it” is evidence; “the track is wrecked” is opinion. Your report in 6C will be built from exactly this kind of note.

Worked examples

Example 1 — scaffolded (Figure 3D.6, MDBA weir data)

(a) How many weirs and locks make up the Murray staircase, and in what years were they built? (1 mark)

Step 1 — read the title and count. The title says 14 weirs and locks; the steps in the figure run from weir 1 at Blanchetown to Yarrawonga Weir. *Step 2 — read the dates.* The labelled weirs run from 1922 (Blanchetown) to 1939 (Yarrawonga). **Answer: 14 weirs and locks, built 1922–1939.**

(b) Which labelled weir holds the water highest above sea level, and at what height? (1 mark)

Step 1 — read up the staircase. The steps climb upstream. The top step is Yarrawonga Weir. **Answer: Yarrawonga Weir, holding water at 124.9 m above sea level.**

(c) What does the staircase shape tell you about the land the river flows through? (2 marks)

Step 1 — connect water level to land height. A river runs downhill, so to hold flat pools the weirs must climb as the land climbs. *Step 2 — read the total climb.* From 3.3 m at Blanchetown to 124.9 m at Yarrawonga, the land rises about 120 m over about 1,700 km. **Answer: the land rises gently and steadily upstream — a long, gentle slope, not steep country.**

Example 2 — scaffolded (Figure 3D.7, Hume Dam inflows)

(a) How many times bigger was the wettest year's inflow than the driest year's? (2 marks)

Step 1 — read both bars. 7,130 GL (1956–57) and 120 GL (2006–07). *Step 2 — divide.*

$7,130 \div 120 \approx 59$ times.

(b) Explain in two sentences why a river that swings like this needs storages if people want a steady supply. (2 marks)

Step 1 — state the problem. In the driest year the river brought less water than one full Hume Dam; in the wettest year it brought more than two full dams. *Step 2 — state what a storage does.* **A storage catches the wet-year surplus and releases it through the dry years, turning a boom-and-bust river into a steadier supply.**

Example 3 — unscaffolded (Figure 3D.3)

Using Figure 3D.3, explain how rising demand for palm oil grown in Indonesia and Malaysia has changed landforms through erosion and deposition. (4 marks)

Demand for palm oil grew the crop from about 2 million tonnes (1970) to around 80 million tonnes (2020), and the land used to grow it from about 3 million hectares to almost 30 million hectares — much of it cleared forest in Indonesia and Malaysia. Clearing removes the trees and leaf litter that break the fall of heavy tropical rain, and the roots that bind the soil, so rain strikes bare or thinly covered ground and erosion speeds up. The eroded soil is carried into streams and rivers and deposited there, raising beds and clouding water. The landform change is therefore twofold: slopes lose soil and can become gullied (erosion), while waterways gain sediment bars and mud (deposition) — the same chain as Figure 3D.2, at the scale of a whole region.

Example 4 — unscaffolded (Figures 3D.4 and 3D.5)

The Ranger mine and Singapore's reclamation change landforms in opposite directions. Describe each change and the management that goes with it. (4 marks)

Ranger is digging *into* the land: open pits, waste-rock dumps and disturbed ground replace the natural surface, in country surrounded by Kakadu National Park. Its management is a rehabilitation duty — the law requires the disturbed land to be returned to a safe, stable condition suitable for joining the park, with a Commonwealth Supervising Scientist overseeing the work. Singapore is building *out from* the land: sand and rock fill shallow sea to make new land (about 580 km² in the 1960s to 736.3 km² now, heading for about 770 km²), changing the coastline and the shallow sea environments beside it. Its management is planning control over what is reclaimed, where and when. One case manages a hole left in the land; the other manages new land made from the sea — both are human-made landforms, and both carry rules because the quality of the environment is what is at stake.

Practice questions

Scaffolded

Q1. Using Figure 3D.1, name the human cause behind each change. (3 marks)

(a) Bare soil and loose gullies on steep country after stock eat the ground cover. (b) A deepened, widened walking track on a popular trail. (c) A new industrial island made by joining several small islands with fill.

Q2. Copy the sentences and fill each gap with *erosion*, *deposition* or *sediment*. (3 marks)

(a) The sand, silt and mud that moved rock is broken into is called _____. (b) The picking up and carrying away of soil and rock is _____. (c) The dropping of carried material where water or wind slows down is _____.

Q3. Put the steps of the walking-track chain from Figure 3D.2 in order by numbering them 1–5. **(2 marks)**

Step	Number
Rain and wind move the loose soil downhill.	
Thousands of boots walk the same track.	
A gully forms; sediment washes into the stream.	
Plants are crushed and die.	
No roots are left to hold the soil.	

Q4. Read Figure 3D.3. **(3 marks)**

(a) About how many times bigger was the land used for oil palms in 2020 than in 1970? **(b)** Name the two countries that hold about 70 per cent of this land. **(c)** What does the cleared land lose that makes erosion faster?

Q5. Read Figure 3D.5. **(3 marks)**

(a) How much bigger is Singapore’s land area in the mid-2020s than in the 1960s? **(b)** What is the name for building new land from the sea? **(c)** Name one place shown in the figure that stands on the new land.

Q6. Read Figure 3D.6. **(3 marks)**

(a) Which labelled weir is closest to the sea, and in which year was it built? **(b)** Mildura’s weir holds the river at 34.4 m. Which state is Mildura in? **(c)** Give one reason, from the theory, why the weirs were built as a staircase.

Q7. Read Figure 3D.8. **(3 marks)**

(a) How much electricity can the Three Gorges power station generate? **(b)** About how long is the reservoir behind the wall? **(c)** What happens to the river’s sediment at the dam, and what does that mean for the lower river?

Q8. Using Figure 3D.9, match each problem to its management response. **(3 marks)**

(a) A dune track is blowing out after the plants were trampled. **(b)** Native fish cannot get past a weir to breed upstream. **(c)** A wetland no longer gets the floods it depends on.

Unscaffolded

Q9. “Erosion in one place is deposition somewhere else.” Explain this sentence using one human cause from Figure 3D.1 or 3D.2. **(3 marks)**

Q10. River regulation gives people steady water, but it changes riverine and wetland environments. Using the Murray staircase (Figure 3D.6) or the Three Gorges Dam (Figure 3D.8), describe two of those changes. **(4 marks)**

Q11. The Ranger mine sits surrounded by Kakadu National Park. Explain why its closure is described as “cleanup becomes the main job”, and who makes sure the cleanup is done well. **(3 marks)**

Q12. *Evaluate* means to weigh both sides in a fair way before giving your view. “The weirs on the River Murray do more good than harm.” Give the strongest fair argument for each side, then give your own view with a reason. **(4 marks)**

Evidence-based response

Q13. Your local landform proposal. Choose one landform within easy reach of your school — a creek bank, a dune, a hillside, a beach, a reservoir shore, a quarry face. Using the cycle in Figure 3D.10:

(a) Describe the landform and one way people are changing it (one or two sentences of specific evidence: what you would observe or measure). **(2 marks)** **(b)** Name the human cause from Figure 3D.1 that best matches your evidence. **(1 mark)** **(c)** Propose one way of managing or protecting the landform, drawn from the response types in Figure 3D.9. Say how your proposal would balance the views of at least two different groups with an interest in the place (for example: walkers, nearby residents, farmers, a local club, the council). **(3 marks)** **(d)** List one source you would check (for example a council plan, a park notice, a map) so your proposal rests on evidence, not opinion. **(1 mark)**

Your notes from this task also feed the fieldwork reporting you will learn in 6C.

Answers

Q1. (a) Introduced species (and farming/grazing pressure). (b) Recreation and tourism. (c) Urban development (reclamation) — or mining/quarrying for the fill; accept either with the figure's wording.

Q2. (a) sediment. (b) erosion. (c) deposition.

Q3. 1 Thousands of boots walk the same track. 2 Plants are crushed and die. 3 No roots are left to hold the soil. 4 Rain and wind move the loose soil downhill. 5 A gully forms; sediment washes into the stream.

Q4. (a) About ten times (3 to almost 30 million hectares). (b) Indonesia and Malaysia. (c) The trees and leaf litter that break the fall of rain, and the roots that bind the soil.

Q5. (a) $736.3 - 580 \approx 156$ square kilometres bigger. (b) Land reclamation. (c) Any of Marina Bay, Changi Airport, Jurong Island.

Q6. (a) Weir 1, Blanchetown, built 1922. (b) Victoria. (c) The land rises gently upstream, so each weir holds a flat pool one step higher, like a staircase, letting boats and water travel up a river that would otherwise be too shallow.

Q7. (a) 22,500 megawatts. (b) About 660 kilometres. (c) Sediment is trapped behind the wall, so much less sand and mud reaches the lower river.

Q8. (a) Boardwalks, fences and replanted dunes. (b) A fishway (fish ladder or lift). (c) Planned releases of water for the environment.

Q9–Q13. See fully-worked solutions.

Fully-worked solutions

Q9. (3 marks) Pick one cause and follow the material. Example — land clearing on a slope (Figure 3D.2, chain 2): clearing removes the plants and roots that protect and bind the soil, so heavy rain strips soil off the slope — that loss is **erosion** (1 mark). The stripped soil does not vanish; the rain and the stream it enters carry it downslope (1 mark). Where the water slows — at the bottom of the slope, in a bend, or in the waterway below — the carried material is dropped as **deposition**, building sediment bars and mud in the waterway. The slope loses landform and the waterway gains one; the same moved material appears at both ends of the journey (1 mark).

Q10. (4 marks) Two of the following, named and explained. *Still water replaces flowing water*: behind each weir (Figure 3D.6) the river is held as a flat pool, so species that need flowing water — certain fish, insects and plants — lose their habitat (2 marks). *Sediment is trapped*: the slowed water drops its sand and mud in the pool (as at Three Gorges, Figure 3D.8), so the pool shallows and the lower river is starved of sediment, which can change its banks and bars downstream (2 marks). *Fish are blocked*: walls stop fish that must move upstream to breed; the Basin has about 10,000 such barriers (2 marks). *Floods are flattened*: below the dams the natural flood pulse that wetlands rely on is reduced, and wetland environments can dry out (2 marks). (Any two, 2 marks each.)

Q11. (3 marks) The mine dug open pits and left waste rock and disturbed ground in country surrounded by a national park, so when production ended in 2021 the work that remained was repairing the land — reshaping, covering and replanting the disturbed ground until it is safe and stable (1 mark). The law requires rehabilitation to a standard suitable for the land to join Kakadu National Park, which is a higher bar than ordinary mine closure (1 mark). A Commonwealth Supervising Scientist independently oversees and checks the work (1 mark).

Q12. (4 marks) *Fair case for “good”*: in a dry country whose river inflow swings from 120 GL to 7,130 GL a year (Figure 3D.7), the staircase stores wet-year water for dry years; towns, irrigation farms and paddle traffic all depend on the reliable level the weirs hold (2 marks, must be a genuine argument, not a straw man). *Fair case for “harm”*: regulation turns flowing river into still pools, traps sediment, blocks fish, and flattens the floods that wetlands need, so riverine and wetland environments are poorer for it (1 mark). *Your view with a reason*: accept any reasoned position, including “both — keep the weirs but run them better (water for the environment, fishways)”; the mark is for the view following from the two weighed cases (1 mark).

Q13. (7 marks) *Model response (a creek bank in a suburban park).* **(a)** “The creek bank below the footbridge is bare and undercut for about ten metres; the desire-line track down to it is 1.5 m wide with no grass left on it.” — specific, measurable evidence (2 marks). **(b)** Recreation and tourism (foot traffic) — or farming/grazing if dogs/off-track use is the cause named; must match the evidence (1 mark). **(c)** Proposal, e.g. a fenced rerouted track with a small viewing platform and replanted bank (response type: boardwalks, fences, replanting). Balance: walkers keep safe creek access via the platform and a maintained track; residents and the council gain a stable bank that sheds less sediment into the creek; the loss (no scrambling down the bank) is accepted in exchange for a better defined access (3 marks — one for the proposal, two for a genuine balance of two named groups). **(d)** One source, e.g. the council’s open-space or creek management plan, a park management notice, or a Vicmap/topographic map of the reach (1 mark).

§2A RECORDED SCOPE DECISION

Aboriginal and Torres Strait Islander content — deliberately not covered. This section does not teach Aboriginal and Torres Strait Islander knowledge, cultures or histories. For VC2HG8K15 this means elaboration .E06 (how First Nations culture and knowledge bear on landform use and management) is **excluded**, and the retained elaboration .E05 is taught **with the words “including Traditional Owners” removed** from its stakeholder-groups proposal. Teachers seeking that content must source it directly with the relevant communities under the appropriate protocols.

Geomorphological hazards: causes, impacts and responses

Geography 7 · Chapter 3 — Landforms and landscapes · Section 3E

For the teacher — VC2 codes: VC2HG8K16 (*Victorian Curriculum F–10 Version 2.0, Geography, Levels 7 and 8, VCAA*).

This section draws on VC2HG8K16.E01, VC2HG8K16.E02, VC2HG8K16.E03 and VC2HG8K16.E04 for MCQ and coverage linking.

Theory

Start with what you know

In 3C you met the processes that build landforms — weathering, erosion, and the moving and dropping of rock material — and in 3D you saw how people change landforms. Most of the time those processes are slow and quiet. Sometimes they are not. Sometimes the ground shakes, a slope gives way, a volcano erupts, or waves arrive that nobody wanted. When a land process like that can harm people, property or places, geographers call it a **geomorphological hazard**.

You have already done this kind of thinking. In Chapter 1 you studied atmospheric and water hazards — droughts, storms, floods and tropical cyclones (Section 1E) — and the idea of a hazard itself comes from your earlier years of schooling. This section uses the same shape of thinking on a new family of hazards: the ones that come from the land itself.

Defining the terms first

geomorphological hazard — a natural land process that can harm people, property or places.

“Geomorphological” simply means “about how landforms are made and changed” (the same word you met in 3C). This section’s hazard family is the one named by the curriculum: **volcanic eruption, earthquake, tsunami, landslide and avalanche**.

hazard versus disaster — this section uses these words with care. A *hazard* is a land process that *could* harm people; it becomes a *disaster* when it actually does, and the people affected cannot cope on their own. An earthquake of the same size is a hazard in an empty desert and a disaster under a city. Other meanings of both words exist; these are the ones used here.

magnitude — the number that says how much energy an earthquake released. It is measured from the shaking recorded by instruments. Each whole step up (say, 5.0 to 6.0) means a much bigger earthquake.

prevention, preparedness, response, recovery — the four stages the curriculum names for managing hazards: reducing risk before an event; getting ready for one; acting during and just after it; and rebuilding afterwards. Section 6 below explains each one.

1. One family, five hazards

The five hazards in this section look different, but they belong together for one reason: all of them move material on the Earth’s surface, suddenly. Rock, molten rock, water, soil, snow or ice — something that was sitting still starts moving fast, and people in its path are in danger.

The five families of geomorphological hazards

A geomorphological hazard is a natural land process that can harm people, property or places

	Earthquake	Volcanic eruption	Tsunami	Landslide	Avalanche
What it is	The ground shakes as rock underground breaks or slips	Molten rock, ash and gas escape from inside the Earth	A series of ocean waves with very long wavelengths	Rock, soil and debris slide down a slope	Snow and ice slide down a mountain slope
Main cause	Sudden movement along a break in the Earth's crust	Pressure from molten rock beneath the crust	An undersea earthquake or volcanic eruption lifts or drops the sea floor	A steep slope becomes weak, often after heavy rain	A steep slope loaded with deep or loose snow
How fast it starts	Seconds — no warning before the shaking	Hours to days of signs, or almost no warning	Hours across the open ocean after the trigger	Minutes, often during or just after heavy rain	Seconds, often triggered by new snowfall or warming
Where it happens	Mostly near plate boundaries; some within plates	Mostly near plate boundaries	Coasts facing undersea earthquake and volcano zones	Steep slopes in hills and mountains, and cut slopes	Snow mountains; in Australia, only the alpine southeast

All five move material on the Earth's surface suddenly — that is why they belong to one hazard family

Table chart of the five geomorphological hazards — earthquake, volcanic eruption, tsunami, landslide and avalanche — with rows describing what each one is, its main cause, how fast it starts and where it happens

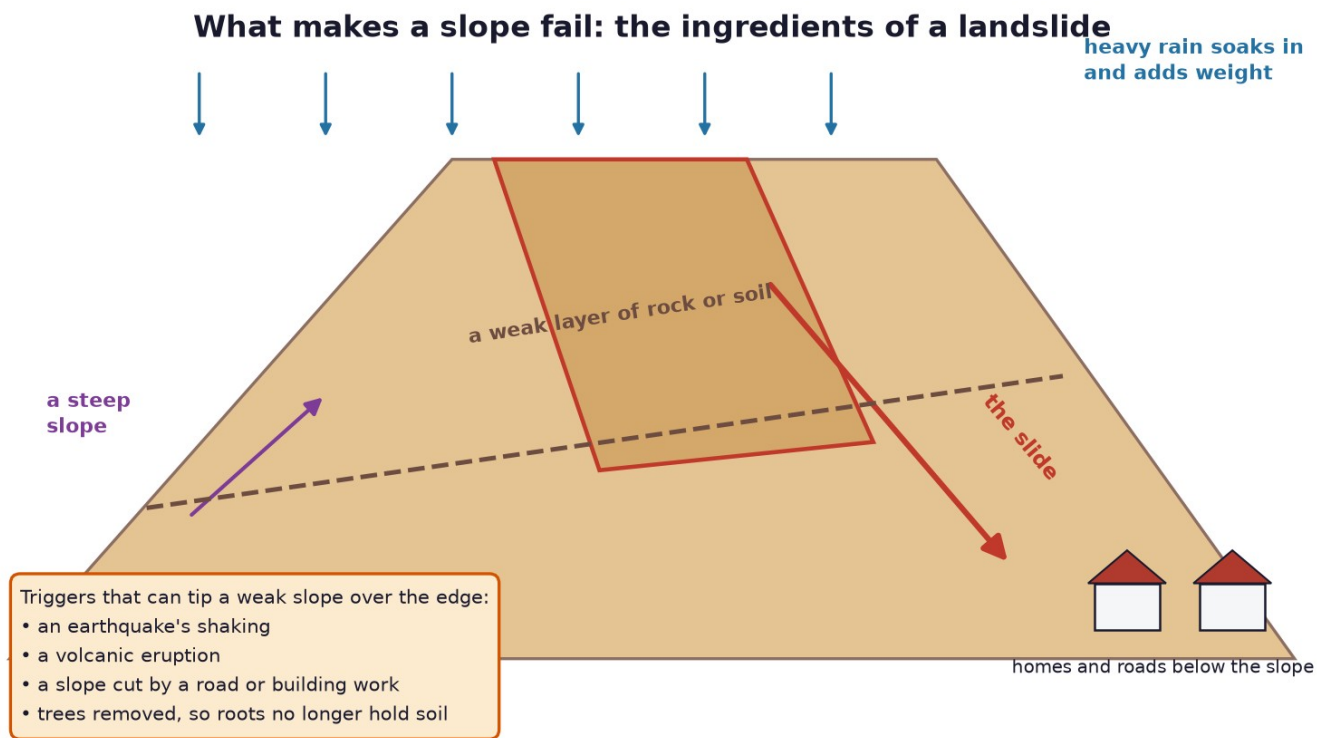
Notice the “how fast it starts” row. Earthquakes give no warning at all. Volcanoes often show signs for hours or days first. Tsunamis travel across the open ocean for hours before they reach the coast — which, as you will see, leaves time to warn people. That difference in timing is one of the big reasons the responses in Section 6 look the way they do.

2. Causes: why the ground moves

The Earth's outer shell is not one piece. It is cracked into enormous slabs called **plates**, which move only centimetres a year — about as fast as your fingernails grow — but they never stop. Most of the action in this section happens where plates meet (at **plate boundaries**) or, less often, in the middle of a plate.

- **Earthquakes.** Rock underground bends slowly as plates push and pull. When it can bend no further, it cracks or slips along a break, and the stored-up spring snaps out as waves of shaking. The point underground where the slip starts is the **focus**; the place on the surface directly above it is the **epicentre**. Most earthquakes are small, but near plate boundaries they can be very large.
- **Volcanic eruptions.** Deep rock can melt into molten rock, which pushes upward through cracks in the crust. When it reaches the surface it erupts as **lava**, ash and gas. Eruptions can also blast rock apart, build new mountains, or — if they happen under the sea — push the ocean out of the way.
- **Tsunamis** are started by something else: an undersea earthquake, eruption or landslide suddenly lifts or drops a large area of the sea floor, and the whole ocean above it moves. Out in deep water a tsunami is low and very long, and travels as fast as a plane. Near the coast it slows down and piles up into a dangerous rush of water. (The word is Japanese for “harbour wave”.)
- **Landslides.** Gravity is always pulling on every slope. A slope holds itself up because of its rock and soil strength and the roots of its plants. When something weakens a slope — heavy rain soaking in, an earthquake's shaking, or people cutting into it — gravity wins, and rock, soil and debris slide down. The figure below shows the ingredients.

- **Avalanches** are the same idea in snow: a steep slope loaded with deep or loose snow lets go all at once.



Cross-section of a hillside showing the ingredients of a landslide — a steep slope, a weak layer of rock or soil, heavy rain soaking in and adding weight, and a wedge sliding down towards homes below — with a list of triggers including earthquake shaking, volcanic eruption, road cuttings and tree removal

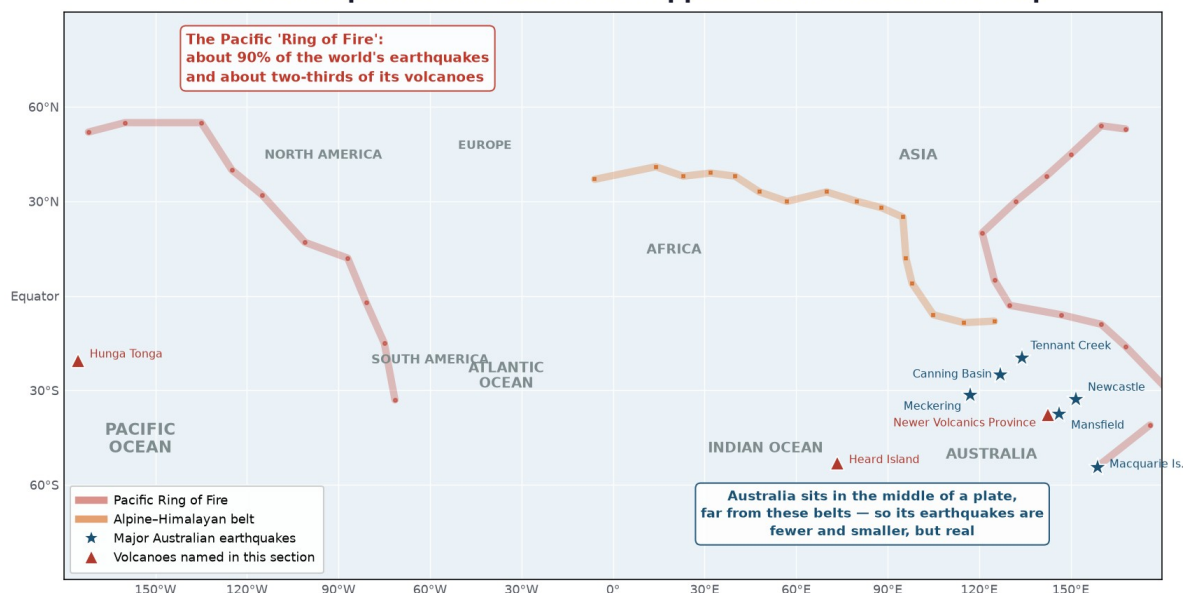
One point matters for the rest of the section. These events are natural — people do not cause earthquakes or eruptions. But people change how often they happen in some cases (Section 5) and, much more, how badly they hurt (Section 4).

3. Where hazards happen

This is the spatial question of the section: *where* do these events happen, and why there? (VCAA's elaboration VC2HG8K16.E01 asks you to investigate "the causes and spatial distribution of a geomorphological hazard".)

The world pattern. Earthquakes and volcanoes are not spread evenly over the Earth. They crowd along plate boundaries. The busiest line is the **Pacific Ring of Fire**, which runs around the edge of the Pacific Ocean — through New Zealand, Indonesia, Japan, Alaska and down the west coast of the Americas. About 90 per cent of the world's earthquakes happen along it, and it holds about two-thirds of the world's volcanoes (figures reported by the US Geological Survey). A second busy line, the Alpine–Himalayan belt, runs from the Mediterranean through the Himalayas to Indonesia.

Where earthquakes and volcanoes happen: a schematic world map

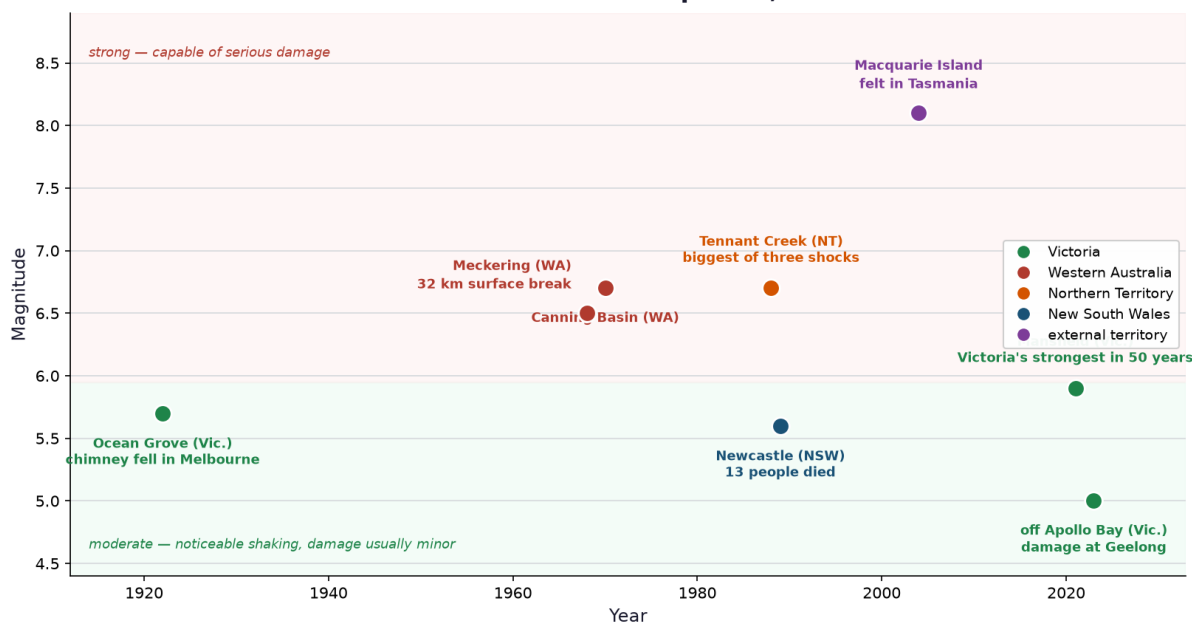


Belts traced through the named plate-boundary regions; event points plotted at their true coordinates; continents not drawn. Earthquake points from the Geoscience Australia catalogue; ring statistics after the US Geological Survey.

Schematic world map showing the Pacific Ring of Fire and the Alpine-Himalayan belt, with points marking major Australian earthquakes at Newcastle, Mansfield, Meckering, Tennant Creek, Canning Basin and Macquarie Island, and volcanoes at the Newer Volcanics Province, Heard Island and Hunga Tonga

Australia's pattern. Look at that map and find Australia: it sits in the middle of a plate, far from the belts. That is why Australian earthquakes are fewer and smaller than those in Japan or Chile — but they are real. The dot chart below plots eight sizeable Australian earthquakes from the Geoscience Australia catalogue. They span the continent — from Western Australia across to Victoria — and the biggest on the list (Macquarie Island, 2004, magnitude 8.1) happened far south of Tasmania.

Selected Australian earthquakes, 1922-2023



Eight of many recorded events, chosen to show that sizeable earthquakes have been felt across Australia: the eight shown span four states and territories plus one external territory. Data: Geoscience Australia catalogue.

Dot chart of eight Australian earthquakes from 1922 to 2023 plotted by year and magnitude, colour-coded by state, from Ocean Grove 1922 to Apollo Bay 2023

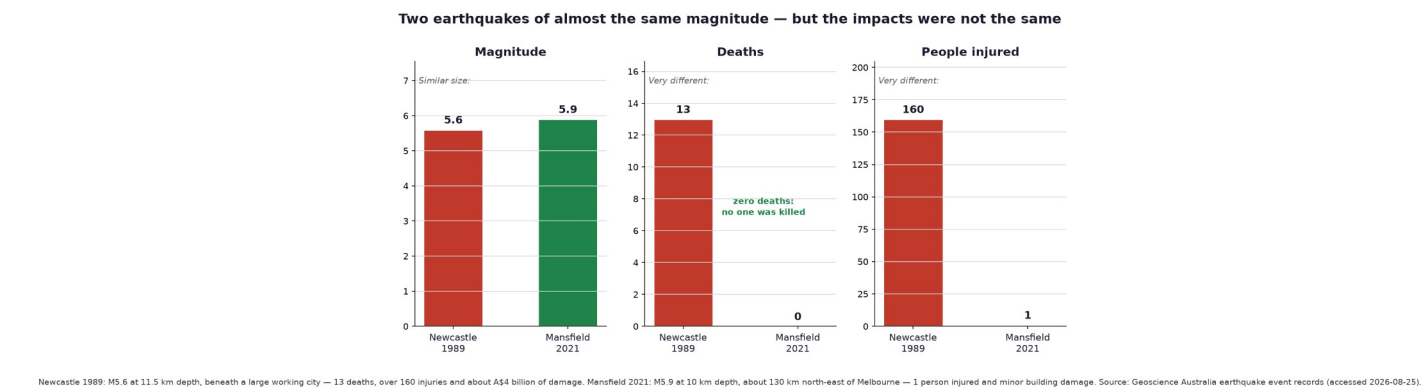
Victoria has its own earthquake record: a shock at Cape Schanck in 1855 caused minor damage in Melbourne; a magnitude 5.7 earthquake under Ocean Grove in 1922 collapsed a chimney as far away as Glen Iris; and on 22 September 2021 a magnitude 5.9 earthquake near Mansfield — Victoria's strongest in 50 years — made buildings up to 50 storeys sway for up to 20 seconds and damaged chimneys and building fronts in Melbourne, about 130 km away. A magnitude 5.0 earthquake off Apollo Bay on 22 October 2023 caused more minor damage.

Where tsunamis come from. Australia is an island, so tsunami sources matter here. The Bureau of Meteorology’s tsunami warning centre points out that Australia is ringed to the north-west, north-east and east by about 8,000 km of active plate boundary — close enough that tsunami waves could reach our coast within two to four hours. That is not long, but it is enough time to warn people, if someone is always watching (Section 6).

Australian volcanoes. Victoria and South Australia share the **Newer Volcanics Province**, a volcanic field of more than 400 small volcanoes. It last erupted about 5,000 years ago, at Mount Schank and Mount Gambier. Australia’s only *active* volcanoes are far away in the Southern Ocean: Heard Island and the McDonald Islands, where lava has flowed in most years since 2008 and one island more than doubled in size between 1994 and 2004. **Avalanches** need deep snow: in Australia that means the Australian Alps in the south-east, where Mount Kosciuszko (2,228 m) and Victoria’s Mount Bogong (1,986 m) are the highest peaks. Australia’s snow slopes are far lower and gentler than the great mountain ranges of the world, and no avalanche disaster is recorded here — but ski patrols still manage the risk on steep snow slopes, as they would in any snow country.

4. What shapes the impacts

Here is the puzzle at the heart of VC2HG8K16.E03: two earthquakes of almost the same magnitude can have very different impacts. Compare the two below.

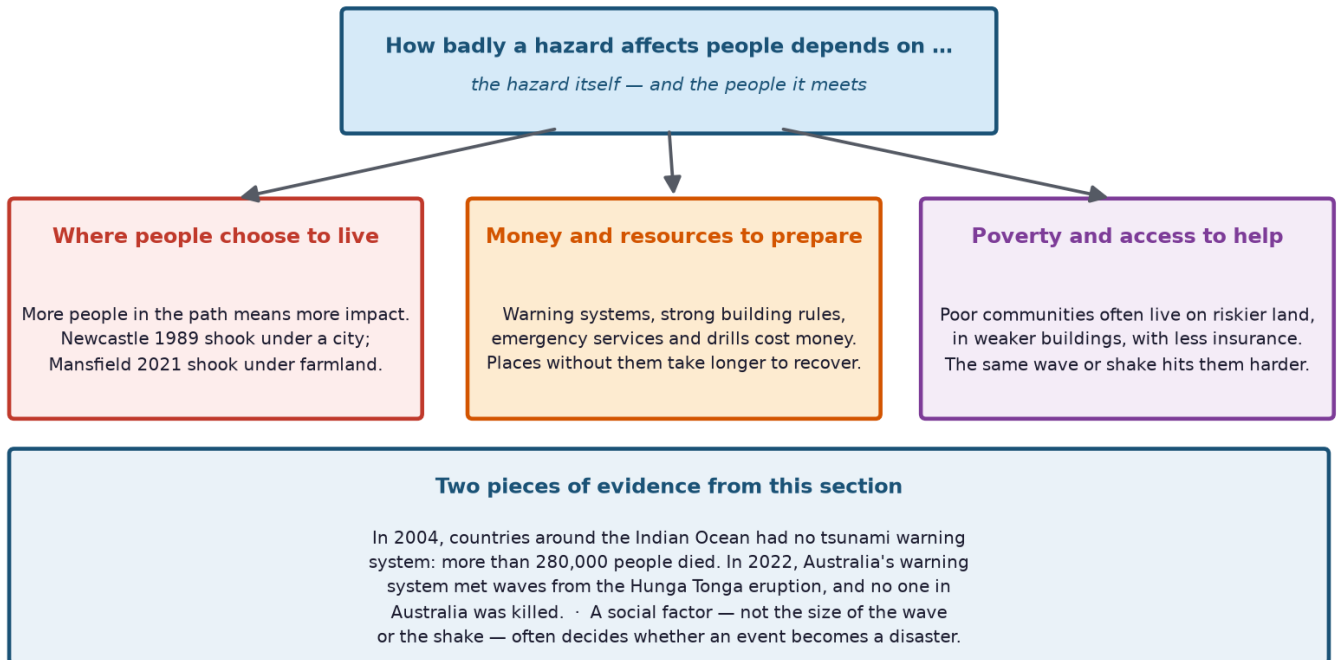


Three bar charts comparing the Newcastle 1989 and Mansfield 2021 earthquakes — similar magnitude (5.6 and 5.9), but 13 deaths against zero, and over 160 people injured against one

The Mansfield earthquake was actually the *bigger* of the two — yet Newcastle lost 13 people and Mansfield lost none. The difference is not in the ground; it is in what was sitting on the ground. Newcastle 1989 shook under a large working city, with older brick and masonry buildings not built for shaking. Mansfield 2021 shook mainly under forest and farmland, and Victoria’s modern buildings swayed rather than broke. The size of the event sets the *possible* impact; the people and places in its path set the *actual* impact.

Three groups of factors do most of the shaping.

Why the same size event can be a small incident in one place and a disaster in another



Concept map of the factors that shape hazard impacts — where people choose to live, money and resources to prepare, and poverty and access to help — with an evidence strip comparing the 2004 Indian Ocean tsunami and the 2022 Hunga Tonga tsunami

- **Where people choose to live.** Coasts, valleys and volcanic slopes are often beautiful, fertile and good for trade — so people settle there, in the very places hazards can reach.
- **Money and resources to prepare.** Warning systems, strong building rules, emergency services and drills all cost money. Places that can afford them lose fewer people and rebuild faster.
- **Poverty and access to help.** Poorer communities often live on the riskiest land in the weakest buildings, with less insurance and fewer services, so the same event hits them harder and recovery takes longer.

One comparison makes the point sharply. On 26 December 2004 a magnitude 9.2 earthquake off Sumatra — the fourth largest recorded since 1900 — sent tsunami waves into 11 countries around the Indian Ocean, where no tsunami warning system existed; more than 280,000 people died. On 15 January 2022, waves from the Hunga Tonga eruption reached Australia's east coast — and Australia's warning system met them: warnings went out, beaches and harbours were cleared, and nobody in Australia died. The two events were not the same size, but the contrast still stands: whether people know the waves are coming changes what a tsunami can do.

5. People and hazards: a two-way street

VC2HG8K16.E02 asks how far *human alteration of environments* has helped cause geomorphological hazards, or made their impacts worse. People cannot start earthquakes or eruptions, but in three ways we are part of the story.

- **We weaken slopes.** Cutting a slope for a road or building work removes the support holding it up, and clearing trees removes the roots that bind soil. Victoria's Great Ocean Road knows this well: its limestone and sandstone cliffs are worn by erosion, and landslides closed sections near Lorne in August 1964 and again in 1971, with heavy rain bringing down a cutting in January 2011. Signs along the road warn of rockfalls for exactly this reason.
- **We add water and weight.** Leaking pipes and drains soak slopes that were built to stay dry. At Thredbo in the NSW Snowy Mountains on 30 July 1997, two ski lodges were destroyed by a landslide in the night; 18 people died, and only Stuart Diver survived, trapped for 65 hours before rescue. Heavy rain and melting snow were part of the build-up, and a leaking water main was also named among the causes.

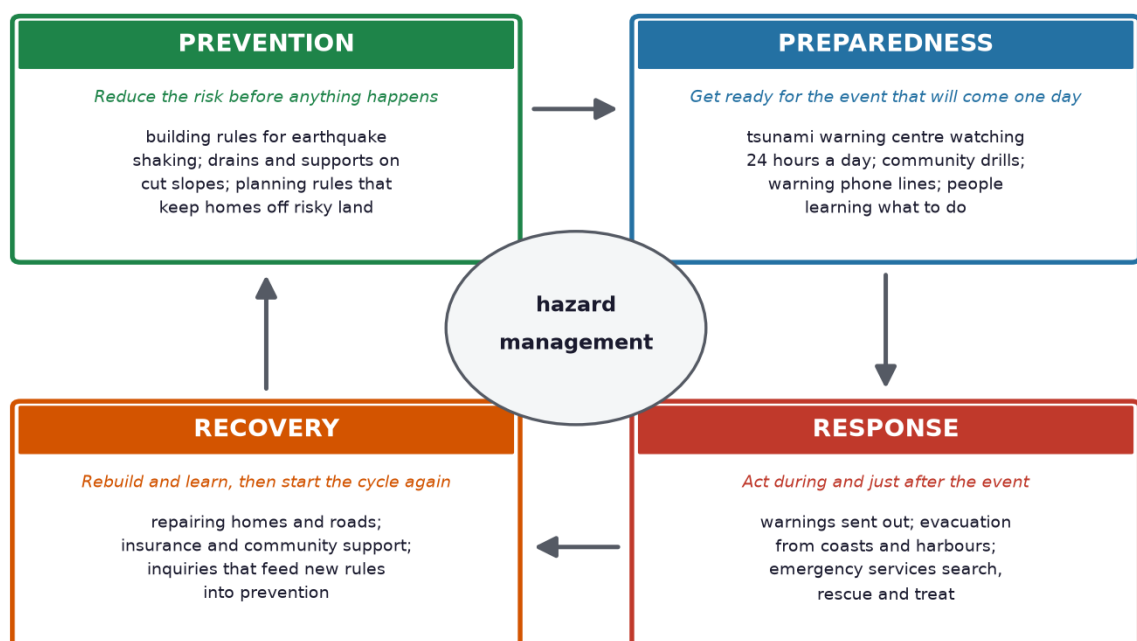
- **We choose to live in the path.** Building cities, ports and holiday towns on coasts, volcanic slopes and flood-prone flats does not cause the hazard — but it multiplies the impact when the hazard arrives. Newcastle's damage bill in 1989 was about A\$4 billion (around \$9.5 billion in 2022 values) mainly because a working city stood above the focus.

The street runs the other way too: because people understand causes, they can reduce impacts — which is the next section.

6. Responses: the four-stage cycle

VC2HG8K16.E04 asks how putting **prevention, preparedness, response and recovery** into practice reduces the harm geomorphological hazards do. The four stages form a cycle, because recovery feeds the lessons back into prevention.

The four stages of hazard management — a cycle, not a line



Events cannot always be prevented — earthquakes cannot be stopped — but every stage of the cycle can stop an event becoming a disaster.

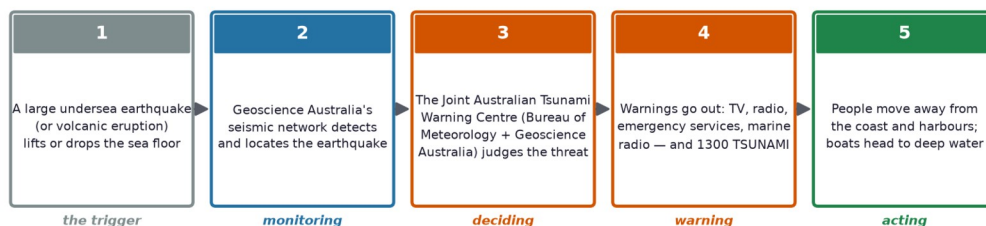
Cycle diagram of the four stages of hazard management — prevention, preparedness, response and recovery — each with Australian examples such as building rules, the tsunami warning centre, evacuation and rebuilding

- **Prevention** means reducing risk before anything happens: engineering drains and supports into cut slopes, building rules that let structures ride out shaking, and planning rules that keep new homes off the riskiest land. Some events cannot be prevented at all — no one can stop an earthquake — so prevention really means stopping an event from becoming a disaster.
- **Preparedness** means getting ready. Australia's clearest example is tsunami warning. The **Joint Australian Tsunami Warning Centre** — run together by the Bureau of Meteorology and Geoscience Australia — watches around the clock, using a national network of earthquake detectors and deep-ocean buoys. The Australian Government committed \$68.9 million to build the Australian Tsunami Warning System by 2009, after the 2004 disaster showed what happens without one. Anyone can call 1300 TSUNAMI (1300 878 6264) for the latest information.
- **Response** is acting during and just after the event: warnings go out on TV, radio and marine radio; people move away from coasts and harbours and boats head for deep water; emergency services search, rescue and treat. At Thredbo, rescuers worked through the night and for two and a half days to reach the people buried under the lodges.

- **Recovery** is rebuilding afterwards: repairing homes and roads, supporting people and businesses, and holding inquiries so the next round of prevention starts wiser.

The warning chain below is worth learning step by step — Worked Example 2 runs a real event through it.

From undersea earthquake to public warning: Australia's tsunami warning chain



The centre watches around the clock. Australia is ringed by about 8,000 km of plate boundary that can send tsunami waves to our coast within two to four hours — enough time to warn, if the system is listening.

Five-step flow chart of Australia's tsunami warning chain, from an undersea earthquake lifting the sea floor, through Geoscience Australia's earthquake detection and the Joint Australian Tsunami Warning Centre's decision, to warnings on TV, radio and 1300 TSUNAMI, and people moving away from the coast

Worked examples

Example 1 — scaffolded

Compare the Newcastle (1989) and Mansfield (2021) earthquakes, then explain why their impacts were so different.

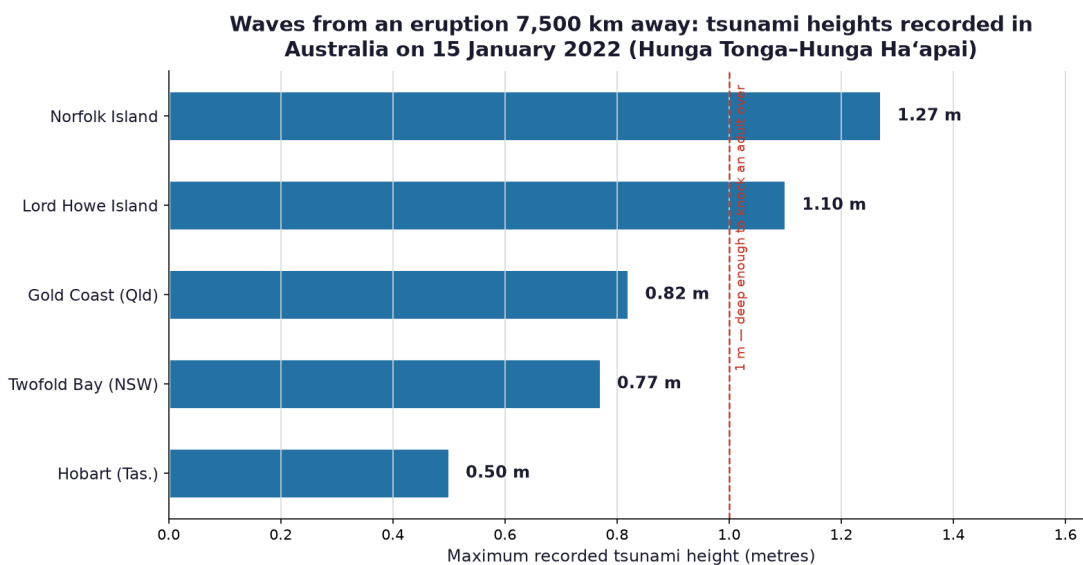
Question	Working
1. How big was each earthquake, and where did each sit relative to people?	Newcastle: magnitude 5.6, depth 11.5 km, beneath a large working city. Mansfield: magnitude 5.9, depth 10 km, about 130 km north-east of Melbourne, near the small town of Mansfield.
2. Read the impacts from the figure.	Newcastle: 13 deaths, more than 160 people injured, about A\$4 billion of damage. Mansfield: one person injured, minor building damage (at least 46 reported cases of damage such as cracked chimneys and building fronts in Melbourne).
3. Which earthquake was bigger?	Mansfield (5.9 beats 5.6) — so size alone cannot explain the impacts.
4. Use the three factor groups from Section 4.	<i>Where people live:</i> one shook under a large city, the other under forest and farmland. <i>Resources:</i> 1989 Newcastle had many older masonry buildings not built for shaking; 2021 Victoria had modern buildings designed to sway. <i>Access to help:</i> both had emergency services, but the shaking under a dense city multiplied what there was to damage.

Conclusion: the magnitude sets the *possible* impact; exposure — who and what stands in the path — sets the *actual* impact. That is exactly what VC2HG8K16.E03 means by social, cultural and economic factors shaping impacts.

Example 2 — scaffolded

Trace the Hunga Tonga eruption of 15 January 2022 through Australia's warning chain.

Stage	What happened in this event
1. The trigger	The Hunga Tonga–Hunga Ha'apai volcano (near Tonga) erupted in a huge explosion, disturbing the sea over a wide area.
2. Detection	Geoscience Australia's instruments recorded the eruption and its effects; tide gauges and deep-ocean buoys watched for waves.
3. The decision	The Joint Australian Tsunami Warning Centre judged the threat to Australia's coast.
4. The warning	The Bureau of Meteorology issued a land warning for Norfolk Island and Lord Howe Island and a marine warning for the east coast — including Victoria, Tasmania and Queensland.
5. The response	People stayed away from beaches and harbours; boats moved to deep water.
6. The result	Waves arrived but stayed small: 1.27 m at Norfolk Island, 1.10 m at Lord Howe Island, 0.82 m at the Gold Coast, 0.77 m at Twofold Bay and 0.50 m at Hobart. No one in Australia was killed.



The Bureau of Meteorology issued a land warning for Norfolk Island and Lord Howe Island and a marine warning for the east coast, including Victoria, Tasmania and Queensland. No one in Australia was killed.

Horizontal bar chart of maximum tsunami heights recorded in Australia on 15 January 2022 after the Hunga Tonga eruption — 1.27 m at Norfolk Island down to 0.50 m at Hobart — with a marker line at 1 metre

Conclusion: a large eruption on the other side of the Pacific became a managed incident in Australia, because preparedness (a watching centre) met response (warnings and people acting on them). The cycle works.

Practice questions

Scaffolded

Q1. In your own words, write this section's working definitions for: (a) geomorphological hazard; (b) the difference between a hazard and a disaster; (c) magnitude.

Q2. Name the five members of this section's hazard family. For each one, write one sentence saying what starts it.

Q3. Using the world belts map: (a) name the two belts where most earthquakes and volcanoes crowd; (b) about what share of the world's earthquakes happens along the Pacific Ring of Fire? (c) why does Australia sit outside both belts?

Q4. Using the Australian earthquakes dot chart: (a) which event was the biggest, and where did it happen? (b) list the three Victorian earthquakes shown, with their years and magnitudes; (c) which earthquake caused the most deaths, and in what year?

Q5. Using the warning chain figure: (a) name the two agencies that run the Joint Australian Tsunami Warning Centre together; (b) how long after a nearby undersea earthquake could tsunami waves reach Australia's coast? (c) what should people do when a tsunami warning is issued?

Q6. Using the slope failure cross-section, list the four ingredients or triggers that can make a slope fail.

Q7. Section 5 says people and hazards run "a two-way street". Give: (a) two examples of human alteration that can contribute to landslides; (b) one example of a place where people's choices about where to live multiplied a hazard's impact.

Q8. Copy this table and sort each action into one stage of the cycle (prevention, preparedness, response or recovery): (a) deep-ocean buoys watch for tsunami waves; (b) a town repairs its roads after an earthquake; (c) planning rules stop new homes being built on a known landslide slope; (d) people move away from the beach when a warning is issued.

Unscaffolded

Q9. "The size of the event sets the possible impact; the people and places in its path set the actual impact." Explain this claim using the Newcastle and Mansfield earthquakes as your evidence.

Q10. Choose a real Victorian place you know (a town, a stretch of coast, or the Alps). Which one or two members of the hazard family could reach it, and why? Use what Section 3 says about where hazards happen.

Q11. A classmate claims: "*Nobody should be allowed to build homes where geomorphological hazards can happen.*" Put that claim in its strongest form, then put the opposing view in its strongest form (think about cities like Newcastle, and what "moving" would cost). Use evidence from this section to say which view the evidence supports better — and remember the mark is for the quality of both steelmanned views, not for which side you land on.

Q12. Two coastal towns of the same size face the same tsunami warning. One has a warning system, drills and strong building rules; the other has none of these. Explain, using the three factor groups from Section 4, why the impacts would differ.

Extended response — evidence-based written task

Q13. *Explain how putting prevention, preparedness, response and recovery into practice reduces the harm geomorphological hazards do.*

Write about one page. Your response must:

- use **two** Australian cases from this section (for example, the Newcastle earthquake, the Mansfield earthquake, the Thredbo landslide, or the Hunga Tonga tsunami of 2022);
- name and explain **all four** stages of the cycle, with at least one real action at each;
- refer to at least one figure from this section and one entry from the source list;
- finish with a sentence stating which stage you think matters most for Australia, and why.

Success checklist: terms defined; both cases described accurately with dates; all four stages named with real actions; a figure and a source referred to; a reasoned closing choice.

Answers

Q1. (a) A natural land process that can harm people, property or places. (b) A hazard *could* harm people; a disaster is when it does, and the people affected cannot cope on their own. (c) The number saying how much energy an earthquake released, measured from recorded shaking. **Q2.** Earthquake (rock cracking or slipping underground); volcanic eruption (molten rock, ash and gas escaping from inside the Earth); tsunami (the sea floor suddenly lifting or dropping); landslide (a weakened slope letting go under gravity); avalanche (a steep snow slope letting go). **Q3.** (a) The Pacific Ring of Fire; the Alpine–Himalayan belt. (b) About 90 per cent. (c) Because it sits in the middle of a plate, far from plate boundaries. **Q4.** (a) Macquarie Island, 2004, magnitude 8.1. (b) Ocean Grove 1922 (5.7); Mansfield 2021 (5.9); off Apollo Bay 2023 (5.0). (c) Newcastle, 1989. **Q5.** (a) The Bureau of Meteorology and Geoscience Australia. (b) Within two to four hours. (c) Move away from the coast and harbours; boats head to deep water; follow official warnings. **Q6.** A steep slope; a weak layer of rock or soil; water soaking in (such as heavy rain); and triggers such as earthquake shaking, an eruption, a road cutting, or tree removal. **Q7.** (a) Any two of: cutting slopes for roads or buildings; clearing trees; adding water through leaking pipes; adding weight on slopes. (b) Newcastle 1989 (a city stood above the focus); Thredbo lodges; Great Ocean Road settlements and traffic. **Q8.** (a) Preparedness. (b) Recovery. (c) Prevention. (d) Response. **Q9–Q12.** See fully-worked solutions for what a good answer contains. **Q13.** Marked against the success checklist.

Fully-worked solutions

Q9. Model answer: Newcastle 1989 (M5.6) and Mansfield 2021 (M5.9) were almost the same size — Mansfield was slightly bigger — yet Newcastle had 13 deaths, over 160 injuries and about A\$4 billion of damage, while Mansfield had one injury and minor damage. The difference is exposure: Newcastle shook under a large city with many older masonry buildings, while Mansfield shook mainly under forest and farmland, and Victoria’s modern buildings swayed rather than broke. A good answer states the claim, checks both earthquakes against it, and names exposure (people, buildings, wealth in the path) as the deciding factor.

Q10. Model answer (Geelong and the Surf Coast): Earthquakes can reach it — Victoria’s record includes shocks at Cape Schanck, Ocean Grove, Mansfield and off Apollo Bay, and Geelong reported damage from the 2023 Apollo Bay earthquake. Tsunamis can reach it too, because the coast faces the Southern Ocean and the Bureau of Meteorology’s marine warnings cover Victorian waters. Landslides are possible on the steep, eroding cliffs along the Great Ocean Road. Marks are for naming a real place, choosing hazards that genuinely fit it, and using Section 3’s reasoning about where hazards happen.

Q11. Strongest form of the claim: hazards are predictable in *where* they strike (plate boundaries, steep slopes, coasts), and every death in a known hazard zone is avoidable, so rules should keep homes out of those zones. Strongest form of the opposing view: whole cities — Newcastle, and coastal towns down the Great Ocean Road — already stand in hazard zones, moving them is beyond any budget, and the better move is to manage the risk (building rules, warnings, drills) while accepting some exposure. Evidence from this section supports the second view as the more workable one: the Mansfield and Newcastle comparison shows impacts are shaped by what stands in the path, and the warning chain shows risk can be managed — but the first view is right that new building is the one moment when exposure can still be refused. Marks are for the quality of the two steelmanned views and the evidence used.

Q12. The town with the system loses fewer people because all three factor groups work for it: *where people live* is managed by planning and building rules; *money and resources* bought the warning system, drills and strong buildings; and *access to help* is faster because the response is rehearsed. The town without these has the same wave but none of the protection: more people in the path, weaker buildings, no warning, slower recovery. A good answer walks through all three factor groups for both towns, not just one.

Q13. Model structure: Paragraph 1 defines geomorphological hazard and the four stages. Paragraph 2 runs case one through the cycle (for example, Hunga Tonga 2022: prevention not possible for the eruption itself, preparedness as the watching centre, response as warnings and beaches cleared, recovery minimal because impacts were small). Paragraph 3 runs case two (for example, Newcastle 1989: what was missing in 1989 and what recovery had to do afterwards). Paragraph 4 names a real action at each of the four stages. Closing sentence picks a stage with a reason — preparedness is a defensible pick for Australia, because our events arrive with some warning time and our distance from the belts makes round-the-clock watching affordable.

Sources used in this section

- VCAA, *Victorian Curriculum F–10 Version 2.0*, Geography, Levels 7 and 8 — VC2HG8K16 and elaborations, via the VCAA export of 2026-07-29.
 - Geoscience Australia, earthquake catalogue and event records — the Newcastle 1989 event (M5.6, depth 11.5 km, 13 deaths, over 160 injured), the Mansfield 2021 event (M5.9, depth 10 km), Meckering 1968, Tennant Creek 1988, Canning Basin 1970, Macquarie Island 2004 and the Victorian events (Cape Schanck 1855, Ocean Grove 1922, Apollo Bay 2023), accessed via the Wikipedia articles *List of earthquakes in Australia*, *1989 Newcastle earthquake* and *2021 Mansfield earthquake* (the GA pages themselves were not retrievable as static pages on 2026-08-25); retrieved 2026-08-25.
 - Bureau of Meteorology, *Joint Australian Tsunami Warning Centre* pages (tsunami origins; the 8,000 km of plate boundary and two-to-four-hour travel times; the \$68.9 million Australian Tsunami Warning System; 1300 TSUNAMI), via archived snapshots of bom.gov.au; retrieved 2026-08-25.
 - Wikipedia, *2004 Indian Ocean earthquake and tsunami* (M9.2 off Sumatra; fourth largest since 1900; over 280,000 deaths; 11 countries hit), consistent with Geoscience Australia's summary of the event; retrieved 2026-08-25.
 - Wikipedia, *Hunga Tonga–Hunga Ha'apai eruption and tsunami* (15 January 2022; Australian wave heights 1.27 m Norfolk Island, 1.10 m Lord Howe Island, 0.82 m Gold Coast, 0.77 m Twofold Bay, 0.50 m Hobart; Bureau of Meteorology warnings); retrieved 2026-08-25.
 - Wikipedia, *1997 Thredbo landslide* (30 July 1997; 18 deaths; two lodges destroyed; Stuart Diver rescued after 65 hours; heavy rain, melting snow and a leaking water main named among the causes); retrieved 2026-08-25.
 - Wikipedia, *Great Ocean Road* (240 km from Torquay to Allansford; landslides near Lorne in August 1964 and 1971; a cutting collapse in January 2011; rockfall warnings); retrieved 2026-08-25.
 - Wikipedia, *Newer Volcanics Province* (over 400 vents; most recent eruptions at Mount Schank and Mount Gambier about 5,000 years ago), *Heard Island and McDonald Islands* (Australia's only active volcanoes; lava flows in most years since 2008; McDonald Island growing from about 1 km² to 2.5 km² between 1994 and 2004), *Pacific Ring of Fire* (about 90 per cent of earthquakes; about two-thirds of volcanoes, after the US Geological Survey), and *Australian Alps* (Mount Kosciuszko 2,228 m; Mount Bogong 1,986 m); retrieved 2026-08-25.
-

Teaching sequence (teacher note — not student-facing)

1. **Hook and terms (1 lesson).** Open on the Newcastle-versus-Mansfield comparison chart: “the smaller earthquake killed 13 people; the bigger one killed none — how?” Define the four boxed terms; use the hazard family table to settle what belongs in the family and why (sudden movement of material at the surface).
2. **Causes and distribution (1–2 lessons).** The plate model; the world belts map; the Australian dot chart; tsunami sources (8,000 km; two to four hours). Worked Example 1 lands here; Q3–Q4, Q6. Keep the earth science lean — 3C already did the processes; this section stays on *where* and *why there* (D1: geography, not geology for its own sake).
3. **Impacts and human alteration (1 lesson).** The factor map; the 2004-versus-2022 contrast; the two-way street (Great Ocean Road, Thredbo, settlement choices). Q7, Q9, Q12. Q11 is the section's steelman task — run it as a structured discussion before writing.
4. **Responses and assessment (1–2 lessons).** The four-stage cycle; the warning chain; Worked Example 2 (the Tonga event runs through every stage); Q5, Q8, Q10. Q13 is the assessed evidence-based response (the CD's own sentence — causes, impacts and responses — made visible).

Links: mirrors 1E exactly (causes and distribution → impacts → prevention, preparedness, response, recovery, VC2HG8K16.E04), so the hazard reasoning students built on atmospheric and water hazards transfers; hazard concept itself is assumed from VC2HG6K05 (Levels 5–6). The skills CDs are *not* taught here (D11); there is no fieldwork requirement in this section. **§2A:** no exclusions apply to VC2HG8K16; no First Nations material is used or required. **Coverage keys:** VC2HG8K16.E01, VC2HG8K16.E02, VC2HG8K16.E03, VC2HG8K16.E04.

Understanding environmental phenomena through interconnection and change

Geography 7 · Chapter 3 — Landforms and landscapes · Section 3F

For the teacher — VC2 codes: VC2HG8K17 (*Victorian Curriculum F–10 Version 2.0, Geography, Levels 7 and 8, VCAA*).

This section draws on VC2HG8K17.E01 and VC2HG8K17.E02 for MCQ and coverage linking.

Theory

Start with what you know

In this chapter you have already looked at Australia’s landscapes (3A), what landscapes mean to people (3B), the processes that make landforms (3C), how people change landforms (3D) and how landforms can be hazards (3E). This section joins those pieces together. It asks a bigger question: *how does a geographer make sense of something happening in the environment?* The two tools named in the curriculum are two of geography’s seven big concepts — **interconnection** and **change** — and by the end of this section the seven geographical concepts will be working together as one toolkit.

Defining the terms first

environmental phenomenon — the Victorian Curriculum uses the term *phenomenon* but does not define it, so this section treats it as: *something that happens in the environment that we can observe and then try to explain*. A rock stack falling into the sea, a river losing its fish, ash washing into a stream after a fire — all are environmental phenomena. Other meanings of the word exist; this is the one used in this section.

interconnection (one of the seven geographical concepts) — the ways people, places and environments are linked, so that what happens in one place can cause things to happen in another.

cause-and-effect chain — a run of changes where each change causes the next one. *Rain falls → soil washes off → the creek turns muddy* is a three-link chain.

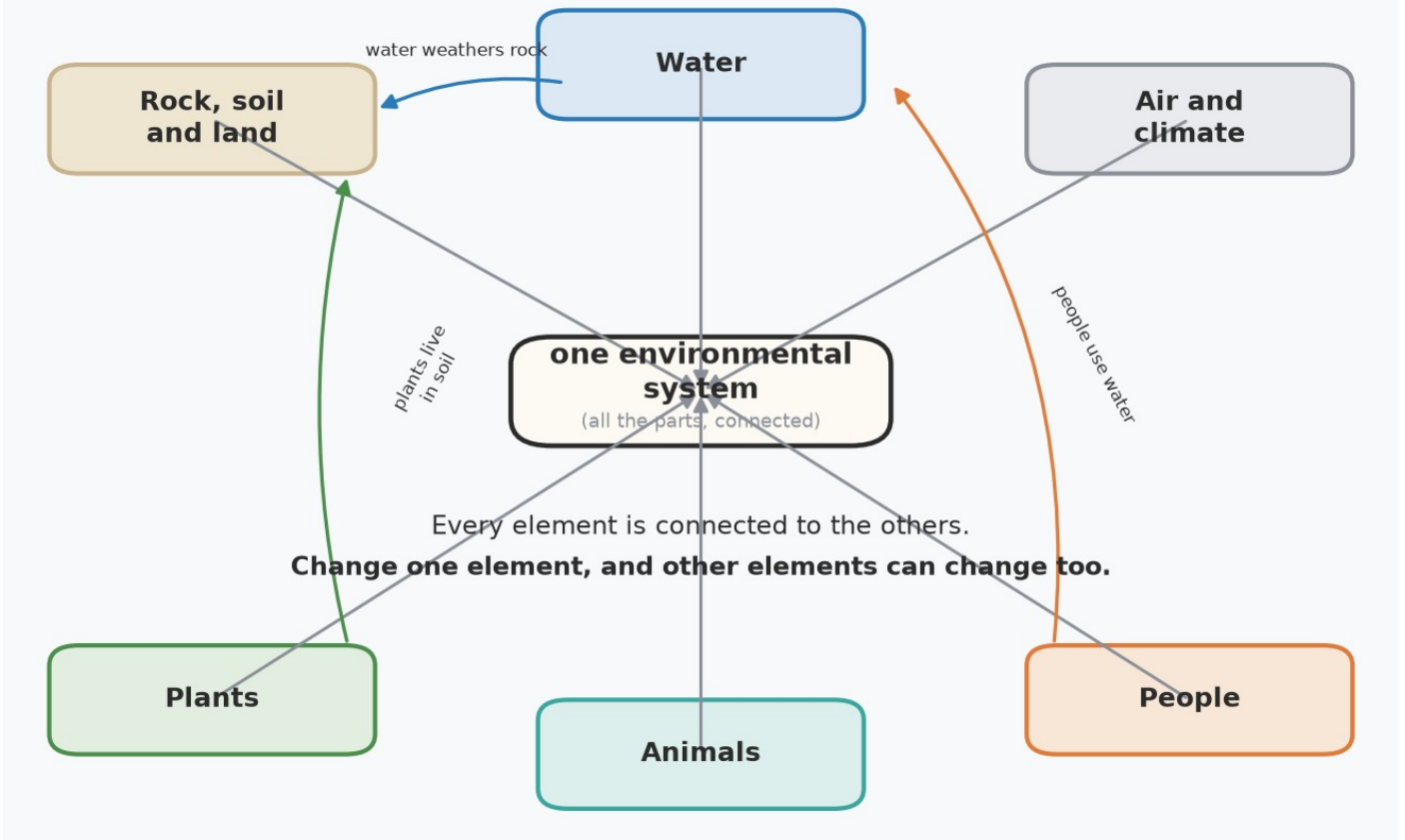
environmental system — an environment seen as connected parts: the rock and soil, the water, the air and climate, the plants, the animals and the people.

geomorphological — simply “about how landforms are made”. Geomorphological processes are the ones you met in 3C: weathering (rock breaking down), erosion (rock being picked up and carried), and the moving and dropping of rock material.

1. The environment is a system of connected parts

Look at the model below. Every element of an environmental system touches the others. Water weathers rock. Plants hold soil together with their roots. People draw water from rivers, and rivers draw their water from rain. Because the parts are connected, a change to one part never stays in one part.

An environmental system: parts that connect



A model diagram of one environmental system: six boxes - rock, soil and land; water; air and climate; plants; animals; people - each joined to a centre box, with labelled links such as “water weathers rock” and “people use water”

That single idea — *change one part and other parts change too* — is the key to this whole section. It is the idea inside VC2HG8K17.E01: change one element of an environmental system and other elements change as well.

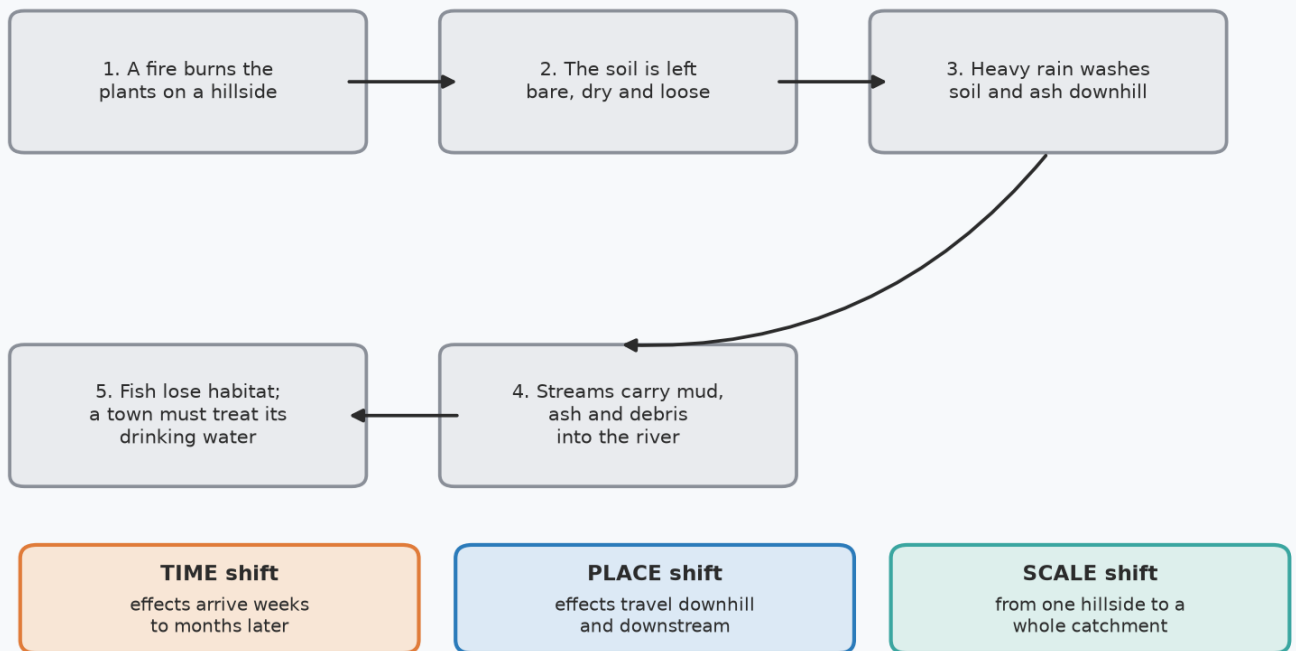
2. A change ripples out in three ways

When one element changes, the effects do not just appear beside it. They:

- **arrive at a different time** — often later: weeks, months, years or even decades after the first change;
- **arrive at a different place** — the cause is here, but the effect lands somewhere else, carried by water, wind, people or trade;
- **happen at a different scale** — the cause may be small and local (one crack in a rock, one hillside), while the effect is much bigger (a whole catchment, a whole coastline).

A **catchment** is all the land that drains into one river and its streams. The model below runs one simple chain through all three shifts. The three boxes at the bottom are the questions a geographer asks about *every* effect: *later? somewhere else? at another scale?*

One change can start a chain of effects

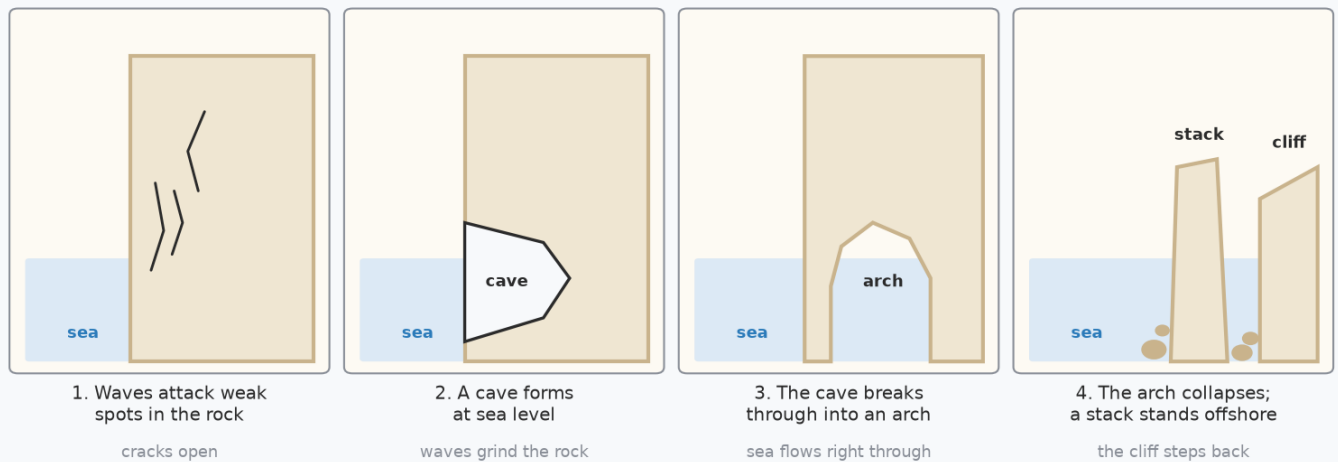


A model cause-and-effect chain in five steps, from a fire on a hillside to a town treating its drinking water, with three boxes naming a time shift, a place shift and a scale shift

3. Landforms are chains too

VC2HG8K17.E02 makes the same point about the land itself: geomorphological processes are **cause-and-effect chains of interconnection**. A landform is not a thing that sits still; it is a stage in a chain. The sequence below builds sea stacks on a coast of soft rock, such as the Port Campbell Limestone on Victoria's south-west coast.

How sea stacks form: a chain of small changes

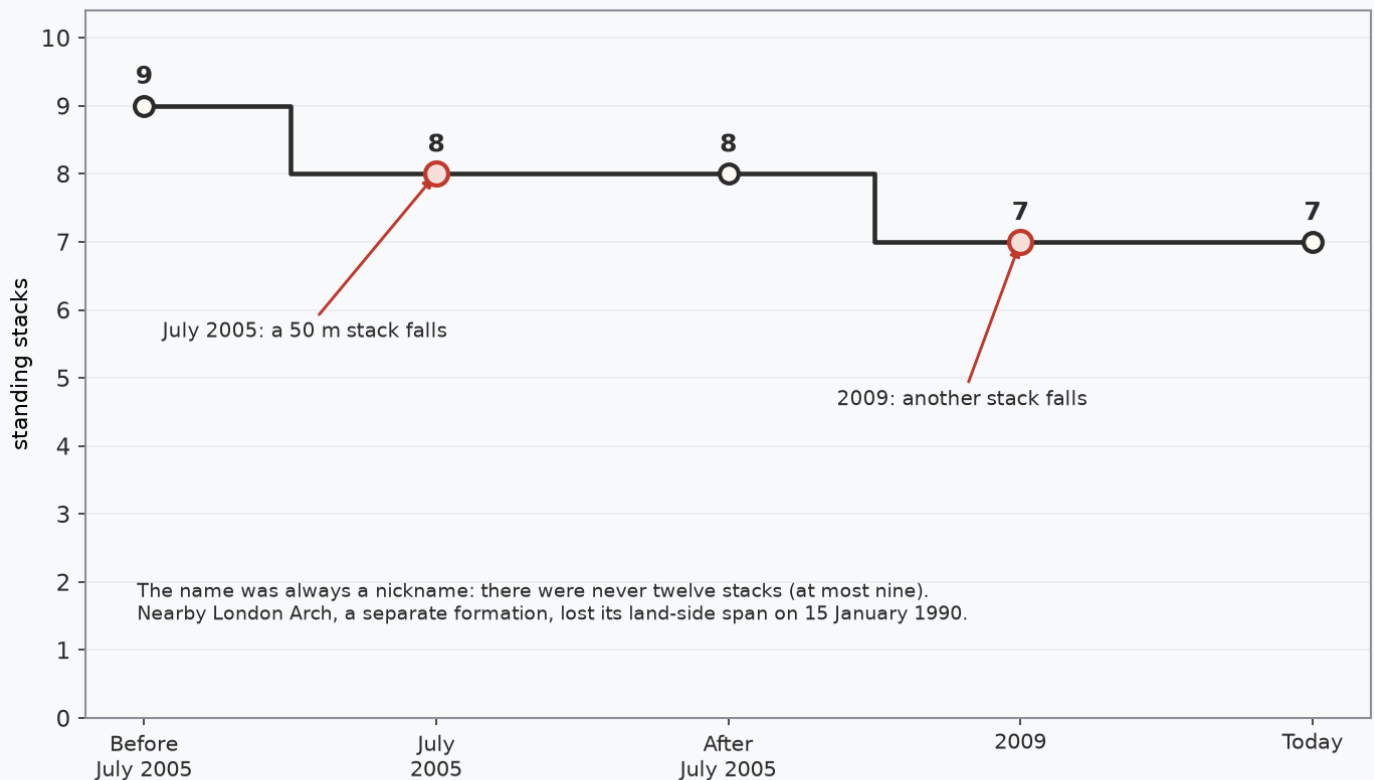


Soft rock, such as limestone, erodes fastest at the water line.

Four labelled panels showing the chain that makes sea stacks: cracks open in a headland, waves cut a cave at sea level, the cave breaks through into an arch, then the arch collapses leaving a stack and a stepped-back cliff

Because each link of the chain takes time, the coast changes in front of us — slowly, then suddenly. Figure 4 counts the standing stacks at the **Twelve Apostles** in Port Campbell National Park. The name was always a nickname: at most nine stacks ever stood. A 50-metre stack fell in July 2005, leaving eight, and another fell in 2009, leaving the seven we see today. Nearby, **London Arch** (once called London Bridge) lost its land-side span on 15 January 1990, leaving two unhurt tourists to be lifted off by a police helicopter.

Standing stacks at the Twelve Apostles, Port Campbell (VIC)



Stack counts and collapse events: Wikipedia, 'The Twelve Apostles (Victoria)' and 'London Arch', retrieved 2026-08-25.

A step chart of standing stacks at the Twelve Apostles: nine before July 2005, eight after a 50-metre stack fell in July 2005, and seven after another fell in 2009, with a note that nearby London Arch lost a span on 15 January 1990

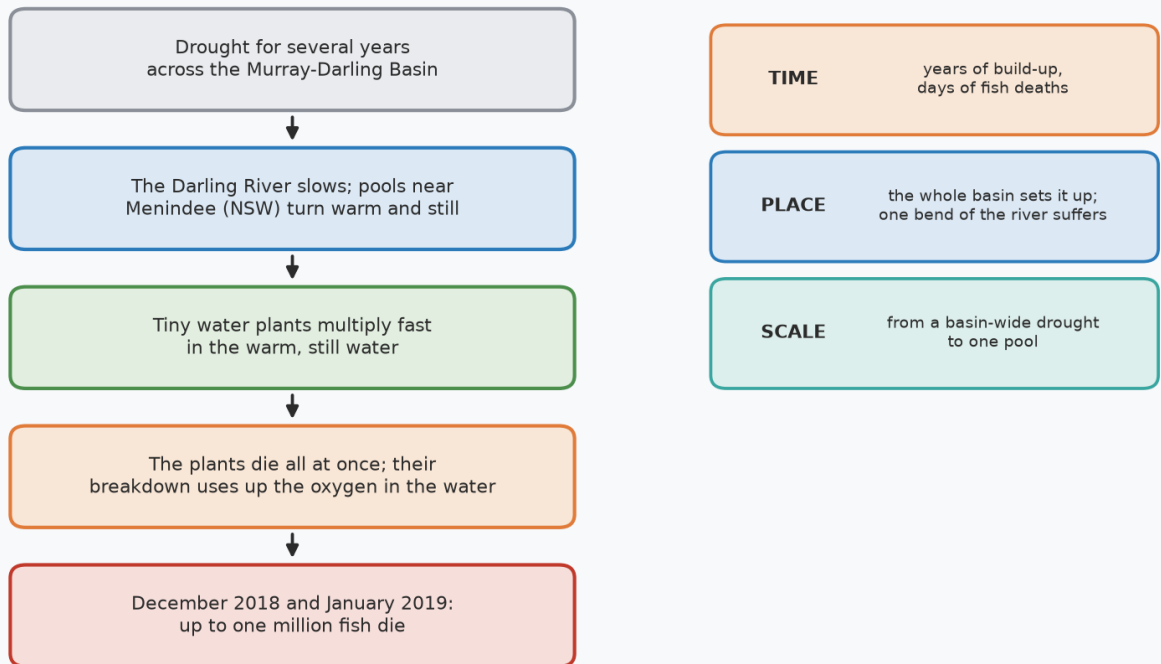
Every one of those falls is the last link of a chain that began decades earlier, when waves first found a weak spot in the rock. The stack is the **effect**; the waves grinding at the water line are the **cause**; the decades between are the **time shift**.

4. Two real chains across real places

The same thinking works far from the coast.

The Menindee fish kills. In December 2018 and January 2019, the Darling River near Menindee (NSW) lost up to one million fish in a matter of days. A NSW Government investigation found the immediate cause was very low oxygen in the water, set up by drought, tiny flows and warm, slow-moving water. Follow the chain in the figure and you can see all three shifts at once: years of build-up ending in days of fish deaths (time), conditions set up across a whole basin but felt at one bend of the river (place), and a basin-wide drought shrinking to one pool (scale).

A chain across a whole basin: the Menindee fish kills



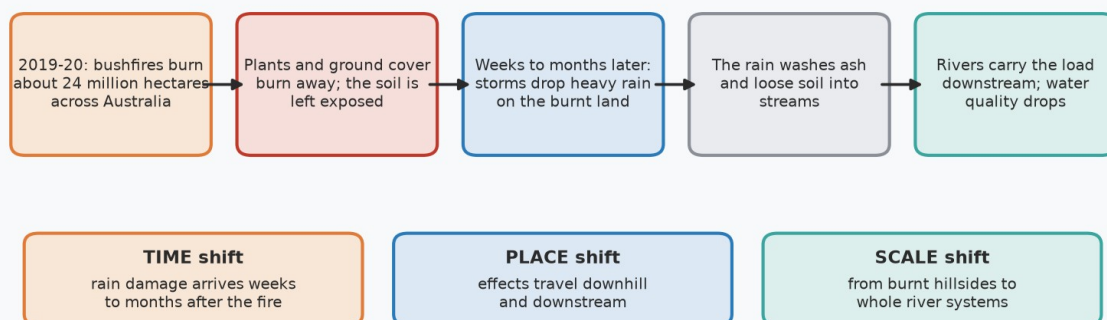
Immediate cause: low oxygen. Setting: drought, very low flows, warm slow-moving water.

NSW Government, Independent Investigation into the Fish Kills in the Darling River at Menindee (2019); fish numbers as widely reported; retrieved 2026-08-25.

A flow chart of the Menindee fish kills: drought slows the Darling River, warm still pools grow huge numbers of tiny water plants, the plants die all at once and their breakdown uses up the oxygen, and up to one million fish die in December 2018 and January 2019

The 2019–20 cascade. In the 2019–20 bushfire season, about 24 million hectares burned across Australia. When plants and ground cover burn away, the soil is left exposed — so when storms arrived weeks to months later, rain washed ash and loose soil into streams, and rivers carried the load to places the fires never touched.

Fire, rain and sediment: the 2019-20 cascade



The 2019-20 season also destroyed more than 3,000 buildings and killed 33 people directly. The same connections that carried damage downstream also carried help: warnings, firefighting and later recovery work all moved between places.

Area burned and losses: Wikipedia, '2019-20 Australian bushfire season' (consistent with the Royal Commission into National Natural Disaster Arrangements, Final Report, October 2020), retrieved 2026-08-25.

A flow chart of the 2019-20 cascade: bushfires burn about 24 million hectares, soil is left exposed, storms weeks to months later wash ash and soil into streams, and rivers carry the load downstream so water quality drops

Connections carry good news too: warnings, firefighting help and recovery work all moved between places in 2019–20. Interconnection is not only about damage; it is about how places depend on each other in every direction.

5. Three cases, one pattern

Lay the three cases side by side and the pattern is impossible to miss. **Every case shows all three shifts:** the effects arrive later, somewhere else, and at another scale.

Three cases, three kinds of shift

Case	Different time?	Different place?	Different scale?
Sea stacks at Port Campbell (VIC)	Yes - decades pass between undercutting and collapse	Yes - the cliff steps back along many kilometres of coast	Yes - from one crack to a whole coastline
Fish kills at Menindee (NSW), 2018-19	Yes - years of drought, days of fish deaths	Yes - the whole basin sets it up; one bend of the river suffers	Yes - from basin-wide drought to one pool
Ash and soil washed after the 2019-20 fires	Yes - weeks to months after the fire	Yes - downhill and downstream into rivers	Yes - from one hillside to a whole catchment

Every case shows all three shifts: the effects arrive later, somewhere else, and at another scale.

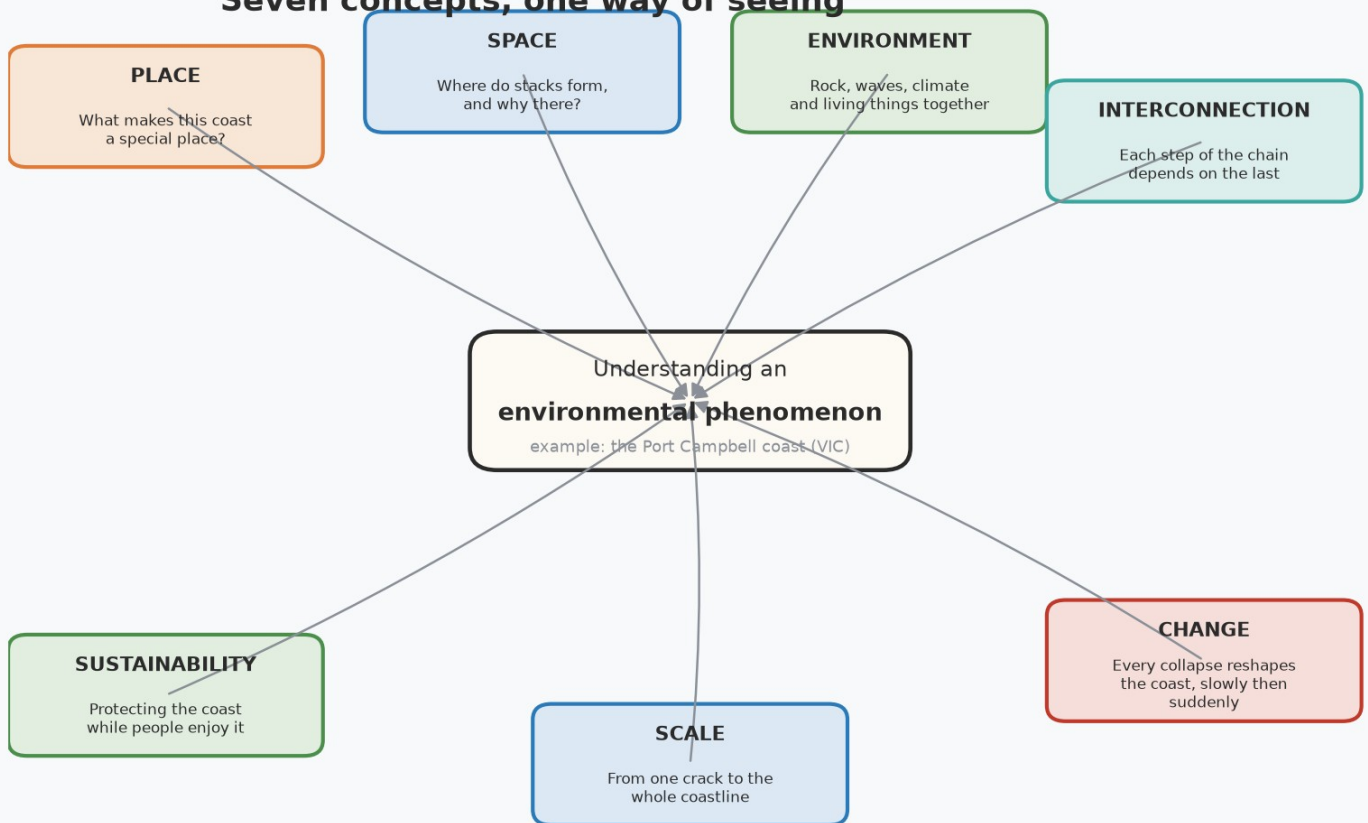
A table checking the three cases - sea stacks at Port Campbell, the Menindee fish kills of 2018-19, and ash and soil washed after the 2019-20 fires - against the three shifts of time, place and scale, with every answer yes

That pattern is what “understanding through interconnection and change” means. To understand an environmental phenomenon, a geographer does not look for one cause and one effect. They trace the whole chain, and they always ask: *when* will the effects land, *where* will they land, and *at what scale*?

6. The concepts come together

This is the second of three sections in this book where the concepts are pulled together into one toolkit (2E used space, environment and interconnection on liveability; 4E will use the full toolkit on how cities grow and change). Here is the whole toolkit, applied to one environmental phenomenon — the changing Port Campbell coast:

Seven concepts, one way of seeing



The seven geographical concepts are one toolkit; each shines a different light on the same event.

A concept map with seven boxes - place, space, environment, interconnection, change, scale and sustainability - each joined to a centre box reading “understanding an environmental phenomenon”, using the Port Campbell coast as the example

When you next read a news story about a flood, a fish kill or a falling stack, those seven boxes are your checklist. What is connected to what? What changed? When, where and at what scale did the effects land? If you can answer those, you are reading the environment the way a geographer does.

Worked examples

Example 1 — scaffolded

Write the Twelve Apostles story as a cause-and-effect chain and label the shifts.

Step in the chain	What kind of link is it?
1. Waves attack weak spots in the soft limestone, right at the water line.	The cause . Waves supply the energy; the soft rock supplies the weakness.
2. Cracks open, and waves grind them into caves.	Effect 1. Slow work — this link takes years to decades (time shift begins here).
3. A cave breaks right through the headland into an arch.	Effect 2. The same chain continues; each effect becomes the next cause.
4. Waves grind the arch's legs thinner; one day the roof falls.	Effect 3. The collapse itself takes seconds, decades after the first grinding (time shift).
5. A stack stands offshore, and the cliff line has stepped back.	Effect 4. The coast now sits a few metres further inland (place shift), and one crack has reshaped a stretch of coastline (scale shift).

Conclusion: a stack is not a thing — it is one stage in a chain. Name the chain (wave erosion of soft rock) and the shifts (decades; along the coast; from crack to coastline), and the landform is understood.

Example 2 — scaffolded

Put the Menindee chain in order, then label the shifts.

Five cards have been shuffled out of order:

- **A.** the breakdown uses up the oxygen in the water
- **B.** drought for several years slows the Darling River
- **C.** up to one million fish die in a matter of days
- **D.** huge numbers of tiny water plants grow in the warm, still pools
- **E.** a cold change kills the plants all at once

Working: the drought comes first (**B**), because slow, warm, still water is what lets the plants multiply (**D**). The plants must die (**E**) before their breakdown can use up the oxygen (**A**), and the fish die only once the oxygen is gone (**C**).

Order: B → D → E → A → C.

Shift	Where we see it in this chain
Time	Years of drought build the risk; the fish deaths take only days.
Place	Conditions are set up across the whole Murray–Darling Basin; the effect lands at one bend of the Darling River.
Scale	A basin-wide drought ends up killing fish in a single pool.

Conclusion: the same toolkit that explained the stacks (chain + three shifts) explains a fish kill 1,000 km inland. That is what a concept toolkit is for.

Practice questions

Scaffolded

Q1. In your own words, write the working definitions this section gives for: (a) environmental phenomenon; (b) interconnection; (c) cause-and-effect chain.

Q2. Using the system diagram: (a) name the three non-living elements; (b) name the three living elements; (c) copy one labelled link (for example, “water weathers rock”) and add a link of your own between two other elements.

Q3. Here is a short chain from a farm creek: (a) stock trample the plants along the bank; (b) the soil is left bare; (c) rain washes soil into the creek; (d) the creek runs muddy and fish eggs are buried in silt. (i) Which step is the first change? (ii) Name two effects. (iii) Which element of the environmental system changes in step (d)?

Q4. Using the coast sequence figure: (a) put these in order: arch, cave, cracks, stack; (b) name the one energy source that drives every step; (c) which part of the cliff erodes fastest, and why does that matter for where caves form?

Q5. Using the stacks count chart: (a) how many stacks stood before July 2005, and why is the name “Twelve Apostles” not exact? (b) what changed the count in July 2005, and what changed it in 2009? (c) how many stacks stand today? (d) which nearby formation lost a span on 15 January 1990?

Q6. Using the Menindee chain figure, match each shift box to the steps of the chain that show it: (a) time; (b) place; (c) scale.

Q7. For each effect below, say whether it is (i) a different time, (ii) a different place or (iii) a different scale from its cause — some effects show more than one shift: (a) ash washes into a stream weeks after a bushfire; (b) an arch roof

falls decades after waves began grinding at its legs; (c) a town far from a fire ground must treat its drinking water; (d) one hillside burning changes water quality in a whole river system.

Q8. Using the concept map, choose the concept (place, space, environment, interconnection, change, scale or sustainability) that best fits each question: (a) Where along a coast do stacks form, and why there? (b) How does the fall of one arch change the way waves attack the cliff beside it? (c) The same chain works on one crack and on a whole coastline. What concept names that idea? (d) Victorians love this coast and want it looked after for the future.

Unscaffolded

Q9. Choose one case from the summary table (the stacks, the fish kills, or the post-fire washing). Explain it as a cause-and-effect chain of at least four steps, and name one time shift, one place shift and one scale shift within it.

Q10. Think of a creek, park, beach or hill near your own school. Describe a cause-and-effect chain of at least three steps that could change it. For each step after the first, say which shifts (time, place, scale) you can see.

Q11. A classmate claims: “*Things that happen far away cannot change the place where I live.*” Put the claim in its strongest form (for example, your street is not where the drought or the fire happened), then put the opposing view in its strongest form, and use evidence from this section to say which view the evidence supports.

Q12. Explain why a geographer who traces connections can suggest better ways of looking after a place than one who studies each part on its own. Use one case from this section as your evidence.

Extended response — evidence-based written task

Q13. *Explain how the concepts of interconnection and change help us make sense of an environmental phenomenon.*

Write about one page. Your response must:

- use **two** of the three cases from this section (the Port Campbell stacks; the Menindee fish kills; the 2019–20 fire cascade);
- trace each case as a cause-and-effect chain of at least three steps;
- name one time shift, one place shift and one scale shift across your answer;
- refer to at least one source from the source list at the end of this section (for example, the NSW Government investigation or the Wikipedia pages on the Twelve Apostles or the 2019–20 season).

Success checklist: terms defined; chains traced step by step; all three shifts named; sources referred to; a closing sentence that states what the two cases have in common.

Answers

Q1. (a) Something that happens in the environment we can observe and try to explain. (b) The links between people, places and environments, so that what happens in one place can cause things in another. (c) A run of changes where each change causes the next. **Q2.** (a) Rock, soil and land; water; air and climate. (b) Plants; animals; people. (c) Any sensible link, e.g. “animals eat plants”. **Q3.** (i) (a). (ii) Any two of (b), (c), (d). (iii) Water (the creek) — and the animals living in it. **Q4.** (a) Cracks, cave, arch, stack. (b) Waves (wave energy). (c) The water line; that is why caves form at sea level, not at the top of the cliff. **Q5.** (a) Nine; the name was a nickname — there were never twelve. (b) A 50 m stack fell in July 2005; another stack fell in 2009. (c) Seven. (d) London Arch (formerly London Bridge). **Q6.** (a) Years of drought → days of fish deaths. (b) Conditions set up across the basin, felt at one bend of the river. (c) Basin-wide drought ending in one pool. **Q7.** (a) Time and place. (b) Time. (c) Place (and scale, if the town draws from a big river system). (d) Scale (and place). **Q8.** (a) Space. (b) Interconnection. (c) Scale. (d) Sustainability (place is also defensible if argued from what makes the coast special). **Q9–Q12.** See fully-worked solutions for what a good answer contains. **Q13.** Marked against the success checklist.

Fully-worked solutions

Q9. Model answer (fish kills): Chain: (1) drought slows the Darling River; (2) warm, still pools grow huge numbers of tiny water plants; (3) the plants die all at once; (4) their breakdown uses up the oxygen; (5) fish die. Time shift: years of drought, days of deaths. Place shift: the basin sets it up, one bend of the river suffers. Scale shift: basin-wide drought to one pool. A good answer names every link and all three shifts.

Q10. Model answer (sample): (1) A new path is cut across a park; (2) walkers wear the grass down to bare soil; (3) rain washes the bare soil into the nearby creek; (4) the creek runs muddy after storms. Shifts: (2)→(4) is a time shift (weeks later); (3)→(4) is a place shift (the park’s soil ends up in the creek); if the creek feeds a bigger river, (4) is also a scale shift. Any chain that is genuinely linked, with shifts correctly named, earns full marks.

Q11. Strongest form of the claim: my street did not burn, did not flood and is not where the Darling River runs, so those events are not my place’s business. Strongest form of the opposing view: places are linked by water, air, trade and people — the 2019–20 fires changed water quality in rivers far from the fire ground, and drought at Menindee was felt by fish, farms and towns along a whole basin. Evidence from this section (the fire cascade’s place and scale shifts; the Menindee chain) supports the opposing view: distance weakens a connection, but it does not cut it. Marks are for the quality of the two views, each put in its strongest form, and for the evidence used — not for which side you land on.

Q12. Because effects land at another time, place and scale, fixing only the part you can see usually fails. Example: cleaning the muddy water at one bend of the Darling would not stop the next fish kill, because the oxygen crash was set up by basin-wide drought and low flows; managing flows across the basin is the lever that works. A good answer uses one case to show that the cause sits somewhere else (or some other time, or some other scale) than the effect.

Q13. Model structure: Paragraph 1 defines the terms (phenomenon, interconnection, change, the three shifts). Paragraphs 2–3 trace the two chosen cases as chains, each with sources named (e.g. “the NSW Government investigation found low oxygen was the immediate cause at Menindee”; “about 24 million hectares burned in 2019–20”). Paragraph 4 names the time, place and scale shifts across the cases. Closing sentence: both cases are only understandable as chains of connected changes whose effects arrive later, somewhere else and at another scale — which is exactly what VC2HG8K17 asks us to do.

Sources used in this section

- VCAA, *Victorian Curriculum F–10 Version 2.0*, Geography, Levels 7 and 8 — VC2HG8K17 and elaborations, via the VCAA export of 2026-07-29.
- Wikipedia, *The Twelve Apostles (Victoria)* and *London Arch* (stack counts; the July 2005 and 2009 collapses; the 15 January 1990 London Arch collapse), retrieved 2026-08-25.
- NSW Government, *Independent Investigation into the Fish Kills in the Darling River at Menindee, December 2018 and January 2019* (2019); the “up to one million fish” figure as widely reported; retrieved 2026-08-25.

- Wikipedia, *2019–20 Australian bushfire season* (about 24 million hectares burned; over 3,000 buildings destroyed; 33 direct deaths), consistent with the Royal Commission into National Natural Disaster Arrangements, Final Report, October 2020; retrieved 2026-08-25.
-

Teaching sequence (teacher note — not student-facing)

1. **Hook and terms (1 lesson).** Open on the stacks count chart: “why is a place called the Twelve Apostles when there are seven?” Define the four boxed terms; use the system diagram to settle “change one part, others change too”.
2. **The engine (1 lesson).** The cascade model and the three shifts (later? somewhere else? at another scale?); the coast sequence; Worked example 1; Q1–Q5.
3. **The cases (1–2 lessons).** Menindee and the 2019–20 cascade; Worked example 2; Q6–Q10. Keep the local chain task (Q10) for homework or a paired fieldwork warm-up — it is designed to run at any Victorian locality.
4. **Pulling it all together (1 lesson).** The summary table and concept map; Q11–Q12 as discussion; Q13 as the assessed written response (this is the achievement standard’s sentence on explaining interconnections and the changes they bring to places and environments, made visible).

Links: the first concepts-together section is 2E; the third is 4E; 6A returns to concept-organised conclusions. The skills CDs are *not* taught here (D11) — this section supplies the knowledge the skills sections draw on. **§2A:** no exclusions apply to VC2HG8K17; no First Nations material is used or required. **Coverage keys:** VC2HG8K17.E01, VC2HG8K17.E02.