

Geography Level 10

Chapter 5 — Skills: geographical inquiry

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Building good questions to drive a geographical inquiry

Content description: VC2HG10S01

Theory

What a geographical inquiry is (VC2HG10S01 .E01). A **phenomenon** is something you can point to that is happening in the world — a pattern, an event or a situation, such as a coastline that is retreating or a harvest that swings from small to record. A **geographical inquiry** is the organised process of asking questions about that phenomenon, collecting and analysing data, and drawing conclusions about places. The inquiry is only as good as its questions, and a question is geographical when at least one of the seven geographical concepts does the work inside it: **place** (what a location is like and what gives it character), **space** (where things are and why they are there), **environment** (how people and the natural world affect each other), **interconnection** (how places are linked), **sustainability** (whether something can keep going without using itself up), **scale** (the size of the lens — local, regional, national, global) and **change** (how and why things differ over time).

Seven concepts that make a question geographical

Concept	A question that uses it
Place	What is Mildura like to live in, and what gives the place its character?
Space	Where in Australia is food grown, and why there instead of somewhere else?
Environment	How does the health of the Murray River affect the irrigated farms beside it?
Interconnection	How are Australian cotton farms linked to clothing factories in other countries?
Sustainability	Can the Bass Coast protect its beaches and still grow its visitor economy?
Scale	Does the answer change if we ask about food waste in a home, a city, or the whole country?
Change	How and why has the coastline near Cape Paterson changed over the past 50 years?

A question is geographical when one or more of these concepts does the work inside it. The example questions use working material from Chapters 1-4 of this book.

Model table, original to this section (SOURCE_USE Rule 3).

Table of the seven geographical concepts, each paired with an example question: Place — What is Mildura like to live in? Space — Where in Australia is food grown? Environment — How does the health of the Murray River affect the irrigated farms beside it? Interconnection — How are Australian cotton farms linked to clothing factories in other countries? Sustainability — Can the Bass Coast protect its beaches and still grow its visitor economy? Scale — Does the answer change between a home, a city and the whole country? Change — How and why has the coastline near Cape Paterson changed over 50 years?

A range of questions, not one question (VC2HG10S01 .E02). The content description says a *range* of questions, because one question can only ever do one job. A strong inquiry draws on four families of questions about the same phenomenon: questions that **describe** (What? Where? — they map the pattern in space), questions that **explain** (Why? How? — they look for causes and processes), questions that **predict** (What next? — they forecast future change) and questions that **evaluate** (What should we do? — they weigh options and make a call). The elaboration also points to the big starting questions of the field, such as “Why is food security important?” and “What is human wellbeing?” — broad questions that open an inquiry but cannot yet be answered with data until they are sharpened.

Four families of geographical questions

One phenomenon: erosion of the Bass Coast surf beaches, Wonthaggi to Inverloch

Family	Example question	What it asks for
What? Where? (describe)	Where along this coast is the shoreline retreating fastest?	It describes a pattern in space.
Why? How? (explain)	Why do some beaches here lose sand faster than others?	It looks for causes and processes.
What next? (predict)	If seas keep rising, how might these beaches change by 2050?	It forecasts future change.
What should we do? (evaluate)	Which response suits a small town best: a seawall, adding sand, or moving buildings back?	It weighs options and makes a call.

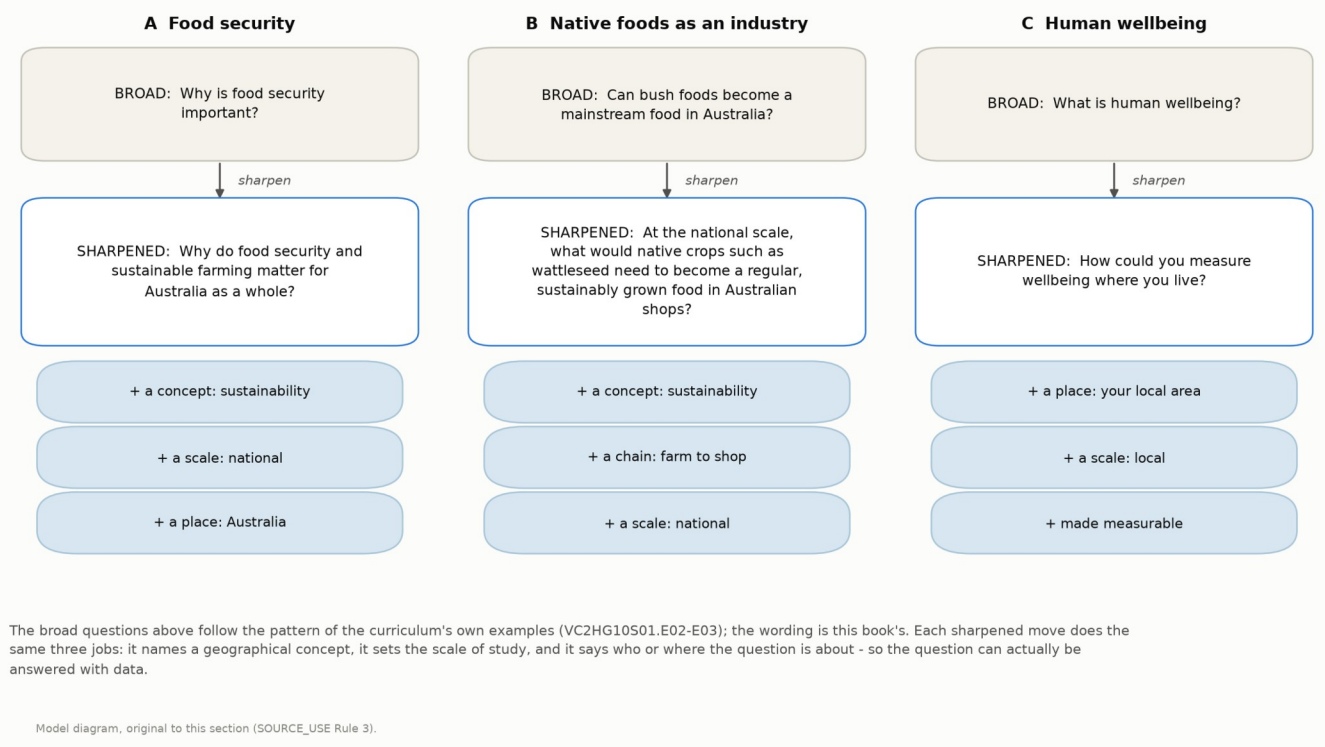
Every inquiry needs a range of questions, not just one: a describe question to map the pattern, an explain question for its causes, a predict question for where it is heading, and an evaluate question for what to do about it.

Model table, original to this section (SOURCE_USE Rule 3); the study area matches section 3B.

Table of the four question families applied to one phenomenon, erosion of the Bass Coast surf beaches from Wonthaggi to Inverloch: describe — Where along this coast is the shoreline retreating fastest? explain — Why do some beaches here lose sand faster than others? predict — If seas keep rising, how might these beaches change by 2050? evaluate — Which response suits a small town best: a seawall, adding sand, or moving buildings back?

Sharpening a question: concept, scale, place (VC2HG10S01 .E03). A broad question becomes answerable when it is sharpened. Sharpening does three jobs: it names a **concept**, it sets a **scale**, and it says **who or where** the question is about. The question “Can bush foods become a mainstream food in Australia?” shows the move: it already sets the scale (national) and names the place (Australia), and it can be sharpened further by asking it as an industry question with the concept of sustainability built in — what would a native crop such as wattleseed need, from farm to shop, to become a regular, sustainably grown food in Australian shops? That is a question a person could actually chase with data: crop yields, growing conditions, processing, marketing and price.

Sharpening a question: add a concept, set a scale, name a place



Three-column diagram showing broad questions sharpened into answerable ones. Column A, food security: “Why is food security important?” becomes “Why do food security and sustainable farming matter for Australia as a whole?” by adding the concept of sustainability, the national scale and the place Australia. Column B, native foods as an industry: the bush food question becomes “At the national scale, what would native crops such as wattleseed need to become a regular, sustainably grown food in Australian shops?” by adding sustainability, the farm-to-shop chain and the national scale. Column C, human wellbeing: “What is human wellbeing?” becomes “How could you measure wellbeing where you live?” by adding a place, the local scale and a measurable form.

From a sharp question to a hypothesis (VC2HG10S01.E04). A **hypothesis** is a testable statement — a claim you write down *before* you look at the data, so that the data can genuinely agree with it or disagree with it. Any sharpened “why” or “do” question can be rewritten as one: “Do countries where more people use the internet sell more services overseas?” becomes “Countries where more people use the internet sell more services overseas.” Because the hypothesis is stated in advance, you can say what evidence would support it and what evidence would count against it — that is what makes it testable rather than just an opinion. Sharpened, hypothesis-testing questions can be drawn from every knowledge chapter of this book.

Sharpened, hypothesis-testing questions drawn from all four knowledge chapters

Chapter	Hypothesis-testing question	Data that could test it
1 Biomes and food security	Is Australia's wheat harvest set mainly by rainfall?	ABARES wheat production: 14.48 Mt in the 2019-20 drought, 40.55 Mt in the record 2022-23 season.
2 Geographies of interconnection	Do countries where more people use the internet sell more services overseas?	Internet use (ITU, 2023) with services exports (World Bank, 2024), as used in section 2A.
3 Environmental change and management	Have sand fences and groynes slowed beach loss on the Bass Coast?	Repeat beach surveys and old photos compared with today's - fieldwork, as taught in section 5B.
4 Geographies of human wellbeing	In Victoria, do local government areas with more degree-qualified residents have higher household incomes?	ABS Census 2021 QuickStats for seven Victorian LGAs - the table in this section (Figure 8).

Each question is sharpened (a concept, a scale, a named place or set of places) and testable: you can say in advance what data would support it and what data would count against it.

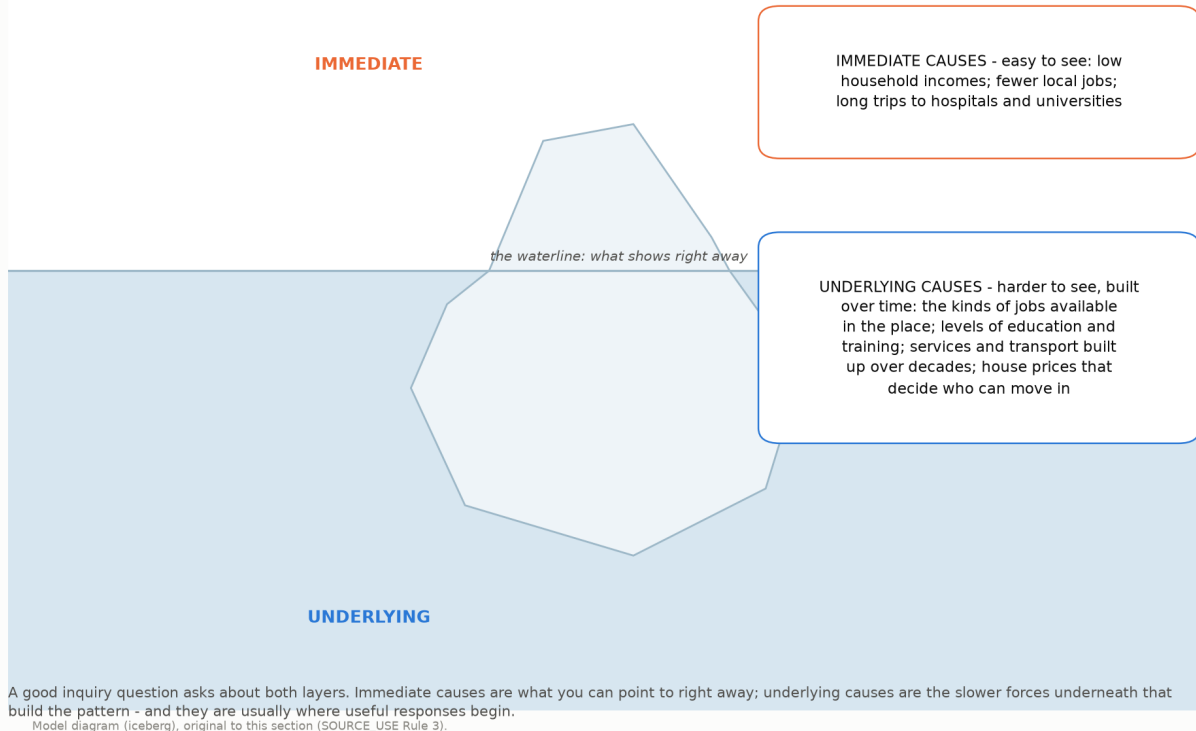
Model table, original to this section (SOURCE_USE Rule 3); datasets as used in sections 1A, 2A and 3B of this book.

Table of four sharpened hypothesis-testing questions, one per knowledge chapter, each with the data that could test it: Chapter 1 — Is Australia's wheat harvest set mainly by rainfall? (ABARES wheat production: 14.48 Mt in the 2019-20 drought, 40.55 Mt in the record 2022-23 season); Chapter 2 — Do countries where more people use the internet sell more services overseas? (internet use with services exports, as used in section 2A); Chapter 3 — Have sand fences and groynes slowed beach loss on the Bass Coast? (repeat beach surveys and old photos, as taught in section 5B); Chapter 4 — In Victoria, do local government areas with more degree-qualified residents have higher household incomes? (ABS Census 2021 QuickStats, the table in this section).

Immediate and underlying causes (VC2HG10S01 . E04). Good explain-questions and good hypotheses both distinguish **immediate causes** — what shows right away, the tip of the iceberg — from **underlying causes**, the slower forces built up over time beneath the waterline. Ask why median weekly household income differs between Victorian places: the immediate answers (fewer local jobs, lower wages in the industries nearby) are real, but underneath them sit the kinds of jobs a place has built up, its levels of education and training, its services and transport, and its house prices, which decide who can afford to move in. An inquiry that only asks about the visible tip will miss where useful responses begin.

What lies behind wellbeing differences: immediate and underlying causes

Example question: why does median weekly household income differ between Victorian local government areas?



Iceberg model diagram: above the waterline, immediate causes (low household incomes; fewer local jobs; long trips to hospitals and universities); below the waterline, underlying causes (the kinds of jobs available in the place; levels of education and training; services and transport built up over decades; house prices that decide who can move in).

Planning the test (VC2HG10S01 . E04). Once a hypothesis is written, the inquiry needs a plan: choose the data, choose the source, choose the places, decide the method, and state in advance what would support the hypothesis and what would count against it. Stating the “against” case *before* collecting data is what keeps an inquiry honest — it stops you from only ever noticing the evidence that suits you. And the plan always ends the same way: a match between the data and the hypothesis points to a possible cause; it never proves one.

Planning how to test a hypothesis

Step	This inquiry
1 Start from a question	Why is human wellbeing higher in some parts of Victoria than in others?
2 Write a hypothesis (a testable statement)	Victorian LGAs where more residents hold a bachelor degree or higher have higher median weekly household incomes.
3 Choose the data	Median weekly household income; share of residents with a bachelor degree or higher.
4 Choose the source	ABS Census 2021 QuickStats.
5 Choose the places (a fair comparison)	Seven Victorian LGAs - same state, same census year, same scale.
6 Decide the method	Rank the seven LGAs by education, then check whether income follows the same order.
7 What would support it	The high-education places are also the high-income places.
8 What would count against it	A place with low education but high income, or no matching order at all.
9 After the test	A match points to a possible cause - it does not prove one. Check other variables next.

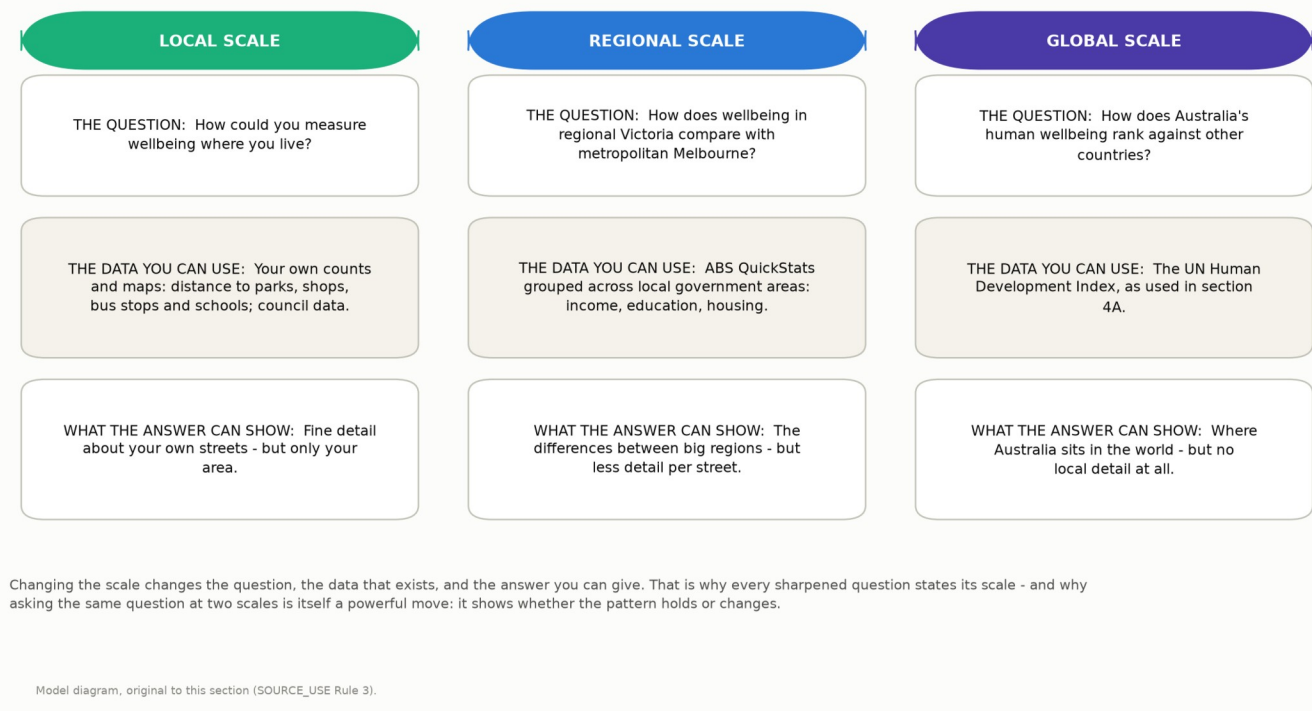
The same plan shape works for the curriculum's example question about organisations' responses: name one program and one region, pick a wellbeing measure, and compare the region before and after the program (sections 4D and 5B show how to collect and judge that data).

Model table, original to this section (SOURCE_USE Rule 3).

Nine-step table planning how to test a hypothesis, worked for the question “Why is human wellbeing higher in some parts of Victoria than in others?”: start from the question; write the hypothesis (Victorian LGAs where more residents hold a bachelor degree or higher have higher median weekly household incomes); choose the data (income and bachelor-degree share); choose the source (ABS Census 2021 QuickStats); choose the places (seven Victorian LGAs — same state, same census year, same scale); decide the method (rank by education, check whether income follows); state what would support it; state what would count against it; after the test, treat a match as a possible cause, not proof.

Choosing a scale (VC2HG10S01 .E05). Every sharpened question states its **scale** — local, regional, national or global — because the scale changes the question itself, the data that exists to answer it, and the answer you can give. “How could you measure wellbeing where you live?” uses your own counts and maps; the same topic at a regional scale compares whole districts using census data; at a global scale it ranks countries using an index such as the UN Human Development Index. Choosing a scale is therefore a real decision, not a formality — and asking the same question at two scales is a powerful move, because it shows whether a pattern holds or changes as the lens widens.

The same topic at three scales: human wellbeing



Three-column diagram of human wellbeing at three scales. Local scale: the question is how to measure wellbeing in your local area, using your own counts and maps of distance to parks, shops, bus stops and schools plus council data; the answer gives fine detail about your own streets but only your area. Regional scale: the question compares regional Victoria with metropolitan Melbourne using ABS QuickStats grouped across local government areas; the answer shows differences between big regions but less detail per street. Global scale: the question ranks Australia against other countries using the UN Human Development Index; the answer shows where Australia sits in the world but no local detail at all.

Controlled comparison of places (VC2HG10S01 . E06). One of the cleanest ways to test a hypothesis about places is a **controlled comparison**: a comparison in which everything about the method is kept the same — the same source, the same year, the same scale, the same variables — so that the only thing varying is the places themselves. A **local government area (LGA)** is the area governed by a local council, and it is a useful scale for comparing parts of one state. The ABS **QuickStats** tool publishes census variables for every LGA, including country of birth, **educational attainment** (the highest level of education people have completed, here the share with a bachelor degree or higher), **median** weekly household income (the middle value when all households are lined up from lowest to highest, so one very rich household cannot pull it up the way it can pull up a mean), and housing **tenure** (whether a household owns its home outright, owns it with a mortgage, or rents).

A controlled comparison: seven Victorian LGAs at the same scale (Census 2021)

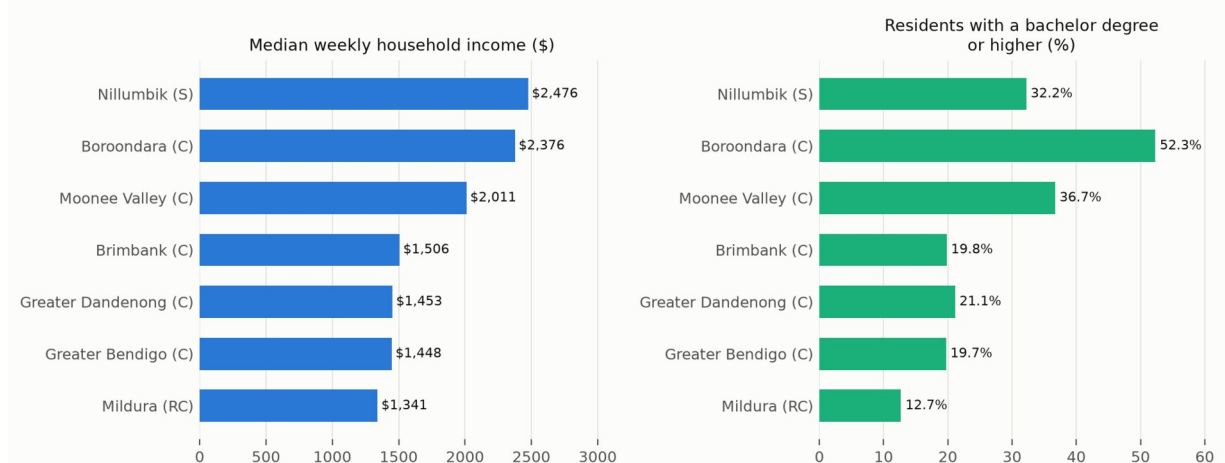
Local government area (LGA)	Where it sits	Median weekly income (\$)	Born overseas (%)	Bachelor degree or higher (%)	Owns home (%)	Rents (%)
Nillumbik (S)	Outer north-east Melbourne, semi-rural	2,476	19.0	32.2	89.1	8.9
Boroondara (C)	Inner-east Melbourne	2,376	35.4	52.3	68.4	28.8
Moonee Valley (C)	Inner north-west Melbourne	2,011	31.5	36.7	65.2	32.2
Brimbank (C)	Western Melbourne	1,506	54.1	19.8	69.4	26.7
Greater Dandenong (C)	South-eastern Melbourne	1,453	63.4	21.1	61.2	35.0
Greater Bendigo (C)	Regional city, about 150 km north-west of Melbourne	1,448	15.4	19.7	70.5	26.9
Mildura (RC)	Regional city, far north-west Victoria	1,341	22.0	12.7	65.4	29.8

Owns home = owned outright + owned with a mortgage (sums of the QuickStats tenure components). Percentages are shares of occupied private dwellings, so the housing shares do not add to 100. The comparison is 'controlled' because every place is read from the same census, at the same scale, in the same state - so the places, not the method, are what varies. Source: ABS Census of Population and Housing 2021, QuickStats (LGA codes 21110, 21180, 22620, 22670, 24780, 25060, 25710), retrieved 25 Aug 2026.

Table of seven Victorian LGAs at the same scale from Census 2021, with median weekly income, born overseas, bachelor degree or higher, owns home, and rents: Nillumbik (S) \$2,476, 19.0, 32.2, 89.1, 8.9; Boroondara (C) \$2,376, 35.4, 52.3, 68.4, 28.8; Moonee Valley (C) \$2,011, 31.5, 36.7, 65.2, 32.2; Brimbank (C) \$1,506, 54.1, 19.8, 69.4, 26.7; Greater Dandenong (C) \$1,453, 63.4, 21.1, 61.2, 35.0; Greater Bendigo (C) \$1,448, 15.4, 19.7, 70.5, 26.9; Mildura (RC) \$1,341, 22.0, 12.7, 65.4, 29.8. Source: ABS Census of Population and Housing 2021, QuickStats.

Read the table as a controlled comparison and the hypothesis from the test plan can be checked directly. Rank the seven LGAs by the share with a bachelor degree or higher — Boroondara 52.3, Moonee Valley 36.7, Nillumbik 32.2, Greater Dandenong 21.1, Brimbank 19.8, Greater Bendigo 19.7, Mildura 12.7 — and the three top places on education are exactly the three top places on income (\$2,476, \$2,376 and \$2,011, though with Nillumbik and Boroondara swapping order), while the four lower places stay low on both. The pattern mostly supports the hypothesis. Now add country of birth and the story stops being simple: the two low-income Melbourne LGAs (Greater Dandenong 63.4% and Brimbank 54.1% born overseas) have the *highest* overseas-born shares, while the two low-income regional cities (Greater Bendigo 15.4% and Mildura 22.0%) have the *lowest*. A variable that lines up one way in the city and the other way in the regions is telling you that place and history matter too — and that is exactly the kind of discovery a controlled comparison is for.

Do income and education line up across the seven LGAs?



Source: ABS Census of Population and Housing 2021, QuickStats, seven Victorian LGAs, retrieved 25 Aug 2026. The three top places on education are the three top places on income; the four lower places stay low on both.

Paired bar charts of the seven LGAs: median weekly household income from Mildura \$1,341 up to Nillumbik \$2,476, and residents with a bachelor degree or higher from Mildura 12.7% up to Boroondara 52.3%. The three top places on education are the three top places on income; the four lower places stay low on both. Source: ABS Census of Population and Housing 2021, QuickStats.

A match is not a proof (VC2HG10S01 . E06). When two variables line up across places, there are always at least two stories. Story one: education raises income — a place with more degree-qualified residents holds more highly paid jobs, so household incomes are higher. Story two, the strongest version of the other side: income attracts education — a place with high incomes and expensive housing, like inner-east Melbourne, draws in highly paid, highly qualified workers and prices out everyone else, so the census is showing the *sorting* of people by what they already earn, not education creating income. Both stories fit the same table, and a single census snapshot cannot say which is doing more work. That is not a failure of the method; it is what the method is for. The controlled comparison turns a vague claim into a checked pattern, shows where the pattern breaks (here, country of birth), and hands the inquiry its next question — which is always the sign of a good one.

Worked examples

Example 1 — scaffolded

Build a range of sharpened questions for one phenomenon: the swing in Australia's wheat harvest from 14.48 Mt in the 2019–20 drought year to 40.55 Mt in the record 2022–23 season (ABARES, as used in section 1A).

Working	Comment
Phenomenon: the Australian wheat harvest swung from 14.48 Mt (2019–20) to 40.55 Mt (2022–23), nearly three times larger, on only slightly more sown area.	Name the phenomenon as a dated, checkable fact — not “wheat” but a change you can point to.
Describe: <i>Where in Australia was the 2022–23 record harvest grown, and where did the 2019–20 crop fail most?</i>	A What?/Where? question maps the pattern in space before anything is explained.
Explain: <i>Why did the national wheat harvest nearly triple between 2019–20 and 2022–23?</i> — concept: change and environment; scale: national; place: Australia.	A Why? question sharpened with a concept, a scale and a place.
Predict: <i>If rainfall returns to its long-run average, what national harvest size should Australia expect over the next five seasons?</i>	A What next? question; it can be tested against later ABARES reports.
Evaluate: <i>Should Australia rely on a grain export industry whose size can nearly triple or halve in three</i>	An evaluate question for the call, plus a testable statement rewritten from the explain question.

seasons? — hypothesis form: “Australia’s wheat harvest size is set mainly by seasonal rainfall.”

Test for the hypothesis: if it is right, record seasons (2022–23) line up with good rain years and poor seasons (2019–20) with drought years; if harvest size ever broke away from rainfall, that would count against it.

State the support and against cases *before* the data — that is what makes the statement a hypothesis.

Example 2 — unscaffolded

Using the seven-LGA table (Figure 8, ABS Census 2021 QuickStats), test the hypothesis “Victorian LGAs where more residents hold a bachelor degree or higher have higher median weekly household incomes,” then judge what the test can and cannot show.

Rank the LGAs by bachelor degree or higher: Boroondara 52.3%, Moonee Valley 36.7%, Nillumbik 32.2%, Greater Dandenong 21.1%, Brimbank 19.8%, Greater Bendigo 19.7%, Mildura 12.7%. Read income in that order: \$2,376, \$2,011, \$2,476, \$1,453, \$1,506, \$1,448, \$1,341. The pattern mostly holds: the three top education places are the three top income places, and the four lower places stay low on both — so the data support the hypothesis, with one clear wrinkle, Nillumbik, which ranks third on education but first on income (\$2,476). Adding country of birth complicates the picture in a different way: the low-income Melbourne LGAs have the highest overseas-born shares (Greater Dandenong 63.4%, Brimbank 54.1%) while the low-income regional cities have the lowest (Greater Bendigo 15.4%, Mildura 22.0%), so no single variable tells the whole story. What the test cannot do is prove cause. The match fits two stories equally well: education lifting incomes, or high-income, high-education households sorting themselves into the same expensive places (Boroondara’s housing is 28.8% rented against Nillumbik’s 8.9%, a sign of very different housing markets). The comparison is controlled — same census, same year, same scale — so the places vary, not the method; but a snapshot shows that two variables travel together, not which one is pulling. Verdict: the hypothesis is supported as a pattern, worth keeping, and not proven as a cause; the next question is which underlying story the income-and-housing data fit better.

Practice questions

Scaffolded

Q1. Use Figure 1. (a) List the seven concepts that make a question geographical. (b) State the two concepts doing the main work in the Sustainability row’s question. (c) The Scale row’s question names three scales — list them. (d) Pick one row other than Place and name the place or feature of the environment its question is about.

Q2. Use Figure 2. (a) Which family of question looks for causes and processes? (b) “Where along this coast is the shoreline retreating fastest?” names which family, and which concept does it mainly use? (c) Write one predict-family question about the Bass Coast that is different from the one in the figure. (d) Explain in one sentence why a single question is not a range.

Q3. Use Figure 3. (a) For column A, state the concept, the scale and the place added to the broad question. (b) For column B, state the extra move that turns the bush food question into an industry question. (c) For column C, explain what “made measurable” adds to the question. (d) Sharpen “Has human wellbeing improved over time?” by adding one place and one scale of your choice; write the full sharpened question.

Q4. Use Figures 4 and 5. (a) From Figure 4, state the data that could test the Chapter 1 question about the wheat harvest. (b) Define hypothesis in one sentence. (c) From Figure 5, list two immediate and two underlying causes of wellbeing differences. (d) Sort these into immediate or underlying: (i) a major local employer closes; (ii) the place never built up training services and transport over the decades.

Q5. Use Figure 6. (a) State the hypothesis written in step 2. (b) State what would count against it (step 8). (c) Give the three reasons in step 5 that the seven LGAs make a fair comparison. (d) Using step 9, explain in one sentence why a match between the data and the hypothesis is not proof.

Q6. Use Figures 7, 8 and 9. (a) From Figure 7, state one thing that changes when the same topic moves from local to global scale. (b) From Figure 8, state Mildura (RC)’s median weekly household income and explain what “median”

means. (c) From Figure 8, state which LGA has the highest share of renting households and give the value. (d) From Figure 9, name the LGA that breaks the simple education-matches-income order, and describe how.

Un scaffolded

Q7. Choose one phenomenon, issue or challenge used in Chapters 1–4 of this book (for example: the swing in the Australian wheat harvest between the 2019–20 drought and the record 2022–23 season; erosion of the Bass Coast surf beaches; or the digital divide in Australia). Write four questions about it — one from each family in Figure 2 — and tag each question with the concept or concepts it mainly uses.

Q8. (a) Sharpen the broad question “Why is food security important?” in a way that is different from Figure 3 column A: choose a different concept and set the scale at regional. Write the full sharpened question. (b) Rewrite your sharpened question as a hypothesis, and name one dataset from this book that could test it.

Q9. Use Figures 8 and 9. (a) Rank the seven LGAs from highest to lowest share of residents with a bachelor degree or higher, write the median weekly income beside each, and state whether income follows the same order. (b) Now compare the born-overseas column for the two low-income Melbourne LGAs against the two regional cities, and describe the pattern in one sentence. (c) A classmate says Figure 9 proves that more education causes higher income. Write two or three sentences giving the strongest version of the opposite story — that high-income places attract highly qualified residents — then give your own one-sentence, reasoned conclusion about what this test can and cannot show.

Q10. Consider this question: “How well have government and non-government programs lifted human wellbeing in the regions where they work?” Pick one real response named in this book (for example, the Bass Coast works against beach loss from section 3B) and, following the shape of Figure 6, write for it: your hypothesis (step 2), your method (step 6), what would support it (step 7) and what would count against it (step 8).

Inquiry task

Design a question set for your own inquiry (VC2HG10S01.E01–VC2HG10S01.E06). Choose one phenomenon, issue or challenge from Chapters 1–4 of this book and build the questioning stage of a full inquiry. Your question set must include:

1. A one-sentence statement of the phenomenon, naming a real place and, where possible, a dated fact (as section 1A dates the wheat harvest or this section dates the census).
2. A range of at least four questions covering all four families in Figure 2, each tagged with the concept or concepts doing the work (E01, E02).
3. Two sharpened versions of your broadest question, sharpened at two different scales, each showing the concept, the scale and the place (E03, E05).
4. One hypothesis written as a testable statement, with a test plan in the shape of Figure 6 that includes a controlled comparison of at least two places using one named, real dataset (ABS QuickStats, or a dataset already used in this book) (E04, E06).
5. One sentence stating what evidence would support your hypothesis and what would count against it, and one sentence stating what your test will not be able to prove.

Check before you submit: every question names or implies a scale; every question could be answered with data that exists; your comparison keeps the method the same so only the places vary; and your conclusion sentence treats a match as a possible cause, not a proven one.

Answers

Q1. (a) Place, space, environment, interconnection, sustainability, scale, change. (b) Sustainability (keeping the beaches working without using them up) and environment; interconnection also appears in the link to the visitor economy. (c) A home, a city, the whole country. (d) Any correct pairing, e.g. the Environment row is about the Murray River and its irrigated farms; the Change row is about the coastline near Cape Paterson.

Q2. (a) The explain family (Why? How?). (b) Describe family; the concept of space (where along the coast). (c) Any forecast question, e.g. “If seas keep rising, which carparks and roads near Wonthaggi will be lost first?” (d) One question does one job; a range is needed to describe, explain, predict and evaluate the same phenomenon.

Q3. (a) Concept: sustainability; scale: national; place: Australia. (b) It adds the farm-to-shop chain — asking what the crop would need to become a regular commercial food. (c) It turns the question into one with an answer you can measure, e.g. with indicators you choose for your own area. (d) Any sharpened form, e.g. “Has human wellbeing improved in Greater Bendigo over the past twenty years?”

Q4. (a) ABARES wheat production: 14.48 Mt in the 2019–20 drought and 40.55 Mt in the record 2022–23 season. (b) A hypothesis is a testable statement written before the data are checked, so the data can support it or count against it. (c) Immediate: low household incomes; fewer local jobs (or long trips to hospitals and universities). Underlying: the kinds of jobs available; levels of education and training (or services and transport built over decades; house prices that decide who can move in). (d) (i) Immediate; (ii) underlying.

Q5. (a) Victorian LGAs where more residents hold a bachelor degree or higher have higher median weekly household incomes. (b) A place with low education but high income, or no matching order at all. (c) Same state, same census year, same scale. (d) A match shows two variables travelling together; other variables or the reverse cause could produce the same match.

Q6. (a) Any correct change, e.g. the data that exists changes from your own counts to census groups to a world index (or the amount of local detail falls as the scale widens). (b) \$1,341; the median is the middle value when all households are lined up from lowest to highest. (c) Greater Dandenong (C), 35.0%. (d) Nillumbik (S): third on education (32.2%) but first on income (\$2,476).

Q7. Any four questions, one per family, each correctly tagged. Example for the wheat swing: describe — “Where in Australia was the 2022–23 record harvest grown?” (space); explain — “Why did the harvest nearly triple from 2019–20 to 2022–23?” (change, environment); predict — “What harvest size should be expected if rainfall returns to average?” (change); evaluate — “Should export income rely on a crop this variable?” (sustainability).

Q8. (a) Example: “Why is the security of food supply important for the Murray–Darling Basin’s farming regions at the regional scale?” (concept: environment or interconnection, scale: regional). (b) Hypothesis example: “Irrigated regions with more secure water allocations grow more food per hectare than regions with less secure allocations.” Testable against section 1A’s crop and yield data.

Q9. (a) Boroondara \$2,376; Moonee Valley \$2,011; Nillumbik \$2,476; Greater Dandenong \$1,453; Brimbank \$1,506; Greater Bendigo \$1,448; Mildura \$1,341. The top three education places are the top three income places and the bottom four stay low, with one inversion (Nillumbik). (b) The low-income Melbourne LGAs have the highest overseas-born shares while the low-income regional cities have the lowest — the variable does not line up with income in one simple way. (c) Opposite story: high incomes and expensive housing draw qualified workers into the same places (Boroondara), so the census may be showing sorting by existing income rather than education creating income. Conclusion example: the controlled comparison shows a pattern that supports the hypothesis, but a snapshot cannot show which variable is cause and which is effect.

Q10. Example for the Bass Coast works (section 3B): hypothesis — “Beaches protected by sand fences and groynes have lost less area since the works were built than unprotected stretches of the same coast.” Method — compare repeat beach surveys (or matched old and recent photos) for protected and unprotected stretches over the same years. Support — protected stretches show clearly less loss. Against — protected and unprotected stretches lose area at the same rate, or protected stretches lose more.

Fully-worked solutions

Q1. (a) The seven concepts are place, space, environment, interconnection, sustainability, scale and change. (b) The Sustainability row asks whether the Bass Coast can protect its beaches and still grow its visitor economy — the work is done by sustainability (protecting the beaches without using them up) and environment, with interconnection linking the beaches to the visitor economy. (c) The three scales named are a home, a city and the whole country. (d) For example, the Environment row's question is about the Murray River and the irrigated farms beside it, and the Change row's question is about the coastline near Cape Paterson.

Q2. (a) The explain family — Why? and How? questions look for causes and processes. (b) It is a describe-family question (it maps where the retreat is fastest), and the concept doing the main work is space — the pattern along the coast. (c) Model answer: “If seas keep rising, how might the dune line between Kilcunda and Inverloch change by 2050?” — a forecast, so predict family. (d) A single question can only do one job; the same phenomenon needs a describe question to map it, an explain question for its causes, a predict question for where it is heading and an evaluate question for what to do — that set is the range.

Q3. (a) Column A adds the concept of sustainability, the national scale, and the place Australia. (b) Column B adds the farm-to-shop chain: the question stops asking about bush food in general and asks what a native crop such as wattleseed would need — growing, processing, marketing, price — to reach Australian shops as a regular commercial food. (c) “Made measurable” means the question says how wellbeing would be counted (for example, distances to parks, shops, bus stops and schools), so an answer can be collected rather than just discussed. (d) Model answer: “Has human wellbeing improved in Mildura over the past twenty years?” — the place (Mildura) and the scale (a single local area, read over time) make the broad question answerable with data.

Q4. (a) The Chapter 1 question could be tested with ABARES wheat production figures: 14.48 Mt in the 2019–20 drought year and 40.55 Mt in the record 2022–23 season. (b) A hypothesis is a testable statement written before the data are checked, so that the data can genuinely support it or count against it. (c) Immediate causes in the figure: low household incomes, fewer local jobs, long trips to hospitals and universities — any two. Underlying causes: the kinds of jobs available in the place, levels of education and training, services and transport built up over decades, house prices that decide who can move in — any two. (d) (i) A major employer closing is immediate — it shows right away in incomes. (ii) A place that never built up training services and transport is underlying — it is a slow force built over decades beneath the waterline.

Q5. (a) “Victorian LGAs where more residents hold a bachelor degree or higher have higher median weekly household incomes.” (b) A place with low education but high income, or no matching order at all, would count against it. (c) The seven LGAs are all in the same state, read from the same census year, at the same scale — so the method is identical and only the places vary. (d) Step 9 says a match points to a possible cause but does not prove one, because the reverse cause or a third variable could produce the same match — which is why the plan ends by checking other variables.

Q6. (a) Moving from local to global scale, the data that exists changes — your own counts and maps become grouped census data and then a world index — and the answer loses local detail. (b) Mildura (RC)'s median weekly household income is \$1,341. The median is the middle household's value when every household is lined up from lowest to highest, so a few very rich households cannot pull it up the way they pull up a mean. (c) Greater Dandenong (C), where 35.0% of occupied private dwellings are rented. (d) Nillumbik (S) breaks the simple order: it ranks third on education (32.2% bachelor or higher) but first on income (\$2,476), so education is not the only thing setting income.

Q7. Model answer for erosion of the Bass Coast surf beaches (section 3B): describe — “Where along the coast from Wonthaggi to Inverloch is the shoreline retreating fastest?” (space); explain — “Why do some beaches here lose sand faster than others?” (environment, change); predict — “If seas keep rising, how might these beaches change by 2050?” (change); evaluate — “Which response suits a small town best: a seawall, adding sand, or moving buildings back?” (sustainability). Each question does a different job, and each names or implies the same place and phenomenon — that is what makes them a range rather than a list.

Q8. (a) Model sharpened question: “Why is the security of food supply important for the irrigated farming regions of the Murray–Darling Basin at the regional scale?” — the concept is now environment (or interconnection between river health and farms) instead of sustainability, and the scale is regional instead of national. (b) Hypothesis: “Irrigated regions with more secure water allocations produce more food per hectare than regions with less secure allocations.”

One dataset that could test it: section 1A's crop production and yield figures (for example, irrigated rice averaging 11.0 t/ha against dryland wheat at about 3.1 t/ha in the record 2022–23 season).

Q9. (a) Education rank with incomes: Boroondara 52.3% — \$2,376; Moonee Valley 36.7% — \$2,011; Nillumbik 32.2% — \$2,476; Greater Dandenong 21.1% — \$1,453; Brimbank 19.8% — \$1,506; Greater Bendigo 19.7% — \$1,448; Mildura 12.7% — \$1,341. Income follows the same broad order — the top three education places are the top three income places and the bottom four stay low on both — with one inversion, Nillumbik earning the most from third place on education. (b) The two low-income Melbourne LGAs have the highest born-overseas shares (Greater Dandenong 63.4%, Brimbank 54.1%) while the two low-income regional cities have the lowest (Greater Bendigo 15.4%, Mildura 22.0%) — so country of birth does not line up with income in one simple direction. (c) Strongest opposite story: if high incomes and expensive housing draw degree-qualified workers into the same places — Boroondara's 28.8% renting against Nillumbik's 8.9% hints at very different housing markets — then the census may be capturing the sorting of already-high earners, not education raising incomes. Reasoned conclusion: the controlled comparison supports the hypothesis as a pattern and shows where it frays, but a same-year snapshot cannot tell which variable is cause and which is effect — so the match is a finding to follow up, not a proof.

Q10. Model answer using the Bass Coast response (section 3B). Step 2, hypothesis: “Beaches protected by sand fences and groynes have lost less beach area since the works were built than unprotected stretches of the same coast.” Step 6, method: compare repeat beach surveys — or matched old and recent photographs, as taught in section 5B — for protected and unprotected stretches over the same years, on the same coast, so only the protection varies. Step 7, would support it: protected stretches clearly losing less area than unprotected ones over the same period. Step 8, would count against it: protected and unprotected stretches losing area at the same rate, or protected stretches losing more. Because the comparison keeps the coast, the years and the method the same, it is controlled — and because the against-case is stated in advance, the test can genuinely fail, which is what makes it a test.

Gathering and comparing data: fieldwork, geospatial tools and secondary sources

Curriculum — Geography 10 · Chapter 5: Geographical skills (VC2HG10S02). Content description: VC2HG10S02. Draws on VC2HG10S02 .E01 (trimmed), VC2HG10S02 .E02, VC2HG10S02 .E03, VC2HG10S02 .E05 (linkage keys for the question bank and coverage audit, not a teaching order). First Nations disposition: .E01 is taught **without** its First Nations example (trimmed per TOC §2A) and .E04 is **excluded entire** — no First Nations material appears in this section, and the excluded elaboration is never taught back in; ethical conduct of research is still exercised through .E03/.E05 (honest recording, consent when surveying or interviewing peers). Cross-curriculum priority carried by this section: none assigned — this is a skills section; its practice material is drawn from the book’s *Sustainability* contexts where the curriculum itself names them. Concepts woven through: change, scale, interconnection, place. Related sections in this book: 1C (sustainability of farming — the curriculum’s own relevance example refers to sustainable food production), 3A–3E (the environmental-change evidence this section re-uses as secondary material, and the evaluations that reuse this section’s checklist).

Teaching sequence (for teachers)

This block is teacher-facing guidance, not student text. Allow about 6 lessons.

1. **Hook — sort the pile.** Bring six items: a photo you took of the school oval this week, an old aerial photograph of the district, a newspaper clipping, an ABS table, a tally of litter you counted, and a Wikipedia page. Students sort them into “we collected this” and “someone else collected this”, and lead that into **Key ideas 1** and Figure 1. Define *primary source* and *secondary source* at first use.
2. **Methods and fieldwork (.E01).** Key ideas 2 with Figures 2 and 3. Define *fieldwork*, *quantitative* and *qualitative* at first use. Run a 15-minute practice outside: each pair fills in one model record sheet for a named spot in the school grounds.
3. **Change over time at a real place (.E01 as trimmed).** Key ideas 3 with Figure 4 (Lake Corangamite). Teach the method the elaboration retains — comparing aerial photographs or images over time to document human use or alteration of a place — against the dated timeline. If you have internet access, repeat the comparison live on Geoscience Australia’s free DEA Maps. Do **not** restore the trimmed First Nations example.
4. **Planning across scales with digital tools (.E02).** Key ideas 4 with Figures 5 and 6. Use the climate-change example as the curriculum names it (global causes; national impacts on Australia, Bangladesh or a Pacific Island nation). Define *geospatial technologies*, *GPS*, *remote sensing* and *GIS* at first use.
5. **Processing and evaluating (.E03).** Key ideas 5 with Figures 7 and 8. Define *relevance*, *reliability*, *information bias* and *selection bias*. Run the symmetry drill: the same three tests applied to a mining-industry page and to an environment-group page; mark the reasoning, not the conclusion (CONTESTED_TERMS Rules 3–5). Worked example 1.
6. **Comparing and inquiring (.E05).** Key ideas 6 with Figure 9, Worked example 2, the unscaffolded set and the inquiry task. Ethical conduct is exercised here and only here, per §2A: record what you actually observed, never invent data, and get consent before surveying or interviewing people.

Assessment notes: comparison items (Q9, Worked example 2) earn marks for naming *why* results agree or differ (year, sample, question wording) — not for declaring one source “wrong”. Bias items mark reasoning, not the side reached. No item may draw on material excluded by TOC §2A.

Key ideas

1. Two families of sources (E01)

Every geographical inquiry works with two families of material.

A **primary source** is material you collect yourself, first-hand, for your own question: your own observations, counts, measurements, photos, sketches, surveys and interviews. A **secondary source** is material someone else collected or

wrote: ABS statistics, Bureau of Meteorology records, reports, news items, maps and satellite images published by others.

Primary and secondary sources		
The two families of material a geographical inquiry works with		
	Primary sources	Secondary sources
What it is	Material you collect yourself, for your own question.	Material someone else collected or wrote.
Examples	Fieldwork observations, your own survey or interview, your own measurements, photos and sketches you take.	ABS statistics, Bureau of Meteorology records, reports, news items, maps and satellite images published by others.
Strengths	Fits your question exactly; up to date; you know exactly how it was collected.	Large samples; expert methods; quick to reach; long time series.
Limits	Takes time to collect; small samples; your own choices can bring bias in.	May be old; may not fit your question; you must check the author and any bias.

Original table created for this section.

A two-column model table comparing primary and secondary sources across four rows. What it is: primary is material you collect yourself for your own question; secondary is material someone else collected or wrote. Examples: primary — fieldwork observations, your own survey or interview, your own measurements, photos and sketches you take; secondary — ABS statistics, Bureau of Meteorology records, reports, news items, maps and satellite images published by others. Strengths: primary — fits your question exactly, up to date, you know how it was collected; secondary — large samples, expert methods, quick to reach, long time series. Limits: primary — takes time, small samples, your own choices can bring bias in; secondary — may be old, may not fit your question, you must check the author and any bias.

Figure 1 — Primary and secondary sources. Source: original table created for this section.

The same item can change families depending on who collected it. A satellite image you download from Geoscience Australia is a secondary source for you; a photo of the school oval you take this week is a primary source. What matters is whether **you** collected it for **your** question.

2. Primary methods, including fieldwork (E01)

Fieldwork is first-hand collecting done out in the world, at the place itself, rather than at a desk. Figure 2 sets out five primary methods, including fieldwork.

Primary research methods, including fieldwork

Five ways to collect original material, and when each one fits

Method	What you get	Tools	Best for
Field observation and sketch	A careful record of what a place is like right now: what you see, hear and measure.	Clipboard, field record sheet, camera, pencil.	A base line to compare the same place against later.
Aerial photos or satellite images over time	How a place has been used or changed across years or decades.	Old and new images; free tools such as DEA Maps.	Documenting human use or change of a biome, e.g. a shrinking lake.
Survey (questionnaire)	Answers from many people to the same set of questions, ready to count.	Printed or online form; a tally sheet.	What a group does or thinks, e.g. peers' use of technology.
Interview	One person's views in depth, with room to ask 'why'.	Question list; recorder, with permission.	Perspectives on a local issue, e.g. environmental management.
Counts and measurements	Numbers: how many, how long, how hot, how fast, and where.	Tape measure, thermometer, counter, stopwatch.	Patterns across space, e.g. changes along a street or shore.

Original table created for this section, drawn from VC2HG10S02.E01 (as trimmed per the book plan).

A four-column table of five primary research methods. *Field observation and sketch*: a careful record of what a place is like right now, using a clipboard, field record sheet, camera and pencil, best for a base line to compare the same place against later. *Aerial photos or satellite images over time*: how a place has been used or changed across years or decades, using old and new images and free tools such as DEA Maps, best for documenting human use or change of a place, e.g. a shrinking lake. *Survey (questionnaire)*: answers from many people to the same set of questions, ready to count, using a printed or online form and a tally sheet, best for what a group does or thinks, e.g. peers' use of technology. *Interview*: one person's views in depth with room to ask why, using a question list and a recorder with permission, best for perspectives on a local issue, e.g. environmental management. *Counts and measurements*: numbers — how many, how long, how hot, how fast, and where — using a tape measure, thermometer, counter and stopwatch, best for patterns across space, e.g. changes along a street or shore.

Figure 2 — Primary research methods, including fieldwork. Source: original table created for this section, drawn from VC2HG10S02.E01 (as trimmed per the book plan).

Two words label what each method returns. **Quantitative** data is data in numbers — counts, measurements, percentages — ready to graph. **Qualitative** data is data in words, sketches and descriptions — what a place is like, and what people think about it. A good investigation often collects both: a count of litter items (quantitative) beside a field sketch of the same site (qualitative).

Whatever the method, fieldwork lives or dies on the record made **on the spot**. Figure 3 is a model fieldwork record sheet: the site as a named place, the date and time, the weather, the method, a labelled sketch, numbered observations, and a small measurements table. Filled in at the site, it is primary evidence; filled in from memory a week later, it is not.

Model of a fieldwork record sheet

Bring a sheet like this to any site — filled in on the spot, it is primary evidence

Site: a named place (e.g. the creek behind the school oval)

Date and time: ____ / ____ / ____ Weather: _____ Method: observation / sketch / count / measurement

Field sketch — draw what you see

Label the parts: what is natural, what is built, what is changing.

Add a north arrow, and your position.

Observations — number them

1. _____
2. _____
3. _____
4. _____
5. _____

Measurements

What	Value	Tool
Width of the creek	1.8 m	Tape measure
Water temperature	14 °C	Thermometer
Litter items counted	23	Counter

Model only — original diagram created for this section.

A model fieldwork record sheet. A header strip asks for the site as a named place (e.g. the creek behind the school oval), the date and time, the weather and the method (observation, sketch, count or measurement). The left panel is a blank field sketch with lines to label what is natural, what is built and what is changing, plus a reminder to add a north arrow and your position. The top-right panel has five numbered blank observation lines. The bottom-right panel is a measurements table with three example rows: width of the creek 1.8 metres by tape measure; water temperature 14 degrees Celsius by thermometer; litter items counted 23 by counter.

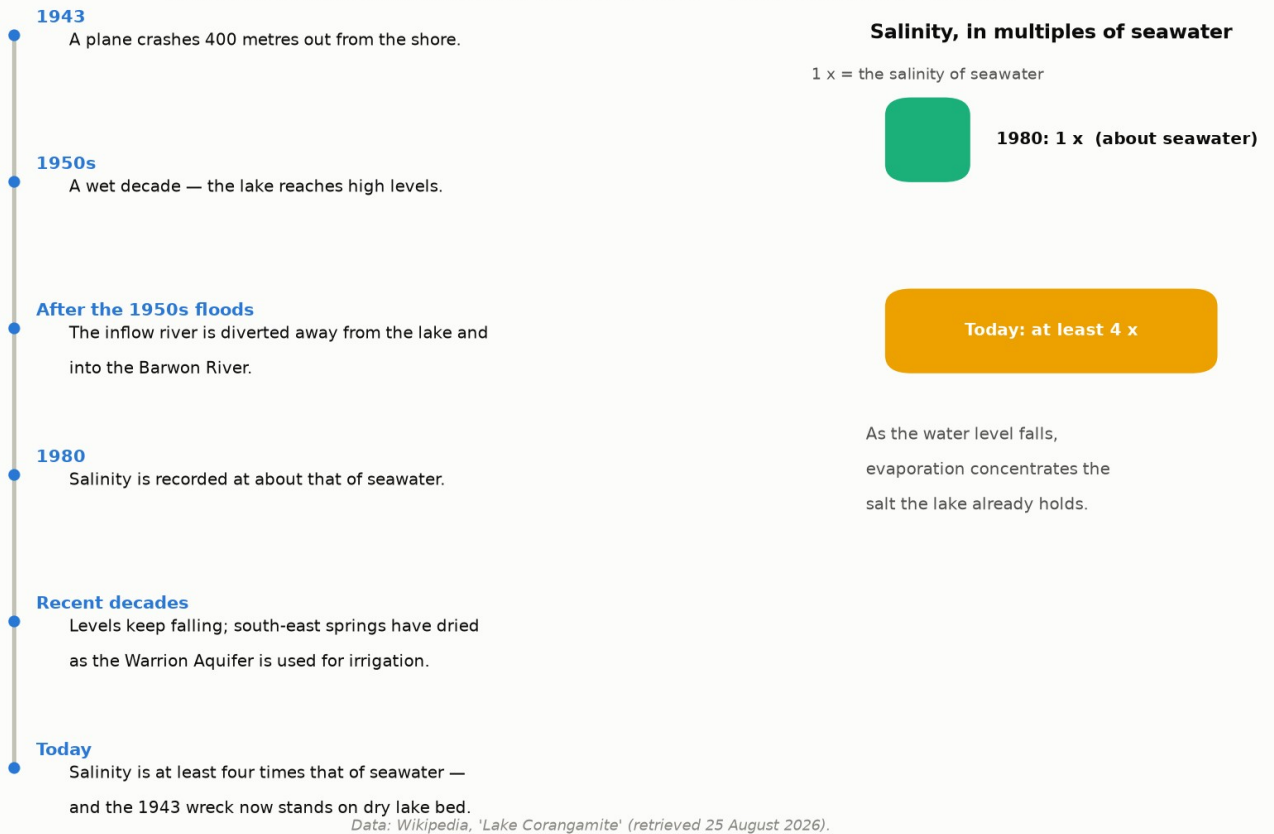
Figure 3 — Model of a fieldwork record sheet. Source: original diagram created for this section.

3. Documenting change over time at a real place (E01)

The method “compare images over time” is best learnt on a real place. **Lake Corangamite**, near Colac in Victoria’s western district, is Australia’s largest permanent saline lake — about 230 square kilometres. **Salinity** means how salty the water is. Aerial photographs and satellite images, checked against dated records, document how people have altered the lake (Figure 4).

A real case of change over time: Lake Corangamite (Vic.)

Australia's largest permanent saline lake, near Colac — about 230 square kilometres



A two-part diagram about Lake Corangamite in Victoria. Left: a dated timeline — 1943, a plane crashes 400 metres out from the shore; 1950s, a wet decade and the lake reaches high levels; after the 1950s floods, the inflow river is diverted away from the lake and into the Barwon River; 1980, salinity is recorded at about that of seawater; recent decades, levels keep falling and south-east springs dry as the Warrion Aquifer is used for irrigation; today, salinity is at least four times that of seawater and the 1943 wreck stands on dry lake bed. Right: two horizontal bars of salinity in multiples of seawater — 1980 at 1 times (about seawater) and today at at least 4 times — with the note that as the water level falls, evaporation concentrates the salt the lake already holds.

Figure 4 — A real case of change over time: Lake Corangamite (Vic.). Source: Wikipedia, “Lake Corangamite”. Retrieved 25 August 2026.

An **aquifer** is underground rock that holds water. The timeline shows human decisions — diverting the inflow river, drawing on the Warrion Aquifer for irrigation — written into the lake’s falling levels and rising salt. The images make it visible: a plane wreck that came to rest 400 metres out under water in 1943 now stands on dry lake bed. Comparing an old aerial photograph with a recent satellite image of the same shoreline is exactly the .E01 method: the use and alteration of the place, documented over time.

4. Planning an investigation across scales, with digital tools (E02)

Scale is the size of the lens: local, regional, national, global. A strong investigation plans the same question at more than one scale, because each scale asks a different thing. The curriculum’s own example is human-induced climate change: its **causes** are investigated at the **global** scale, with **impacts** felt at the **national** scale — on Australia, Bangladesh or a Pacific Island nation. Figure 5 spreads that one question across four scales and matches each scale with digital tools and data.

Planning an investigation across scales

One question, spread across scales: what causes human-induced climate change, and what are its impacts?

Scale and place	What this scale asks	Digital tools and data to use
Global	What is changing, and what is causing it? Greenhouse gas levels rose from about 331 parts per million in 1976 to about 424 in 2024.	Spreadsheet of published records (e.g. the Cape Grim record, Bureau of Meteorology); world maps of emissions.
Australia	What are the impacts here? The land has warmed about 1.5 °C since 1910; every year since 1996 was warmer than the 1961-1990 average.	State of the Climate 2024 (Bureau of Meteorology and CSIRO); DEA Maps satellite imagery to compare land over time.
South Asia, including Bangladesh	What could the impacts do to people? Up to 40 million people in South Asia could move within their own countries by 2050.	World Bank Groundswell (2021) figures in a table or chart; maps of low-lying delta regions.
Tuvalu (Pacific)	What does change look like for one small island country? Sea level has risen about 3.9 mm per year since 1993 — about twice the world average rate.	Funafuti tide-gauge record in a spreadsheet; satellite images of the atoll to see how narrow the land is.

Data: State of the Climate 2024 (BOM/CSIRO); World Bank Groundswell (2021); tide-gauge record at Funafuti, Tuvalu. Retrieved 25 August 2026.

A three-column planning table with four scale rows. Global: what is changing and what is causing it — greenhouse gas levels rose from about 331 parts per million in 1976 to about 424 in 2024; tools: a spreadsheet of published records such as the Cape Grim record (Bureau of Meteorology) and world maps of emissions. Australia: what are the impacts here — the land has warmed about 1.5 degrees Celsius since 1910 and every year since 1996 was warmer than the 1961-1990 average; tools: State of the Climate 2024 (Bureau of Meteorology and CSIRO) and DEA Maps satellite imagery to compare land over time. South Asia, including Bangladesh: what could the impacts do to people — up to 40 million people in South Asia could move within their own countries by 2050; tools: World Bank Groundswell (2021) figures in a table or chart and maps of low-lying delta regions. Tuvalu (Pacific): what does change look like for one small island country — sea level has risen about 3.9 millimetres per year since 1993, about twice the world average rate; tools: the Funafuti tide-gauge record in a spreadsheet and satellite images of the atoll to see how narrow the land is.

Figure 5 — Planning an investigation across scales. Source: State of the Climate 2024 (BOM/CSIRO); World Bank Groundswell (2021); tide-gauge record at Funafuti, Tuvalu. Retrieved 25 August 2026.

Geospatial technologies — tools that collect, store and display information about *where* things are on Earth — do much of the collecting and processing in a modern investigation. Figure 6 stacks the four layers.

Geospatial technologies: the stack

Four layers that turn positions, images and data into geographical evidence

1 Positioning — GPS

Global Positioning System satellites fix your position on Earth's surface, so every observation, photo or sample can be pinned to a spot on a map.



2 Remote sensing — satellites photograph the Earth

Landsat (NASA/USGS) — first satellite launched 23 July 1972; the longest-running satellite imaging programme.
Sentinel-2 (Copernicus programme) — 10-metre detail, passing over the same spot about every 5 days. Geoscience Australia's Digital Earth Australia holds more than 30 years of landscape change for the whole country, free.



3 GIS — layers of data in one place

A Geographic Information System stacks data layers — roads, land use, waterways, elevation — for the same area, so you can see where things are, what sits next to what, and what has changed.



4 Online maps and analysis

Interactive maps anyone can open — e.g. Geoscience Australia's free DEA Maps — let you view the same Australian landscape at different dates and compare.

Programme facts: Geoscience Australia DEA page; Wikipedia, 'Landsat program' and 'Sentinel-2' (retrieved 25 August 2026).

A four-band stack diagram of geospatial technologies joined by arrows. Band 1, Positioning — GPS: Global Positioning System satellites fix your position on Earth's surface so every observation, photo or sample can be pinned to a spot on a map. Band 2, Remote sensing — satellites photograph the Earth: Landsat (NASA/USGS), first satellite launched 23 July 1972, the longest-running satellite imaging programme; Sentinel-2 (Copernicus programme), 10-metre detail, passing over the same spot about every 5 days; Geoscience Australia's Digital Earth Australia holds more than 30 years of landscape change for the whole country, free. Band 3, GIS — layers of data in one place: a Geographic Information System stacks data layers such as roads, land use, waterways and elevation for the same area, so you can see where things are, what sits next to what, and what has changed. Band 4, Online maps and analysis: interactive maps anyone can open, e.g. Geoscience Australia's free DEA Maps, let you view the same Australian landscape at different dates and compare.

Figure 6 — Geospatial technologies: the stack. Source: Geoscience Australia, Digital Earth Australia page; Wikipedia, "Landsat program" and "Sentinel-2". Retrieved 25 August 2026.

- **GPS** (Global Positioning System) fixes where each observation, photo or sample was taken, so fieldwork can be mapped exactly.
- **Remote sensing** is imaging the Earth from satellites or aircraft without touching it. Landsat's first satellite launched on 23 July 1972 — the longest-running satellite imaging programme — which means over 50 years of comparable images of the same Australian places. Sentinel-2 returns over the same spot about every 5 days at 10-metre detail.
- **GIS** (Geographic Information System) is software that stacks layers of mapped information — roads, land use, waterways, elevation — for one area, so patterns and changes can be seen.
- **Online maps** such as Geoscience Australia's free **DEA Maps** put more than 30 years of Australian landscape change in a browser, so a class can compare the same place at different dates without specialist software.

5. Processing and checking: relevance, reliability, bias (E03)

Collecting is only the start. Before data is used, it is processed (put into tables, graphs or maps) and checked with three tests.

- **Relevance** — does the information fit my question: the right topic, the right place, the right scale, and the right *date*? An example question: “Does the information agree with what current experts and studies say?”
- **Reliability** — who is the author, and what qualifies them? Does the author cite other specialists or published reports? Can I check its figures against a second, independent source?
- **Bias** — does the source push one side, or hide part of the picture?

Figure 7 sets the three tests out as a working checklist.

The source checklist: relevance, reliability, bias	
Ask these questions of anything you collect or find — primary or secondary	
Test	Questions to ask
Relevance	Does it fit my question — the right topic, place and scale? Does it reflect current thinking, or is it out of date? (Example: 'Does the information agree with what current experts and studies say?')
Reliability	Who is the author, and what qualifies them? Does the author cite other specialists or published reports? Can I check its figures against a second, independent source?
Bias	Does it present one side of an issue (information bias)? Does it select only some of the facts — e.g. only the positive sides of a program — while leaving others out (selection bias)? Who produces it, and what do they gain from it?
Apply the same checklist to sources you agree with and sources you disagree with.	
Question stems from VC2HG10S02.E03, set out as an original checklist for this section.	

A two-column checklist table with three rows. Relevance: does it fit my question — the right topic, place and scale — and does it reflect current thinking, or is it out of date, with the example question “Does the information agree with what current experts and studies say?” Reliability: who is the author and what qualifies them, does the author cite other specialists or published reports, and can I check its figures against a second, independent source? Bias: does it present one side of an issue (information bias), and does it select only some of the facts — e.g. only the positive sides of a program — while leaving others out (selection bias); who produces it, and what do they gain from it? A footer reads: apply the same checklist to sources you agree with and sources you disagree with.

Figure 7 — The source checklist: relevance, reliability, bias. Source: question stems from VC2HG10S02.E03, set out as an original checklist for this section.

Bias has two common shapes (Figure 8). **Information bias** is presenting one side of an issue. **Selection bias** is choosing only some of the facts — for example, only the positive aspects of a program — while leaving the rest out.

Two kinds of bias to test for

Bias can sit in what a source says — or in what it chooses to show

Information bias

The source presents one side of an issue.

Model example: a web page about a proposed mine lists the jobs it would bring and says nothing about the waste it would make.

Test: what does the other side say, and where can I find it?

Selection bias

The source picks which cases to show.

Model example: a report on foreign aid shows only the projects that succeeded — the positive side — while cultural and social problems are not considered.

Test: which cases were left out, and does leaving them out change the message?

Both tests apply to any source — whichever side of an argument it favours.

Original models for this section; the aid example follows VC2HG10S02.E03.

A two-panel diagram of the two kinds of bias. Left panel, Information bias — the source presents one side of an issue; model example: a web page about a proposed mine lists the jobs it would bring and says nothing about the waste it would make; test: what does the other side say, and where can I find it? Right panel, Selection bias — the source picks which cases to show; model example: a report on foreign aid shows only the projects that succeeded, the positive side, while cultural and social problems are not considered; test: which cases were left out, and does leaving them out change the message? A footer reads: both tests apply to any source, whichever side of an argument it favours.

Figure 8 — Two kinds of bias to test for. Source: original models for this section; the aid example follows VC2HG10S02.E03.

Both tests apply to **any** source — whichever side of an argument it favours. A mining industry page and an environment campaign page get the same three tests, applied the same way; the aim is to mark where each is strong and where each is one-sided, not to sort sources into “good” and “bad” by who agrees with them.

6. Comparing primary with secondary findings (E05)

The last skill is putting your own primary findings side by side with secondary research materials and asking: do they agree, and if not, why not? A difference is not automatically an error — it is information about year, sample or question wording. Figure 9 works the comparison with a model class survey checked against real ABS figures.

Comparing primary with secondary findings (model)

A class survey of 25 Year 10 students (model data) checked against the ABS Household Use of Information Technology survey, 2016-17

Question asked	Class result (model)	ABS 2016-17	Why results agree or differ
'Have you used the internet in the last week?'	25 of 25 = 100%	98% of 15-17 year-olds were internet users	Both very high. The class was surveyed in 2026; the ABS figure is from 2016-17 — nine years earlier.
'Do you have internet access at home?'	24 of 25 = 96%	97% of households with children under 15 had home access	Very close — the ABS group (households with children) matches a class of students well.
'Is the internet fast enough where you live?'	20 of 25 = 80%	No matching ABS figure	The ABS never asked this question — a primary study can ask things no secondary source answers.

The class sample is 25 students in one school; the ABS sample covers thousands of households across Australia. When results differ, the cause may be the year, the sample or the question wording — not an error.

ABS figures: catalogue 8146.0, 2016-17, released 28 March 2018. Class figures are model data for teaching only.

A four-column worked model table comparing a class survey of 25 Year 10 students (model data) with the ABS Household Use of Information Technology survey, 2016-17. Row 1: “Have you used the internet in the last week?” — class 25 of 25, 100 per cent; ABS: 98 per cent of 15-17 year-olds were internet users; both very high, but the class was surveyed in 2026 and the ABS figure is from 2016-17, nine years earlier. Row 2: “Do you have internet access at home?” — class 24 of 25, 96 per cent; ABS: 97 per cent of households with children under 15 had home access; very close, because the ABS group matches a class of students well. Row 3: “Is the internet fast enough where you live?” — class 20 of 25, 80 per cent; ABS: no matching figure, because the ABS never asked this question, and a primary study can ask things no secondary source answers. A footer notes that the class sample is 25 students in one school while the ABS sample covers thousands of households across Australia, so when results differ the cause may be the year, the sample or the question wording — not an error.

Figure 9 — Comparing primary with secondary findings (model). Source: ABS figures: catalogue 8146.0, 2016-17, released 28 March 2018. Class figures are model data for teaching only. Retrieved 25 August 2026.

7. Bringing it together

Collect (primary methods including fieldwork, and geospatial technologies where they fit), process (tables, graphs, maps), check (relevance, reliability, bias) and compare (primary against secondary). Those four moves are the whole of VC2HG10S02 — and they are the same moves the investigations in 3A–3E were built on. This section makes the moves explicit, so the next investigation is yours to plan.

Worked examples

Example 1 — scaffolded (evaluating a secondary source, E03)

A web page states: “Australia’s population is 23,128,129.” The page was last updated in 2014. You are answering a question about Australia’s population **now**, in 2026. Use the checklist (Figure 7) to evaluate the source.



Step	Reasoning
Relevance — topic, place, scale	The topic (Australia's population), the place (Australia) and the scale (national) all fit the question.
Relevance — currency	The page is from 2014. Tracing the number shows it is the ABS estimated resident population for June 2013 — thirteen years old for a 2026 question. On currency, it fails .
Reliability	The number behind the page is real: 23,128,129 matches the ABS estimated resident population, June 2013. The ABS is Australia's official statistician, references its methods, and its figures can be checked in a second source → the underlying source is reliable .
Bias	A population count from the ABS does not argue one side of an issue and does not hide unfavourable facts → no material bias.
Judge	The source is reliable but not current , so it does not answer a 2026 question. Replace the figure with the latest published ERP — 26,659,922 (June 2023) or 27,194,286 (June 2024) — and cite the retrieval date. The lesson: a source can be trustworthy and still too old for the question.

Example 2 — unscaffolded (comparing primary with secondary, E05)

Using Figure 9, compare the class's primary findings with the ABS secondary findings, and explain the pattern of agreement and difference.

A strong response reads something like this:

On home access, the results nearly agree: 96% of the class against 97% of ABS households with children under 15 — close, because a class of Year 10 students resembles that ABS group. On recent use, both figures are very high (100% against 98%), yet they should not be expected to match exactly: the class was surveyed in 2026 and the ABS figure is from 2016-17, nine years earlier, when access was lower. On speed, the class's 80% has no ABS partner, because the ABS never asked that question — a primary study can ask things no secondary source answers, which is one reason to do fieldwork at all. Where results differ, the causes are the **year**, the **sample** (25 students in one school against thousands of households nationwide) and the **question wording** — not an error in either source.

Practice questions

Scaffolded

Q1. Classify each item as a primary or secondary source *for you*: (a) a photo you take of the school oval this week; (b) a newspaper article about a flood; (c) your own count of litter in the schoolyard; (d) an ABS report on internet use; (e) an interview you record, with permission, with the park ranger; (f) a satellite image you download from DEA Maps.

Q2. Using Figure 2, choose the best method for each question: (a) How many students travel to school by bike? (b) How do residents feel about a new bike path? (c) How has the creek bank changed since 1990?

Q3. Using Figure 3 (the model record sheet): (a) list four things the header must record; (b) say why the sheet must be filled in at the site, not from memory later.

Q4. Using Figure 4 (Lake Corangamite): (a) what was the lake's salinity in 1980, and what is it today, in multiples of seawater? (b) name two human decisions written into the lake's change.

Q5. Using Figure 6, name the layer of the geospatial stack that: (a) pins your fieldwork observations to a spot on a map; (b) photographs the Earth from orbit without touching it; (c) stacks roads, land use and waterways for one area.

Q6. Using Figure 7, write one relevance question and one reliability question you would ask of a tourism web page describing a national park.

Un scaffolded

Q7. Plan one investigation question at **two** scales, in the style of Figure 5. For each scale, name what that scale asks and one digital tool or dataset you would use.

Q8. The Minerals Council of Australia is the industry body for mining companies; the Australian Conservation Foundation calls itself “Australia’s national environment organisation”. Each publishes pages about mining. Apply the **same** three tests (relevance, reliability, bias) to both, and say how you would use them — or not — when checking a fact such as the number of people employed in mining.

Q9. In Figure 9 the class reports 100% used the internet in the last week, while the ABS reports 98% of 15-17 year-olds were internet users in 2016-17. Give **two** reasons the figures differ without calling either source wrong.

Q10. Design a 20-minute fieldwork visit to a named local site (for example, a stretch of the Maribyrnong River at Keilor, or the creek behind your school). Include one quantitative method and one qualitative method, the tools you would carry, and one thing you would do to keep your data trustworthy.

Inquiry task — run your own mini investigation (collect, process, compare)

You will collect your own primary data, compare it with a real secondary source, and check that secondary source with the Figure 7 checklist.

1. **Plan.** Choose one question about one named local place (e.g. “Is litter worse at the station reserve than at the school gate?”). Choose **two** methods from Figure 2 — one must be fieldwork, and one must use a digital or geospatial tool (for example, comparing two dates of satellite imagery on DEA Maps). State the scale of your question.
 2. **Collect.** Carry out your fieldwork and record it on the spot, using a sheet modelled on Figure 3: named site, date and time, weather, method, numbered observations, measurements. If you survey or interview people, get their consent first, and record only what was actually said and observed.
 3. **Process.** Put your primary data into one table or graph.
 4. **Find a secondary source.** Locate one real published source about your place or question — for example your local council, the Bureau of Meteorology, the ABS, EPA Victoria or Geoscience Australia. Record its author and publication date, and your retrieval date.
 5. **Compare (.E05).** Put one of your primary findings beside the secondary source’s matching figure or statement. Do they agree? Explain any difference by year, sample or question wording.
 6. **Evaluate (.E03).** Apply the three tests — relevance, reliability, bias — to your secondary source.
 7. **Report.** Half a page, plus your table or graph and your record sheet. Label anything you invented or simulated as **model data**.
-

Answers

Q1. (a) Primary. (b) Secondary. (c) Primary. (d) Secondary. (e) Primary. (f) Secondary — the image was collected by someone else (the satellite operator); your own photo would be primary. **Q2.** (a) Counts (a survey also acceptable). (b) Interview or survey. (c) Aerial photos or satellite images over time. **Q3.** (a) Site as a named place; date and time; weather; method. (b) Memory drops and smooths details; a record made at the site is primary evidence, a record made later is not. **Q4.** (a) 1980: about 1 times seawater; today: at least 4 times. (b) Diverting the inflow river into the Barwon after the 1950s floods; drawing on the Warrion Aquifer for irrigation. **Q5.** (a) GPS. (b) Remote sensing. (c) GIS. **Q6.** Answers vary; e.g. relevance — “Is this page about the park as it is now, or has it been updated?” reliability — “Who wrote the page, and does it reference park management or other experts?” **Q7–Q10.** See fully-worked solutions.

Inquiry task. Answers vary. Check that the student planned one question at a stated scale with two methods (one fieldwork, one digital/geospatial), recorded on the spot, processed the data, compared it with one named real secondary source with a retrieval date, and applied the three tests.

Fully-worked solutions

Q7. Model plan. Question: “Is my local creek changing, and why?” Local scale — what this scale asks: what is the creek like right now, and what is in it? Method: field observation, a litter count and a width measurement at one named site; tool: a phone camera with GPS to pin the site, and the model record sheet. National/regional scale — what this scale asks: is the catchment getting drier, or is land use changing upstream? Tool: Bureau of Meteorology rainfall records in a spreadsheet, and DEA Maps to compare two dates of satellite imagery of the same reach. The two scales answer different halves of the one question: the fieldwork shows the change up close; the rainfall record and the images show whether the cause sits upstream or in the climate. Any plan with a named question, two scales, a method and a named digital tool per scale earns the mark.

Q8. Apply the same tests to both. Relevance: both are highly relevant to a question about mining — it is their core subject. Reliability: both are real, long-standing organisations (the Minerals Council of Australia is the industry’s advocacy body; the Australian Conservation Foundation has campaigned since 1965), and both can be checked against other sources; neither is a random anonymous page. Bias: both have a side. The industry body gains from mining growing, so its pages risk selection bias (jobs and royalties in, wastes and emissions out); the environment group gains from mining being restricted, so its pages risk the mirror-image selection bias (damage in, jobs and materials out). The same tests, the same finding shape, on both sides. For a **fact** such as mining employment, use a neutral third source — the ABS — and use the two advocacy pages for what each side *argues*, labelled as such. Mark is earned by applying the tests symmetrically, not by picking a side.

Q9. Any two of: (1) **year** — the class was surveyed in 2026, the ABS figure is from 2016-17, nine years earlier, and use has risen since; (2) **sample** — 25 students in one school is a small, local sample, while the ABS covers thousands of households across Australia; (3) **question wording** — “used in the last week” is not the same as being an “internet user”, so the two percentages were never measuring exactly the same thing. A difference explained is a difference used well — neither source needs to be “wrong”.

Q10. Model design. Site: a named 50-metre stretch of the Maribyrnong River at Keilor (or your own named site). Quantitative method: a 10-minute litter count within a marked 5-by-5 metre square, tallied by type (plastic, paper, glass, other). Qualitative method: a labelled field sketch of the bank, with two written observations of bank condition and use. Tools: model record sheet, pencil, tally counter, tape measure, gloves and a bag for safety, phone camera with GPS. Keeping the data trustworthy: record only what is actually counted and observed, on the spot — never tidy the numbers up afterwards — and if any people are surveyed or interviewed, ask their consent first. Any design with a named site, one quantitative and one qualitative method, named tools, and an honest-recording or consent step earns the mark.

Sources

All figures in this section are original, generated from the values shown and listed below. Retrieval date for all cited datasets: 25 August 2026, unless stated.

- Wikipedia, “Lake Corangamite” — about 230 square kilometres, Australia’s largest permanent saline lake; 1943 plane wreck 400 metres out; wet 1950s; inflow diverted to the Barwon River after the 1950s floods; 1980 salinity about that of seawater; Warrion Aquifer springs dried; today at least four times the salinity of seawater with the wreck on dry lake bed. Figure 4.
- ABS, *Household Use of Information Technology*, catalogue 8146.0, 2016-17 (released 28 March 2018) — 98% of 15-17 year-olds were internet users; 97% of households with children under 15 had home internet access. Figure 9.
- ABS, *National, State and Territory Population* — estimated resident population: 23,128,129 (June 2013, derived from published series), 26,659,922 (June 2023), 27,194,286 (June 2024). Worked example 1.
- World Bank, *Groundswell* (press release, 13 September 2021) — up to 40 million people in South Asia could move within their own countries by 2050 under climate impacts. Figure 5.
- Wikipedia, “Sea level rise in Tuvalu” — Funafuti tide gauge: about 3.9 mm per year since 1993, about twice the world average rate. Figure 5.
- Bureau of Meteorology and CSIRO, *State of the Climate 2024* — Australia’s land has warmed about 1.5 °C since 1910; every year 1996-2024 warmer than the 1961-1990 average. Figure 5.
- Bureau of Meteorology / CSIRO, Cape Grim Baseline Air Pollution Station record — carbon dioxide about 331 parts per million (1976) to about 424 (2024). Figure 5.
- Geoscience Australia, Digital Earth Australia page — more than 30 years of Landsat landscape change for Australia, free; free DEA Maps browser tool; Geoscience Australia is the Commonwealth’s statutory geoscience agency. Figure 6 and inquiry task.
- Wikipedia, “Landsat program” — first satellite launched 23 July 1972; longest-running satellite imaging programme. Figure 6.
- Wikipedia, “Sentinel-2” — 10-metre detail; about 5-day revisit with both satellites in orbit. Figure 6.
- Wikipedia, “Minerals Council of Australia” — industry advocacy body for Australian mining companies. Q8.
- Australian Conservation Foundation, about page — “Australia’s national environment organisation”, campaigning since 1965. Q8.
- Original diagrams and model data — Figures 1, 2, 3, 7, 8 and the class-survey column of Figure 9 (labelled model data throughout).

Note on scope: this section teaches VC2HG10S02 through real, named, sourced Australian and Victorian places and datasets, with en-AU spelling throughout. .E01 is taught without its First Nations example and .E04 is excluded entire, per TOC §2A; no First Nations material appears in this section, and ethical conduct of research is exercised only through .E03/.E05 (honest on-the-spot recording; consent when surveying or interviewing peers). Contested sources are tested symmetrically and reasoning is marked, not conclusions. All model material — the record sheet, the bias examples and the class survey — is labelled as model; every non-model datum is real, named and retrieval-dated above.

Showing what the data says: graphs and maps made with geospatial technologies

Curriculum — Geography 10 · Chapter 5: Skills: geographical inquiry (VC2HG10S03). Content description: VC2HG10S03. Draws on VC2HG10S03.E01, VC2HG10S03.E02, VC2HG10S03.E03, VC2HG10S03.E04, VC2HG10S03.E05, VC2HG10S03.E06, VC2HG10S03.E07 (linkage keys for the question bank and coverage audit, not a teaching order). First Nations disposition: none. Concepts woven through: place, scale, interconnection, spatial association and change, carried by the working material this section borrows from Chapters 1–4 (D6). Related sections in this book: 5A (inquiry questions), 5B (gathering and comparing data, including fieldwork and geospatial tools), 5D (interpreting and evaluating), and the sections that supply the working material — 1A (biomes), 1B and 1D (food and water), 2A (digital tools), 3A (environmental change), 4A and 4B (measuring and comparing wellbeing).

Teaching sequence (for teachers)

This block is teacher-facing guidance, not student text. Allow about 5 lessons.

1. **Hook — same data, different pictures.** Hand out the six-country data in Figure 10 and ask pairs to show it three ways: as the table, as a column graph of the ranks, and as dots on a world sketch. Compare what each format shows best and lead into **Key ideas 1** (Figure 1). Define *data*, *representation* and *variable* at first use.
2. **BOLTSS (.E01).** Key ideas 2 with Figure 2. Run a broken-map audit in pairs: give a sketch map with two conventions missing and have students find and fix them. Then audit Figure 7 against BOLTSS so students see the conventions applied to a thematic map, not just a sketch.
3. **Geospatial technologies (.E02, .E03).** Key ideas 3–4 with Figures 3–5. If the class has a free web atlas or GIS (any browser tool that stacks and switches map layers), demonstrate switching one layer on and off and clicking a region to read its values — the interactivity of .E02. Tie the Shen Neng 1 chain (Figure 5) back to 3A's cause-chain discipline: dated event → named place → consequence.
4. **Multi-variable and special-purpose representations (.E04, .E05).** Key ideas 5–6 with Figures 6–7. Practise reading the climate graph against the 1A biomes, then run Worked example 1 so students see a special-purpose map built step by step from a table.
5. **Two variables and parts of a whole (.E06, .E07).** Key ideas 7–8 with Figures 8–10 and Worked example 2. The *mechanics* of scatterplots — choosing axes, scaling, plotting points — are taught by the Mathematics book (VC2M9ST03, VC2M9ST04, VC2M10ST02, VC2M10ST05; see §4). Here students **use** a finished scatterplot to do geography: describe the pattern, locate the named countries, explain the exception.
6. **Consolidation.** The inquiry task is the section's assessment: build one statistical or special-purpose map with a digital tool, audit it with BOLTSS, and write the analysis. The unscaffolded set suits lessons 5–6.

Assessment notes: analysis items mark the use of evidence — a value, a place and a pattern read from the representation — not prose style. Plotting mechanics and any computation of statistics are assessed in Mathematics, not here (§4). No item may draw on material excluded by TOC §2A; this section carries none.

Key ideas

1. Same data, different formats (E01)

Data are the facts and figures an inquiry collects (5B does the collecting). A **representation** is any way of showing data so that it can be read: a table, a map, a graph, a diagram or a pie graph. A **variable** is anything that can take different values — rainfall, temperature, income, life expectancy. No format shows everything. Each shows some things best, and hides others (Figure 1).

Analysis means reading the representation and saying what the pattern means for places and people: which place is highest or lowest, where things cluster, what changes over time or across space, and what the pattern suggests about the processes studied in Chapters 1–4.

Choosing a format: what each representation does best

Format	What it shows best	Watch out for	Example in this section
Map	WHERE things are: the spatial distribution of a phenomenon	Needs BOLTSS; choice of colours and classes can change the story	Figures 2, 4 and 7
Table	Exact values, side by side, ready to compare	Too many rows hides the pattern; rounding loses precision	Figure 10
Graph (line, column or climate graph)	Change over time, or amounts compared between places	Axis start and step can make a change look bigger or smaller	Figure 6
Scatterplot	Whether two variables move together across places	A pattern is not proof that one thing causes the other	Figure 8
Diagram or flow diagram	How a process works: steps, links, before and after	Arrows need clear direction and every part needs a label	Figure 5
Pie graph	Shares of ONE whole; the parts must add up to that whole	Misleading when the parts are not one whole, or with many categories	Figure 9

Original table created for this section. The formats listed are those named in VC2HG10S03.E01.

A six-row table comparing the formats used in this section. Columns: format, what it shows best, watch out for, and an example in this section. Rows: map, best for where things are and their spatial patterns, watch that BOLTSS conventions are present, example the Human Development Index map; table, best for exact values side by side, watch that too many numbers hide the pattern, example the six-country wellbeing table; graph, best for change over time or comparisons between places, watch the axis scales, example the climate graphs; scatterplot, best for the relationship between two variables, watch that a pattern is not a rule, example literacy against GDP; diagram or flow chart, best for a chain of causes and effects, watch the direction of the arrows, example the oil spill chain; pie graph, best for parts of one whole, watch that the parts must add to 100 per cent, example freshwater withdrawals by sector.

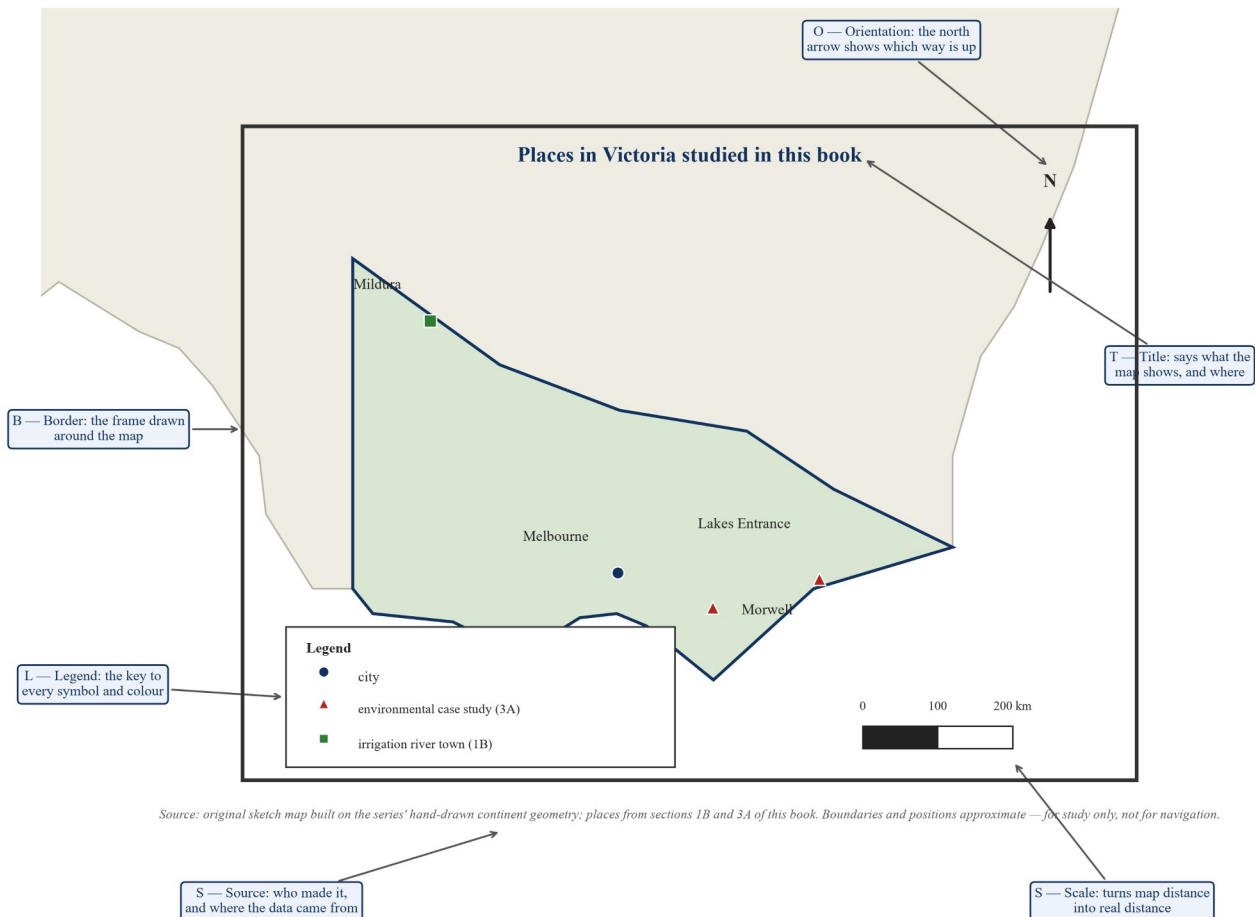
Figure 1 — Choosing a format: what each representation shows best. Source: original table created for this section, drawn from the formats named in VC2HG10S03.E01.

2. BOLTSS — the conventions that make a map trustworthy (E01)

Cartographic conventions are the agreed rules for drawing maps, so that any reader can read any map the same way. In this book they are checked with the mnemonic **BOLTSS**:

- **B — Border.** A frame around the map so the reader knows what area is shown.
- **O — Orientation.** Which way is north; shown with a north arrow unless north is at the top.
- **L — Legend.** The key that explains every symbol, colour and shading.
- **T — Title.** Says what the map shows, and often where and when.
- **S — Scale.** Shows how map distance relates to real distance — a bar scale, a statement, or an honest note that positions are schematic.
- **S — Source.** Says where the data came from, so the reader can check it.

Figure 2 shows all six conventions on a sketch map of Victoria. The conventions are not decoration: without a scale the reader cannot judge distance, without a legend the colours mean nothing, and without a source the data cannot be checked. The same six checks apply to every map in this section, including the maps built with geospatial technologies in Key ideas 3.



Model map: the six BOLTSS parts (Border, Orientation, Legend, Title, Scale, Source) labelled on a simplified map of real places. Original diagram created for this section.

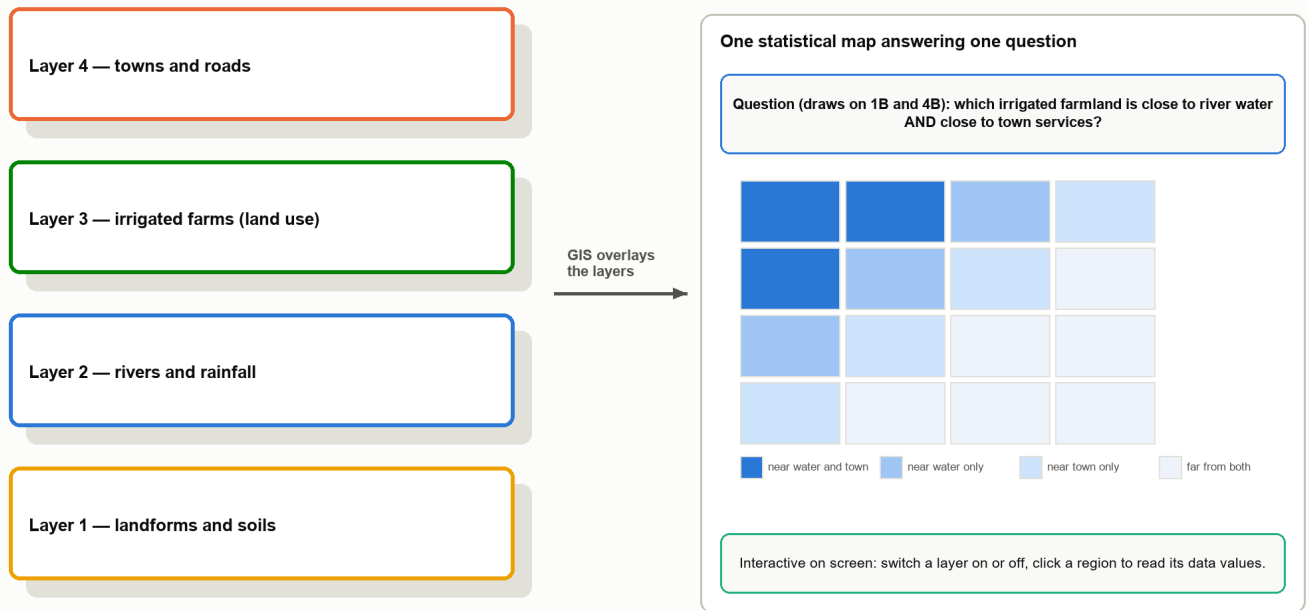
A sketch map of the state of Victoria, Australia, built to show the six BOLTSS cartographic conventions, with a callout box for each letter. The map has a border frame, a north arrow, a legend listing town dot and state border, a title reading Victoria sketch map with the six conventions of BOLTSS, a bar scale of 0 to 200 kilometres, and a source line. Towns marked are Mildura in the north-west, Melbourne in the south, Morwell in the Latrobe Valley and Lakes Entrance on the east coast. Six callouts read: B border, the frame shows the area covered; O orientation, the north arrow sets the direction; L legend, the key to every symbol; T title, what and where the map shows; S scale, map distance against real distance; S source, where the data came from.

Figure 2 — BOLTSS on a sketch map of Victoria. Source: original map created for this section; sketch positions approximate; town positions after Geoscience Australia place data. Retrieved 25 August 2026.

3. Geospatial technologies: layers, overlays and statistical maps (E02)

Geospatial technologies are the digital tools that collect, store and display data about the Earth's surface: satellite imagery, the Global Positioning System (GPS), and **geographic information systems (GIS)** — software that stores map data and lets the user query it. A GIS keeps each theme as a separate **layer** — landforms, rivers and rainfall, land use, towns and roads — and **overlays** the layers to answer a question. The answer is often printed as a **statistical map**: a map whose shading shows data values. A statistical map that shades each area by its value is called a **choropleth** map.

Figure 3 works one question through: *which irrigated farmland is close to river water **and** close to town services?* (draws on 1B and 4B). Overlaid on screen, the layers produce a shaded answer no paper map could give as quickly — and on screen the map is also **interactive**: a layer can be switched on or off, and a region can be clicked to read its data values.



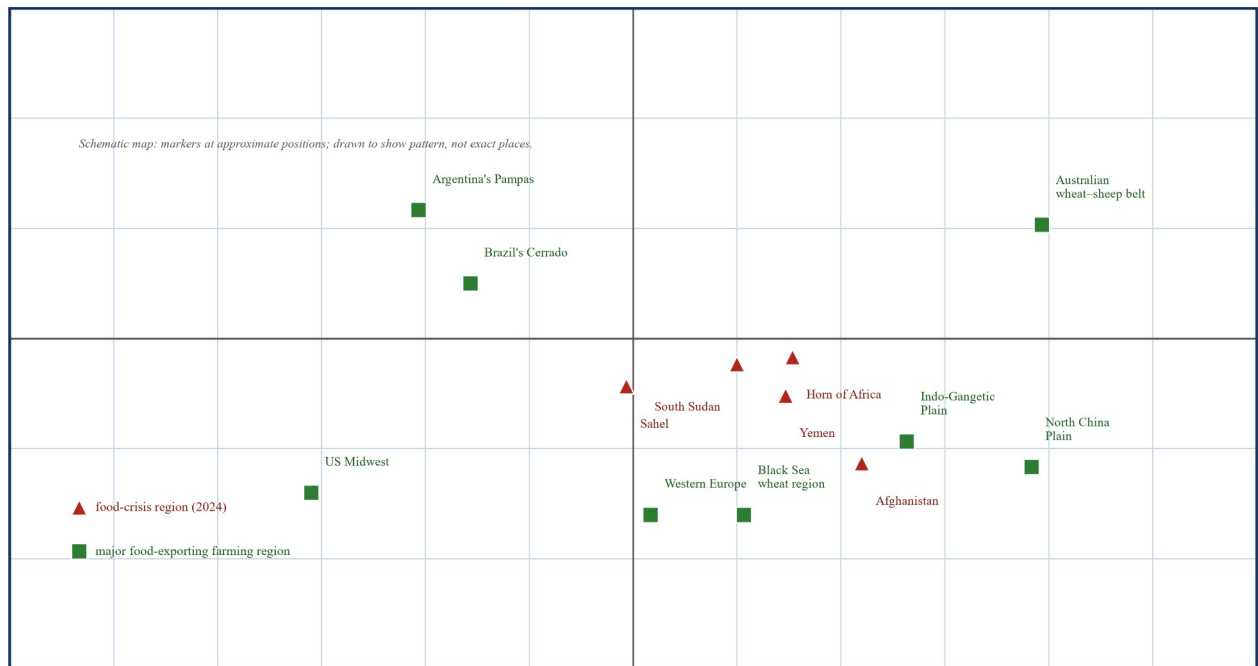
On paper the same map is drawn with BOLTSS (Figure 2) — on screen it can also be interactive.

Original diagram created for this section. The layers use real Australian data sources: Geoscience Australia (landforms), Bureau of Meteorology (rainfall), Murray–Darling Basin Authority (rivers), ABS (land use, towns).

A labelled diagram in two parts. Left: four stacked map layers labelled layer 1 landforms and soils, layer 2 rivers and rainfall, layer 3 irrigated farms land use, and layer 4 towns and roads. An arrow labelled GIS overlays the layers points right to a panel titled one statistical map answering one question. The panel repeats the question, which irrigated farmland is close to river water and close to town services, above a shaded four by four grid map whose legend reads near water and town, near water only, near town only, far from both, and a note: interactive on screen, switch a layer on or off, click a region to read its data values. A footer reads: on paper the same map is drawn with BOLTSS, on screen it can also be interactive.

Figure 3 — How a GIS stacks layers to build a statistical map. Source: original diagram created for this section; the layers use real Australian data sources — Geoscience Australia (landforms), Bureau of Meteorology (rainfall), Murray–Darling Basin Authority (rivers), ABS (land use and towns). Retrieved 25 August 2026.

The curriculum's first example for .E02 pairs maps of food insecurity with land viable for farming. Figure 4 shows that pairing as one schematic world map: the major food-exporting farming regions (drawn from 1B) against the main food-crisis regions of 2024 (drawn from 1D). Read the pattern: the crises sit **away** from the surplus farmland. The gap is not that food cannot be grown — it is that people in crisis regions cannot reliably **access** it, through poverty, conflict or broken transport (1D). That reading *is* the analysis the map was built for.



Original schematic map by the author; regions after FAO food balance sheets and the Global Report on Food Crises 2024 (FAO/WFP). Retrieved 25 August 2026.

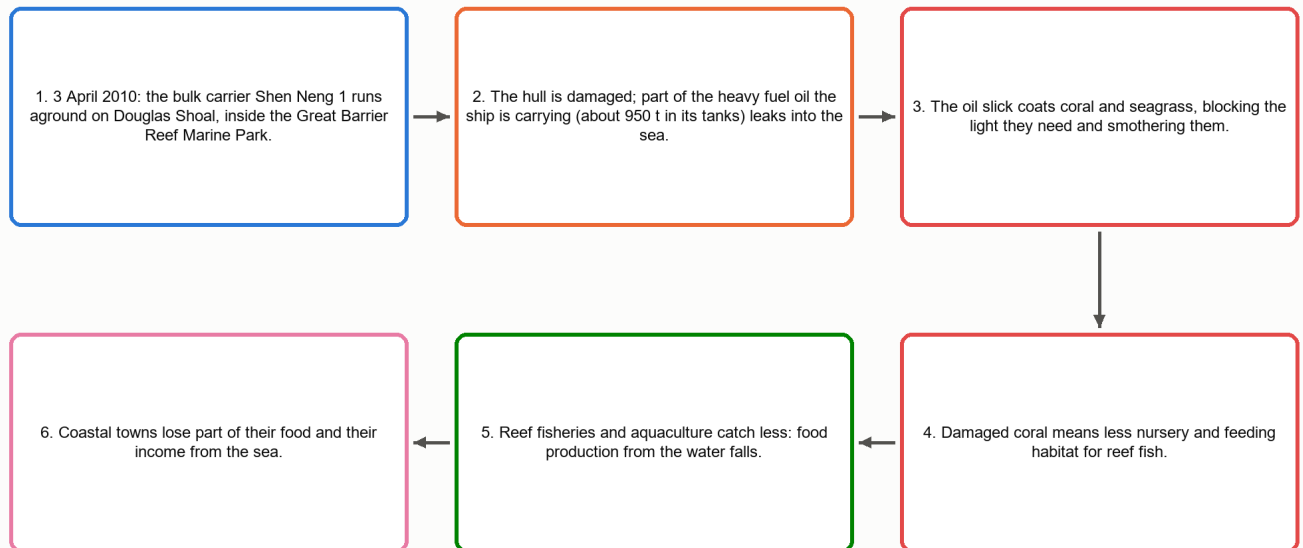
A schematic world map on an evenly spaced latitude and longitude grid. Green squares mark the major food-exporting farming regions: the US Midwest, Argentina's Pampas, Brazil's Cerrado, Western Europe, the Black Sea wheat region, the Indo-Gangetic Plain, the North China Plain and the Australian wheat-sheep belt. Red triangles mark food-crisis regions of 2024: the Sahel, South Sudan, the Horn of Africa, Yemen and Afghanistan. The crisis markers cluster away from the exporting regions, and a legend names both symbol types.

Figure 4 — Food grown for export, and where food crises sit: access is the gap. Source: original schematic map by the author; regions after FAO food balance sheets and the *Global Report on Food Crises 2024* (FAO/WFP). Retrieved 25 August 2026.

4. Showing change as a chain (E03)

Digital tools can also present a *process*: as a 3-D model, an animation, or before-and-after images. The curriculum's example is an oil spill on a coral reef leading to a decline in aquatic food production. On paper the same chain is drawn as a **flow diagram** — boxes in cause order, arrows showing what leads to what (Figure 5).

The chain is real and dated. On 3 April 2010 the bulk carrier *Shen Neng I* ran aground on Douglas Shoal, inside the Great Barrier Reef Marine Park, carrying about 950 tonnes of heavy fuel oil; part of it leaked. The slick coated coral and seagrass, blocking their light. Damaged reef means less nursery and feeding habitat for fish, so fisheries and aquaculture — the farming of fish and other water life — catch less, and coastal towns lose part of their food and their income (3A's chain discipline: dated event → named place → consequence).



This is the E03 idea — a diagram of how spilled oil damages coral reefs and reduces the food harvested from the water. If your class has a digital 3D tool, build the same chain in it.

Chain built for this section from public reporting of the Shen Neng 1 grounding (3 April 2010): Australian Maritime Safety Authority and Great Barrier Reef Marine Park Authority records. Original diagram by the author.

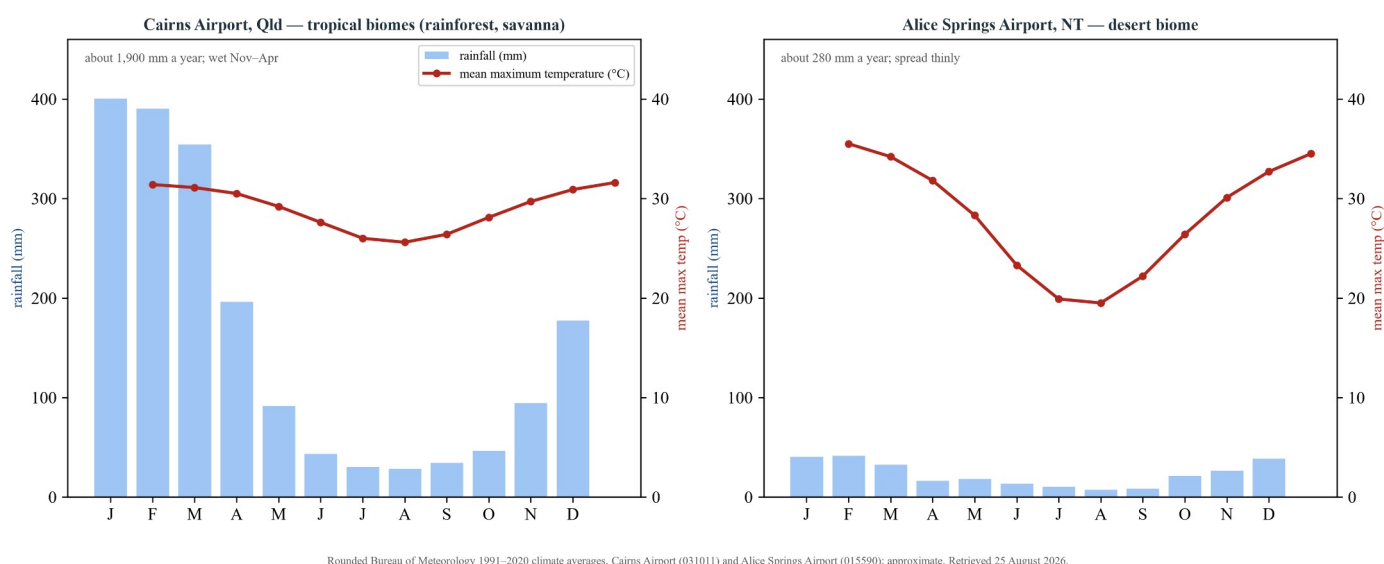
A six-box flow diagram read left to right then right to left in an S-shape. Box 1: 3 April 2010, the bulk carrier *Shen Neng 1* runs aground on Douglas Shoal, inside the Great Barrier Reef Marine Park. Box 2: the hull is damaged; part of the heavy fuel oil the ship is carrying, about 950 tonnes in its tanks, leaks into the sea. Box 3: the oil slick coats coral and seagrass, blocking the light they need and smothering them. Box 4: damaged coral means less nursery and feeding habitat for reef fish. Box 5: reef fisheries and aquaculture catch less; food production from the water falls. Box 6: coastal towns lose part of their food and their income from the sea. A footer notes that the same chain can be built in a digital 3-D tool.

Figure 5 — From one ship to fewer fish: an oil spill flows into food production. Source: chain built for this section from public reporting of the *Shen Neng 1* grounding (3 April 2010): Australian Maritime Safety Authority and Great Barrier Reef Marine Park Authority records. Original diagram by the author. Retrieved 25 August 2026.

5. More than one variable in one representation (E04)

A **complex graph** puts two or more variables in one frame so their relationship can be read directly. Figure 6 does this the way climate is usually shown: rainfall as columns on the left axis, mean maximum temperature as a line on the right axis, one panel per place. Read it against 1A: Cairns Airport sits in the tropical biomes (rainforest and savanna) — about 1,900 mm of rain a year, most of it falling November to April, with warm temperatures all year. Alice Springs Airport sits in the desert biome — about 280 mm a year, spread thinly, with a wide swing between hot summers and mild winters. One representation, four variables (month, rainfall, temperature, place), and the biome pattern of 1A made visible.

One complex graph: temperature + rainfall, read against the biome (1A)



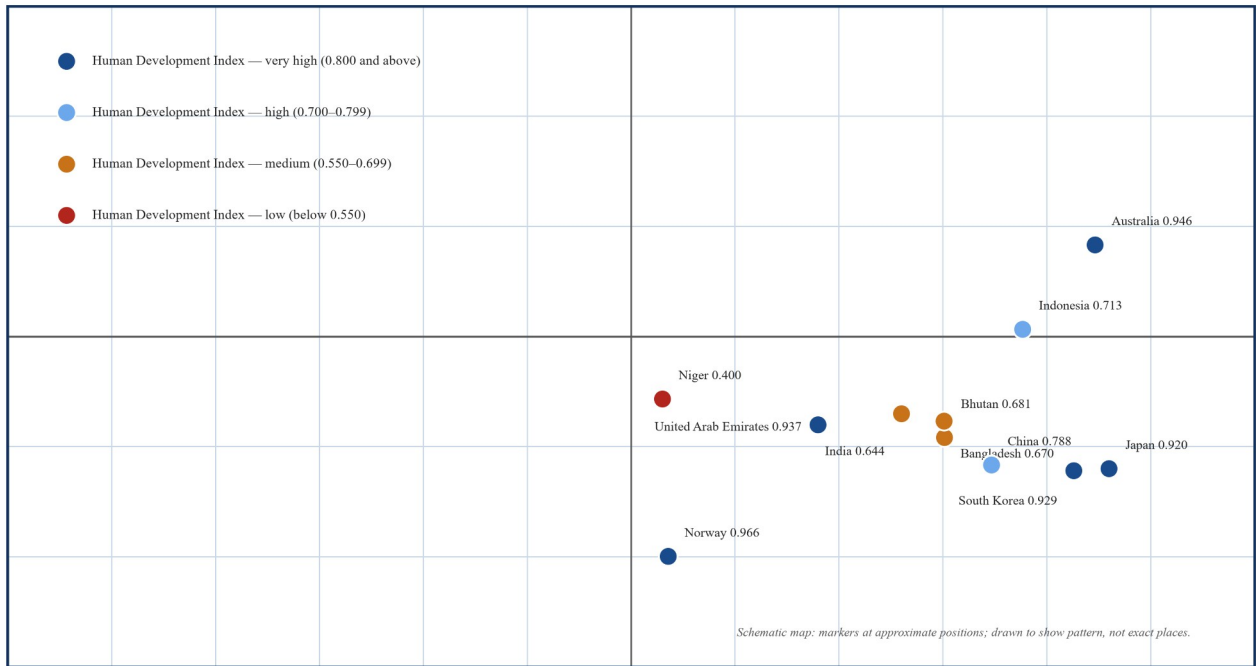
Two side-by-side climate graphs, each with pale blue rainfall columns on a left axis and a red mean maximum temperature line on a right axis, months January to December. Left panel, Cairns Airport, Queensland, tropical biomes: tall rainfall columns from November to April peaking near 400 millimetres, a dry middle of the year, and a temperature line staying between about 25 and 32 degrees. Right panel, Alice Springs Airport, Northern Territory, desert biome: low rainfall columns all year under about 45 millimetres and a temperature line swinging from about 35 degrees in summer to about 20 degrees in winter.

Figure 6 — A complex graph: temperature and rainfall read against the biome (1A). Source: rounded Bureau of Meteorology 1991–2020 climate averages, Cairns Airport (031011) and Alice Springs Airport (015590); approximate. Retrieved 25 August 2026.

6. Special-purpose maps that follow the conventions (E05)

A **special-purpose map** (also called a thematic map) is built to show one theme — rainfall, land use, wellbeing — rather than everything a general map shows. Being special-purpose does not excuse it from the conventions: it still needs BOLTSS (Key ideas 2).

Figure 7 is a special-purpose map of human wellbeing, measured with the **Human Development Index (HDI)** — the United Nations Development Programme’s combined measure of a long and healthy life, education and income (4A). The UNDP groups countries into four categories: very high (0.800 and above), high (0.700–0.799), medium (0.550–0.699) and low (below 0.550). The map shows a clear spatial pattern: very high values cluster in Europe, North America, East Asia and Australia; the low value sits in the Sahel (4B’s reasons — income, health services, education — lie behind the pattern).



HDI values from the UNDP Human Development Report 2023/24 (2022 data); category ranges as defined by UNDP. Map original and schematic. Retrieved 25 August 2026.

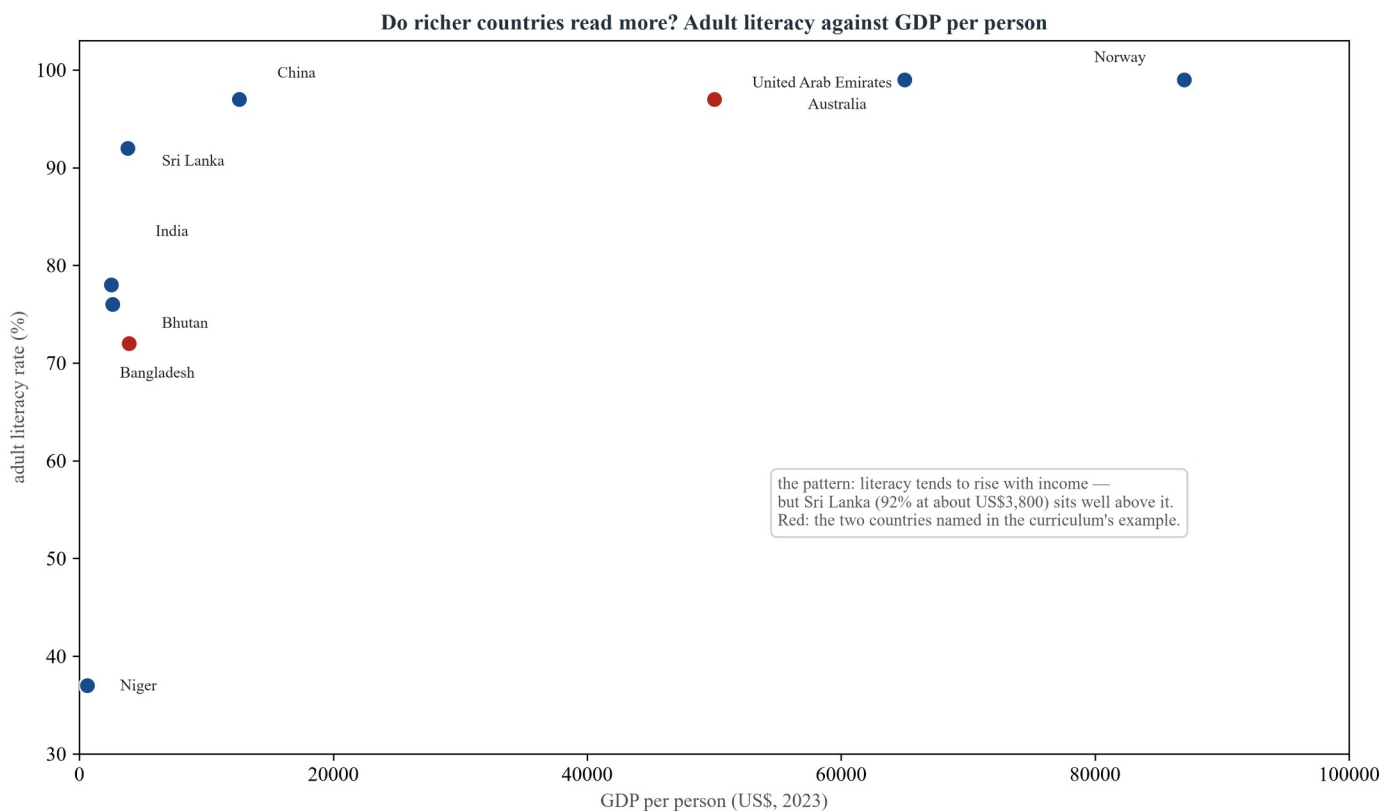
A schematic world map on an evenly spaced latitude and longitude grid with eleven countries marked by coloured dots and labelled with their Human Development Index value for 2022. Dark blue dots for the very high category: Norway 0.966, Australia 0.946, Japan 0.920, South Korea 0.929 and the United Arab Emirates 0.937. Light blue dots for the high category: China 0.788 and Indonesia 0.713. Orange dots for the medium category: Bhutan 0.681, Bangladesh 0.670 and India 0.644. A red dot for the low category: Niger 0.400. A legend lists the four UNDP category ranges.

Figure 7 — A special-purpose map: Human Development Index by category, 2022 data. Source: HDI values from the UNDP *Human Development Report 2023/24* (2022 data); category ranges as defined by UNDP. Map original and schematic. Retrieved 25 August 2026.

7. Scatterplots: two variables, one pattern (E06)

A **scatterplot** shows the relationship between two variables: one point per country (or place, or person), placed by its two values. *How to plot one* — choosing axes, scaling them, plotting points — is Mathematics (VC2M9ST03, VC2M9ST04, VC2M10ST02, VC2M10ST05) and is assumed here. Geography's job is to **read** the plot: describe the pattern, name the places that fit it and the ones that break it, and explain why.

Figure 8 plots adult literacy rate (the share of adults who can read and write) against GDP per person — the value of goods and services a country produces in a year, divided by its population. The curriculum's example pair is on the plot in red: the United Arab Emirates (about US\$50,000 per person, about 97% literacy) and Bhutan (about US\$3,900, about 72%). The pattern: as GDP per person rises, literacy tends to rise with it. The exception is the interesting part — Sri Lanka, at about US\$3,800 per person, is nearly as literate as countries many times richer (about 92%). A pattern with exceptions is a relationship, not a rule (5D).



World Bank, GDP per capita (current US\$, 2023); UNESCO Institute of Statistics, adult literacy rate (most recent year). Values rounded; approximate. Retrieved 25 August 2026.

A scatterplot of adult literacy rate in per cent on the vertical axis against GDP per person in US dollars on the horizontal axis, one dot per country. Niger sits low at about US\$620 and 37 per cent; Bangladesh, India and Bhutan cluster between about US\$2,500 and US\$3,900 with literacy from 72 to 76 per cent; Sri Lanka sits above that cluster at about US\$3,800 and 92 per cent; China at about US\$12,600 and 97 per cent; the United Arab Emirates, Australia and Norway sit high at the right with 97 to 99 per cent. The UAE and Bhutan dots are drawn in red as the curriculum's example pair, and a note box reads: the pattern, literacy tends to rise with income, but Sri Lanka sits well above it.

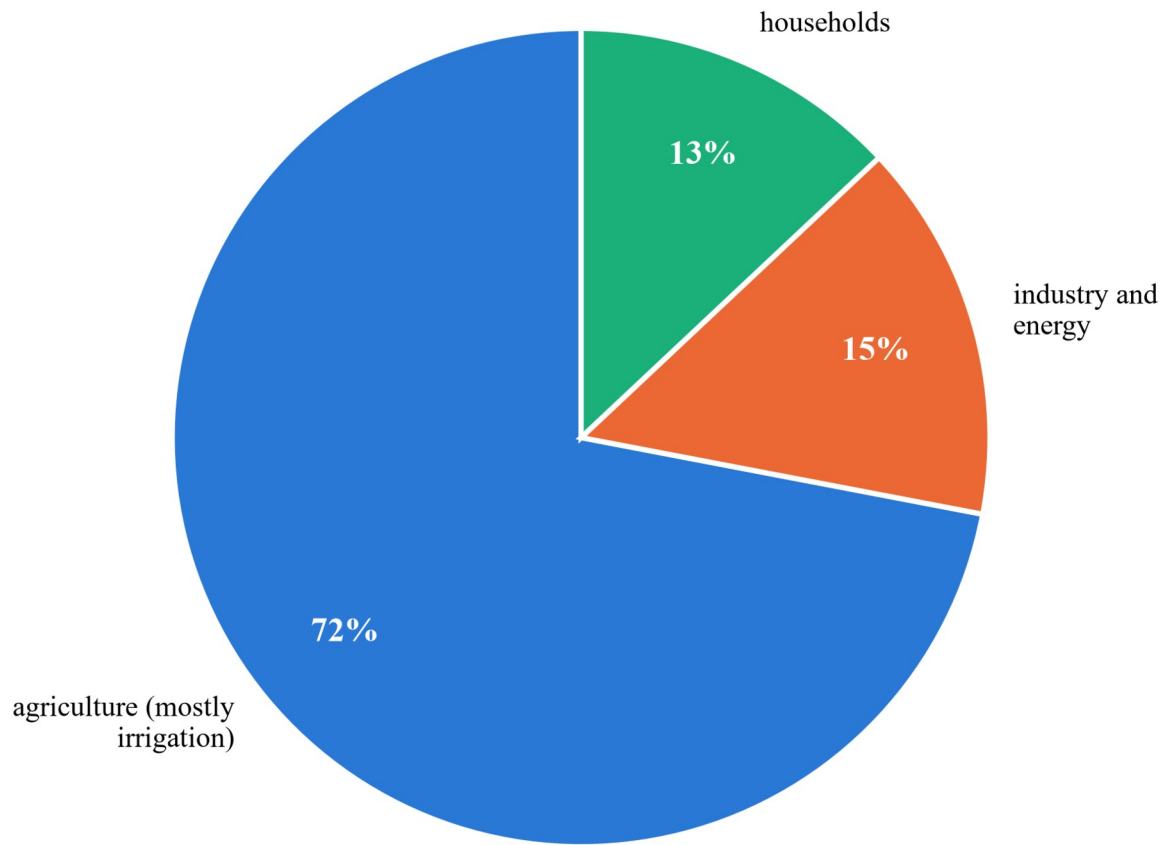
Figure 8 — Adult literacy against GDP per person: a relationship, not a rule. Source: World Bank, GDP per capita (current US\$, 2023); UNESCO Institute for Statistics, adult literacy rate (most recent year). Values rounded; approximate. Retrieved 25 August 2026.

8. Pie graphs and index tables: parts of a whole, comparisons across places (E07)

A **pie graph** shows the parts of **one whole**, so it is only honest when the parts add to 100 per cent. Figure 9 is a true pie: of all the fresh water people withdraw from rivers, lakes and groundwater worldwide, agriculture takes about 72 per cent — mostly **irrigation**, the watering of crops (1B), which is why it dwarfs industry and energy (about 15 per cent) and households (about 13 per cent). Any claim about a water-stressed world has to start from that slice (1D).

A **table** is the right format when exact values must sit side by side. Figure 10 compares six countries on two wellbeing indicators plus the HDI value and rank (4A, 4B). Read across the rows: Norway and Australia share a life expectancy (about 83 years) yet sit 12 ranks apart; the UAE is very high on HDI with a life expectancy four years lower; Bhutan, India and Niger show how far the medium and low categories sit from the top. The same six rows feed Worked example 1, where the table becomes a map.

One whole world: freshwater withdrawals by sector



United Nations World Water Development Report 2023 (UNESCO / UN-Water, after FAO AQUASTAT); values rounded to the nearest whole per cent. Retrieved 25 August 2026.

A pie graph of global freshwater withdrawals by sector with three slices: agriculture, mostly irrigation, 72 per cent in blue; industry and energy 15 per cent in orange; households 13 per cent in green.

Figure 9 — One whole world: freshwater withdrawals by sector. Source: United Nations *World Water Development Report 2023* (UNESCO / UN-Water, after FAO AQUASTAT); values rounded to the nearest whole per cent. Retrieved 25 August 2026.

Measuring wellbeing with more than one index: six countries, 2022 data

Country	Human Development Index value (2022)	HDI rank (out of 193)	Category	Life expectancy (years, about)
Norway	0.966	1	very high	83.3
Australia	0.946	13	very high	83.3
United Arab Emirates	0.937	26	very high	79.2
Bhutan	0.681	125	medium	72.1
India	0.644	134	medium	67.7
Niger	0.400	189	low	61.6

Original table created for this section; values from the UNDP Human Development Report 2023/24 (2022 data).

A five-column table comparing six countries on wellbeing indicators, 2022 data. Columns: country; Human Development Index value; HDI rank out of 193; category; life expectancy in years. Rows: Norway 0.966, rank 1, very high, 83.3; Australia 0.946, rank 13, very high, 83.3; United Arab Emirates 0.937, rank 26, very high, 79.2; Bhutan 0.681, rank 125, medium, 72.1; India 0.644, rank 134, medium, 67.7; Niger 0.400, rank 189, low, 61.6.

Figure 10 — Measuring wellbeing with more than one index: six countries, 2022 data. Source: original table created for this section; values from the UNDP *Human Development Report 2023/24* (2022 data). Retrieved 25 August 2026.

Worked examples

Example 1 — scaffolded (building a special-purpose map, E05/E01)

You have the six-country table in Figure 10. Build the special-purpose map in Figure 7 from it, the way a GIS would: data first, classes second, symbols third, conventions last.

Step	Reasoning
Pick the data and its source	Six countries, HDI values and ranks from the UNDP <i>Human Development Report 2023/24</i> (2022 data). The source line on the map will say exactly this.
Pick the theme and the classes	One theme — wellbeing as HDI. Use UNDP's own four categories (very high, high, medium, low) as the classes, so the shading is defensible.
Sort each country into a class	Norway 0.966, Australia 0.946, UAE 0.937 → very high. China 0.788, Indonesia 0.713 → high. Bhutan 0.681, Bangladesh 0.670, India 0.644 → medium. Niger 0.400 → low.
Give each class one symbol	One colour per category (dark blue, light blue, orange, red), recorded in the legend before the reader meets the map.
Place the markers	At each country's approximate position on an evenly spaced latitude–longitude grid; the scale note admits positions are schematic.
Add BOLTSS and the source	Border frame; orientation north at the top of the grid;

Step	Reasoning
Write the analysis	legend of the four categories; title naming theme, variable and year; scale note; source line. One sentence the map now makes visible: very high wellbeing clusters across Europe, East Asia and Australia, while the single low value sits in the Sahel — a spatial pattern to explain, not just six numbers.

Example 2 — scaffolded (reading a scatterplot, E06)

Use Figure 8. Describe the relationship between the two variables, test it on the curriculum's example pair, and explain the exception.

Step	Reasoning
Read the axes	Horizontal: GDP per person (US\$, 2023). Vertical: adult literacy rate (%). One dot per country.
Describe the pattern	As GDP per person rises, literacy tends to rise — richer countries in this set are also more literate.
Test the example pair	UAE (about US\$50,000, about 97%) sits high at the right; Bhutan (about US\$3,900, about 72%) sits low at the left. The pair spans the income gap and fits the pattern.
Find the exception	Sri Lanka: about US\$3,800 per person — Bhutan's income — yet about 92% literacy, close to China's 97% on a fifth of the income.
Explain it with geography	Income is not the only path to literacy. Sri Lanka has spent on schools and basic health care for decades, so where money goes matters as much as how much there is (4A, 4B).
Judge	The scatterplot shows a relationship, not a rule — and the dots that break the pattern are the ones worth explaining.

Practice questions

Scaffolded

Q1. Use Figure 1. Choose the best format for each job and give a one-line reason: (a) rainfall at Cairns and Alice Springs, month by month; (b) the exact HDI value, rank and category of six countries, side by side; (c) the share of the world's withdrawn fresh water taken by each sector.

Q2. Figure 2 shows BOLTSS. (a) What does each letter stand for? (b) Match each convention to its job: (i) lets the reader check the data, (ii) shows how map distance relates to real distance, (iii) explains every symbol and colour, (iv) frames the area shown.

Q3. Use Figure 3. (a) Which layer carries the rivers? (b) The question asks for farmland close to river water **and** close to town services. Besides the farms layer, which two layers must the GIS overlay to answer it?

Q4. Use Figure 6. (a) Read Cairns' wettest month and its rainfall, about. (b) Read Alice Springs' mean maximum temperature in its hottest month, about. (c) Name the biome each station sits in (1A).

Q5. Use Figure 9. (a) What share of withdrawn fresh water does agriculture take? (b) About how many times larger is that than the household share? (c) Give the one-word reason agriculture dominates (1B).

Q6. Use Figures 7 and 10. (a) Give the HDI category of Australia and of Bhutan. (b) How many ranks apart are the two countries?

Un scaffolded

Q7. Figure 4 places the world's main food-exporting farming regions and the main food-crisis regions of 2024 on one map. Explain what the pattern says about **why** food crises happen (draw on 1D).

Q8. Using Figure 5, write the cause chain from one grounded ship to less food and income for coastal towns as a single paragraph. Use the ideas of interconnection and scale (3A).

Q9. Figure 8 shows a pattern and an exception. Describe the pattern in one sentence, then explain why Sri Lanka sits above it and what that says about how income and wellbeing relate (4A, 4B).

Q10. A classmate must see how wellbeing differs between Norway, Australia, the United Arab Emirates, Bhutan, India and Niger. Choose the format from this section you would use, and justify your choice by comparing it with **two** formats you rejected.

Inquiry task — build and audit your own statistical map (geospatial technologies task)

You will build one map or graph with a digital tool, audit it against the conventions, and analyse it. The skill — representing and analysing with geospatial technologies — *is* the task.

1. **Choose a question from Chapters 1–4.** Examples: *Where does Australia's rainfall fall against where its irrigated farms sit?* (1B), or *How does wellbeing differ between two regions of one country?* (4B). One question, two or three layers or variables.
 2. **Collect from named sources.** Use at least one real dataset — Bureau of Meteorology climate averages, ABS data, or the UNDP Human Development Report. Record the source and your retrieval date.
 3. **Build with a digital tool.** Use any tool that stacks or plots data — a free web atlas or GIS, a spreadsheet chart, or a mapping website. If you build a map, shade or mark at least one variable by value (a statistical map in the style of Figures 4 and 7).
 4. **Audit.** Check your output against BOLTSS. On screen, note which conventions the tool supplies for you (border, orientation, scale) and which you must add (title, legend, source). Print or screenshot it.
 5. **Analyse.** Write two sentences: one describing the pattern (where, how much, which places), one explaining it with a process from the chapter your question came from.
 6. **Extend.** Write one sentence on what interactivity would add — what a user could switch, click or query that paper cannot show.
-

Answers

Q1. (a) A (complex) graph — two variables, rainfall and temperature, month by month for two places, as in Figure 6. (b) A table — exact values side by side, as in Figure 10. (c) A pie graph — parts of one whole that add to 100 per cent, as in Figure 9. **Q2.** (a) Border, Orientation, Legend, Title, Scale, Source. (b) (i) Source, (ii) Scale, (iii) Legend, (iv) Border. **Q3.** (a) Layer 2 — rivers and rainfall. (b) Layer 2 (rivers and rainfall) and Layer 4 (towns and roads), overlaid on Layer 3 (irrigated farms). **Q4.** (a) February, about 390–400 mm. (b) About 35–36 °C (January/February). (c) Cairns: tropical biomes (rainforest and savanna); Alice Springs: desert. **Q5.** (a) About 72 per cent. (b) About five to six times (72 against 13). (c) Irrigation. **Q6.** (a) Australia: very high; Bhutan: medium. (b) $125 - 13 = 112$ ranks. **Q7–Q10.** See fully-worked solutions.

Inquiry task. Answers vary. Check that the student used a named real dataset with a retrieval date, built a statistical or special-purpose representation with a digital tool, audited it against BOLTSS, wrote a pattern sentence and an explanation sentence, and noted what interactivity adds.

Fully-worked solutions

Q7. The crisis regions (Sahel, South Sudan, Horn of Africa, Yemen, Afghanistan) sit away from the great surplus farming regions, so the map argues that food crises are not mainly a *production* problem: the world grows enough food in its exporting belts (1B). The crises sit where people cannot reliably **access** food — poverty, conflict and broken transport cut them off from supplies that exist in other places, which is exactly the constraint 1D names. A map that shows production and crisis on one frame makes that gap a spatial pattern, not an opinion.

Q8. On 3 April 2010 the bulk carrier *Shen Neng 1* ran aground on Douglas Shoal inside the Great Barrier Reef Marine Park, and part of the heavy fuel oil it carried leaked into the sea. The slick coated coral and seagrass, blocking their light, and damaged reef provides less nursery and feeding habitat for fish. With less habitat, reef fisheries and aquaculture catch less, so the coastal towns that depend on them lose part of their food and their income. The chain shows interconnection across scale: one shipping accident at one shoal becomes, link by link, a livelihood problem for towns hundreds of kilometres away.

Q9. Pattern: across these nine countries, literacy tends to rise as GDP per person rises. Sri Lanka breaks the pattern — about 92% literacy on only about US\$3,800 per person — because wellbeing depends on what a country does with its income, not only on how much income there is: decades of spending on schools and basic health care put its literacy close to that of countries many times richer. So the scatterplot says income and wellbeing are related, but the relationship runs through choices (4B), which is why two countries at similar incomes (Sri Lanka and Bhutan) can differ by twenty percentage points.

Q10. A strong answer picks one format and justifies it against two rejects. Example: choose the **table** (Figure 10 style) because the task is exact comparison of several indicators — value, rank, category, life expectancy — and a table keeps every number readable. Reject the **pie graph**: the six countries are not parts of one whole, so a pie would be dishonest. Reject the **scatterplot** for this task: it shows the income–literacy relationship beautifully but drops the rank and life-expectancy columns the classmate must see. (Choosing the special-purpose map instead also earns the mark if justified: it shows the *where* — the spatial pattern — that the table hides, at the cost of exact values.)

Sources

All figures in this section are original, generated from the values shown and listed below. Retrieval date for all cited datasets: 25 August 2026.

- Victorian Curriculum 2.0, Geography Levels 9–10 — VC2HG10S03 and elaborations .E01–.E07 (curriculum references are given as VC2 codes; no VC2 text is reproduced).
- Bureau of Meteorology — 1991–2020 climate averages, Cairns Airport (031011) and Alice Springs Airport (015590); values rounded, approximate. Figure 6.
- UNDP, *Human Development Report 2023/24* (2022 data) — HDI values, ranks, categories and life expectancy for the six countries. Figures 7 and 10, Worked example 1.

- World Bank — GDP per capita, current US\$, 2023; UNESCO Institute for Statistics — adult literacy rate, most recent year. Values rounded; approximate. Figure 8 and Worked example 2.
- United Nations *World Water Development Report 2023* (UNESCO / UN-Water, after FAO AQUASTAT) — freshwater withdrawals by sector, rounded to whole per cent. Figure 9.
- FAO food balance sheets; *Global Report on Food Crises 2024* (FAO/WFP) — exporting farming regions and 2024 food-crisis regions. Figure 4.
- Australian Maritime Safety Authority; Great Barrier Reef Marine Park Authority — *Shen Neng 1* grounding, Douglas Shoal, 3 April 2010; about 950 tonnes of heavy fuel oil on board. Figure 5.
- Geoscience Australia (place data and landforms), Murray–Darling Basin Authority (rivers), ABS (land use and towns), Bureau of Meteorology (rainfall) — layer sources for the GIS diagram. Figures 2 and 3.
- Original diagrams and tables — Figures 1, 2, 3, 5 and 10, drawn from the values and facts they display; schematic world maps (Figures 4 and 7) labelled as schematic.

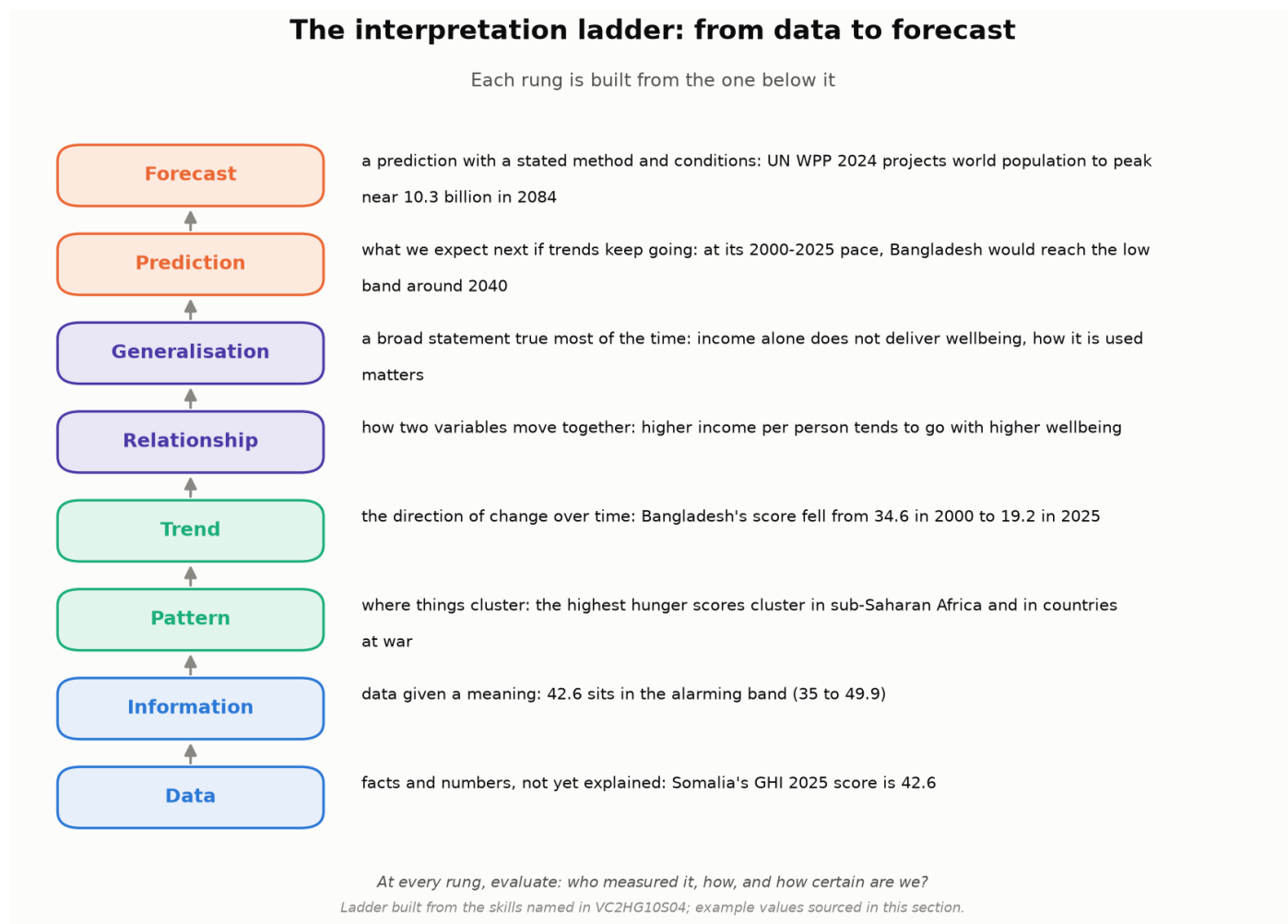
Note on scope: this section teaches VC2HG10S03 — showing and analysing information and data in several formats, with graphs and maps made with geospatial technologies — using working material borrowed from Chapters 1–4 (D6). No First Nations material appears in this section. The mechanics of scatterplots and the computation of statistics are taught by the Mathematics book (VC2M9ST03, VC2M9ST04, VC2M10ST02, VC2M10ST05) and are assumed, not taught, here (§4). Schematic maps are labelled as schematic; approximate values are labelled approximate.

Reading data critically: patterns, trends, predictions, relationships and forecasts

Theory

Part 1 — The work of this section: interpreting and evaluating

To **interpret** data is to say what it means; to **evaluate** it is to judge how good the evidence is and how strong the claims built on it are. This section climbs a ladder of six moves, and evaluation rides along every rung (Figure 1).



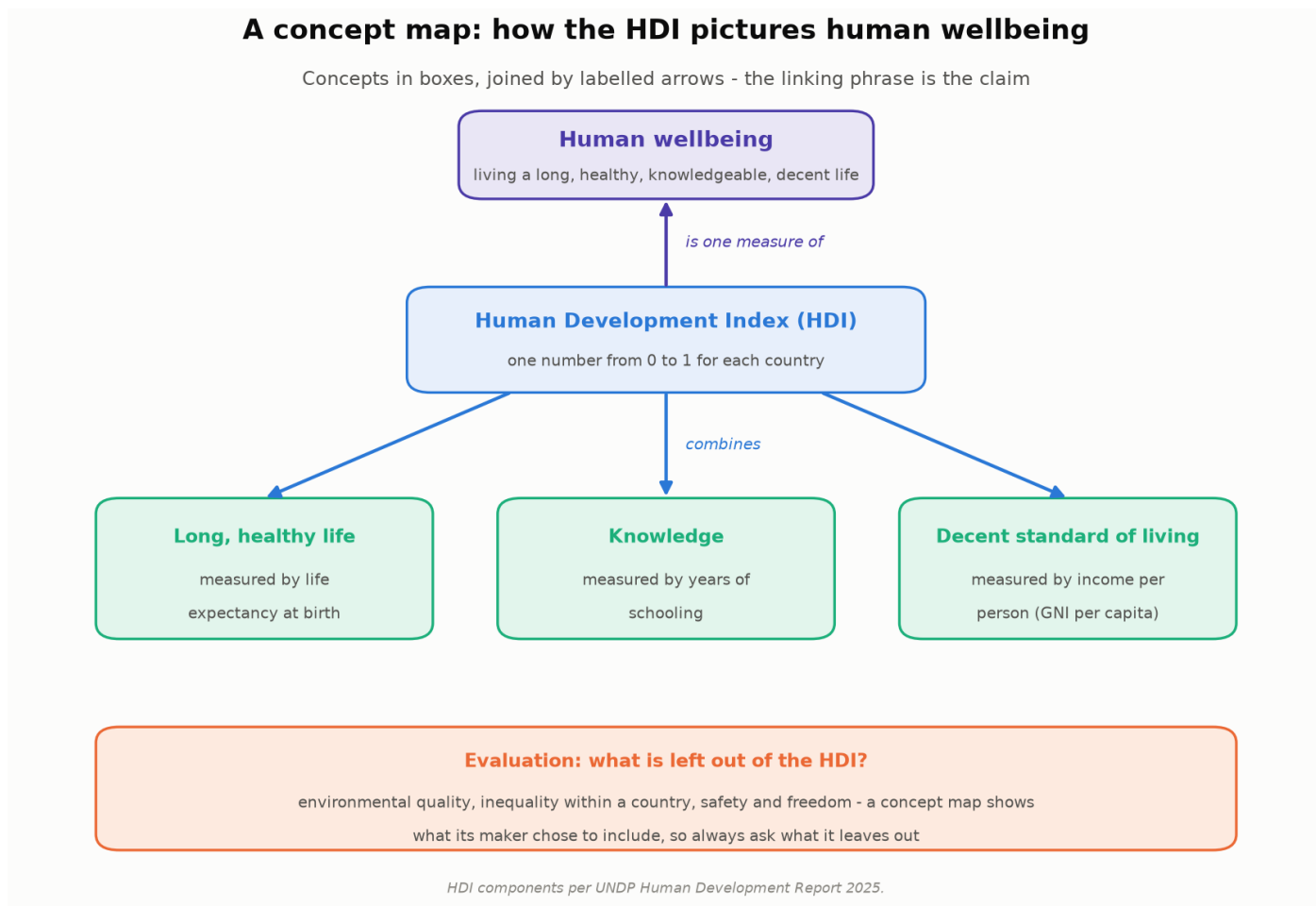
Interpretation ladder from data to forecast in eight rungs: data (Somalia's GHI 2025 score is 42.6), information (42.6 sits in the alarming band), pattern (highest hunger scores cluster in sub-Saharan Africa and countries at war), trend (Bangladesh's score fell from 34.6 in 2000 to 19.2 in 2025), relationship (higher income per person tends to go with higher wellbeing), generalisation (income alone does not deliver wellbeing), prediction (at its 2000-2025 pace Bangladesh would reach the low band around 2040), forecast (UN WPP 2024 projects world population to peak near 10.3 billion in 2084), with the reminder to evaluate at every rung

Figure 1. The interpretation ladder: from data to forecast.

The section title names the rungs, so fix the meanings now. A **pattern** is where things cluster or repeat in space; a **trend** is a direction of change over time; a **relationship** is how two variables move together. A **generalisation** is a broad statement drawn from cases that is true most of the time but not all of it — so a generalisation is always tested by its exceptions. A **prediction** is a statement about what will happen next. Everyday English swaps “prediction” and “forecast”, but this section fixes one meaning for each: a **forecast** is a prediction made by a stated method (usually a model) and carrying stated conditions. When the conditions change, the forecast changes — that is what makes a forecast honest.

Part 2 — Concept maps: linking ideas with claims (E01)

A **concept map** puts ideas in boxes and joins them with labelled arrows; the linking phrase on each arrow is the claim. Figure 2 maps the idea of wellbeing using one real measure, the **Human Development Index (HDI)** — the United Nations’ single number from 0 to 1 for each country, built from three things: a long and healthy life (life expectancy at birth), knowledge (years of schooling) and a decent standard of living, counted as **GNI per capita** (the income per person, in dollars adjusted by **purchasing power parity**, or **PPP**, so that one dollar buys about the same bundle of goods in every country).



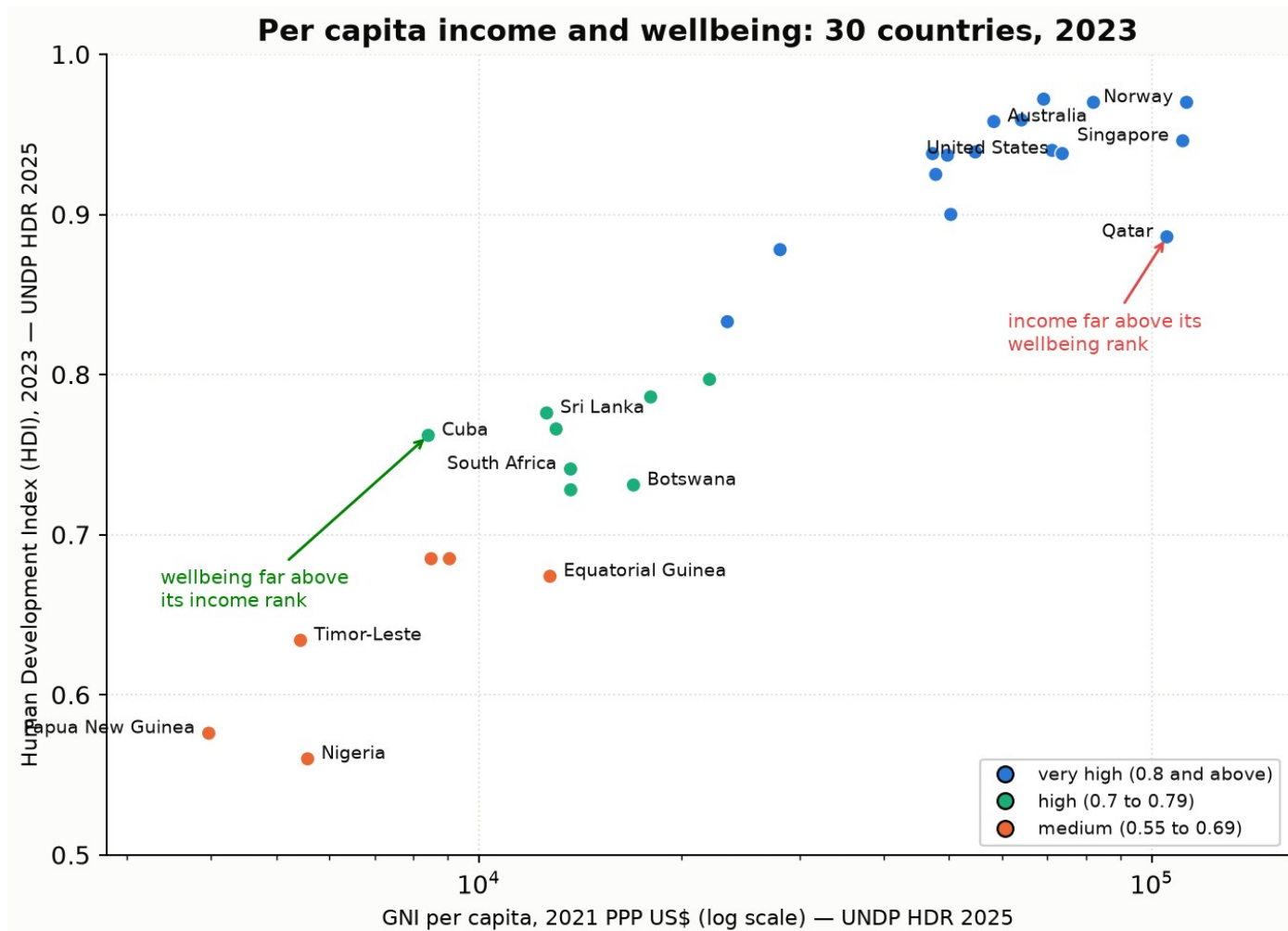
Concept map with human wellbeing at the top, joined by an arrow labelled “is one measure of” to the Human Development Index (HDI), which combines three concepts in green boxes: long healthy life measured by life expectancy at birth, knowledge measured by years of schooling, and decent standard of living measured by income per person (GNI per capita); an evaluation strip below lists what the HDI leaves out: environmental quality, inequality within a country, safety and freedom

Figure 2. A concept map: how the HDI pictures human wellbeing (UNDP HDR 2025).

Read the map the way E01 intends: the arrows carry the thinking. “HDI combines knowledge” is a claim you can question — and the evaluation strip does, because every map leaves things out. The HDI says nothing about clean air, inequality inside a country, safety or freedom. Noticing what a measure leaves out is evaluation, not nit-picking.

Part 3 — The income–wellbeing scatterplot (E03, E04)

The Mathematics book teaches you to construct a scatterplot and place a line of good fit (VC2M10ST02, VC2M10ST05); here you use the skill as a geographer. E04’s scatterplot pairs **per capita income** (per person income, on the x-axis, on a log scale so poor and rich countries share one chart) with a measure of **wellbeing** (the HDI, on the y-axis). Figure 3 plots thirty countries from the UN’s Human Development Report 2025.



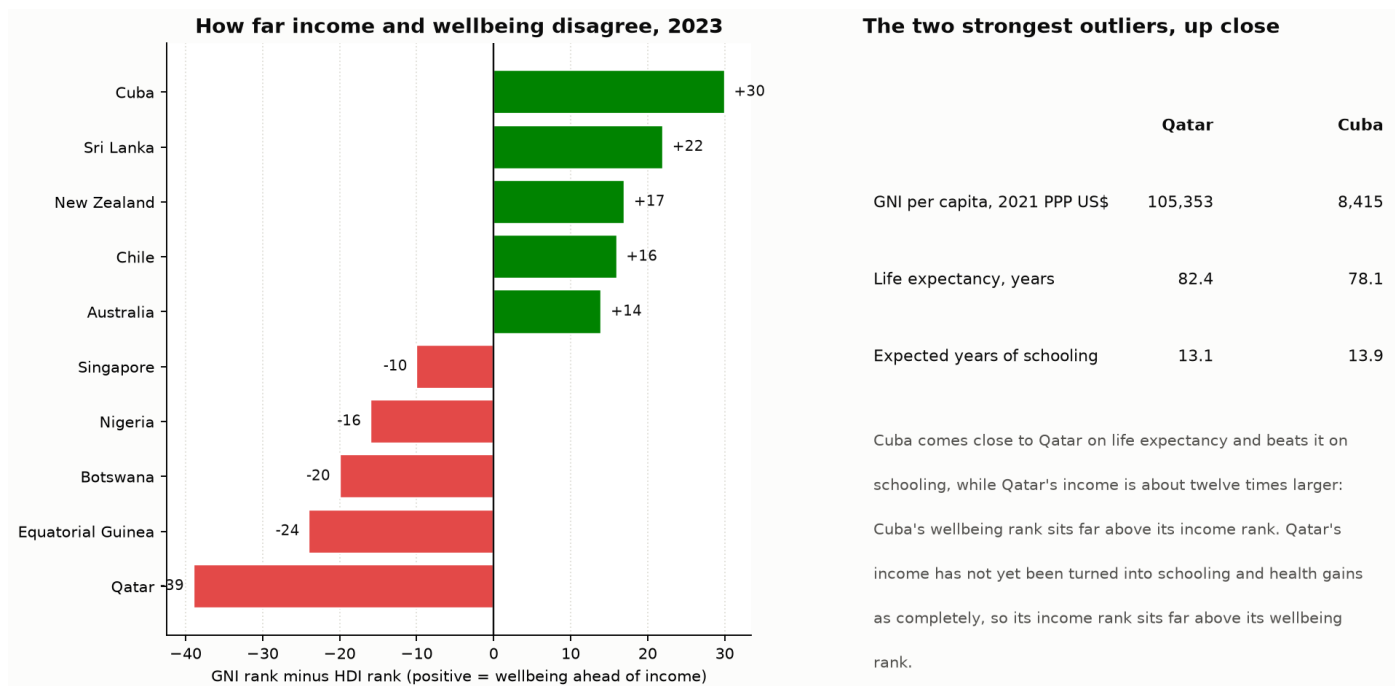
Scatterplot of GNI per capita (2021 PPP US dollars, log scale) against HDI (2023) for 30 countries, coloured by UNDP category (very high 0.8 and above in blue, high 0.7 to 0.79 in aqua, medium 0.55 to 0.69 in orange), with labelled points including Norway, Singapore, United States, Australia, Qatar, Sri Lanka, Botswana, South Africa, Cuba, Equatorial Guinea, Timor-Leste, Papua New Guinea and Nigeria, and arrows marking Qatar as income far above its wellbeing rank and Cuba as wellbeing far above its income rank

Figure 3. Per capita income and wellbeing: 30 countries, 2023 (UNDP HDR 2025).

Interpret first. The **relationship** is positive and strong: richer countries generally sit higher on wellbeing, and the points tighten into the top-right corner. The **pattern** is a curve, not a straight line: above about 50,000 dollars, more income buys very little extra HDI. Now evaluate with the exceptions. An **outlier** is a case that lies outside the general pattern, and Figure 3 carries some famous ones: **Qatar**, **Equatorial Guinea** and **Botswana** sit below the curve (income higher than their wellbeing would lead you to expect), while **Cuba**, **Sri Lanka** and **Australia** sit above it (wellbeing higher than their income would lead you to expect).

Part 4 — Investigating the outliers with Gapminder (E04)

A good geographer treats an outlier as a question, not a mistake. Figure 4 measures the disagreement for ten countries as the gap between a country's income rank and its HDI rank, and then puts the two strongest outliers side by side.



Two-panel figure: left, horizontal bars of GNI rank minus HDI rank for ten countries (Cuba +30, Sri Lanka +22, New Zealand +17, Chile +16 and Australia +14 in green above zero; Singapore -10, Nigeria -16, Botswana -20, Equatorial Guinea -24 and Qatar -39 in red below zero); right, a table comparing Qatar and Cuba on GNI per capita (105,353 vs 8,415 PPP US dollars), life expectancy (82.4 vs 78.1 years) and expected years of schooling (13.1 vs 13.9), concluding that Cuba matches Qatar's schooling and comes close on life expectancy while Qatar's income is about twelve times larger

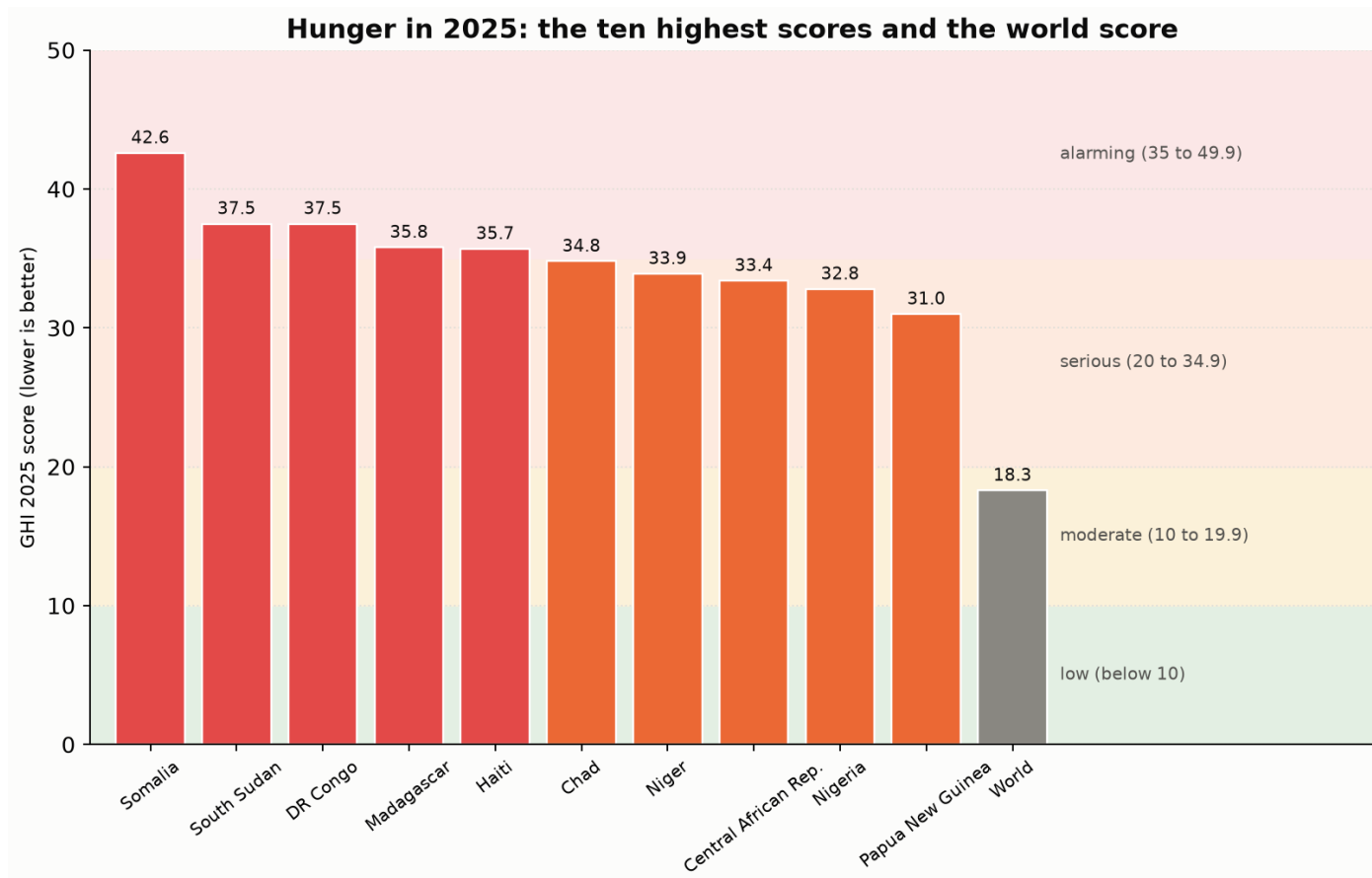
Figure 4. Outliers: when income and wellbeing disagree (UNDP HDR 2025).

Qatar's income per person is about twelve times Cuba's, yet Cuba's life expectancy comes within four years and its expected schooling is higher: Cuba turns a small income into long, well-schooled lives, so its wellbeing rank sits 30 places above its income rank. Qatar's oil income is enormous but has not (yet) been turned into schooling and health as completely, so its income rank sits 39 places above its wellbeing rank. Equatorial Guinea is the sharpest warning in the set: oil money with a life expectancy of only 63.7 years.

E04 names a tool for this investigation: **Gapminder** (gapminder.org), the free geospatial tool that replays the income–life-expectancy scatterplot year by year for every country. Replaying Qatar and Cuba since 1950 shows the generalisation behind the outliers: income can jump in a decade (oil, war, reform), while life expectancy and schooling only climb slowly — so at any moment, countries whose income jumped recently sit below the curve, and countries that invested in health and school rooms for decades sit above it.

Part 5 — Explaining hunger patterns with two real indexes (E06)

The **Global Hunger Index (GHI)** scores a country's hunger from four measures: **undernourishment** (the share of people whose food does not supply enough energy, or calories, for a year), **child mortality** (children dying before age five), **stunting** (children too short for their age, the mark of long-running poor nutrition) and **wasting** (children too light for their height, the mark of recent hunger), weighted one-third, one-third, one-sixth and one-sixth. Lower is better; the bands are low (below 10), moderate (10 to 19.9), serious (20 to 34.9), alarming (35 to 49.9) and extremely alarming (50 and above). Figure 5 shows the ten highest scores in 2025 beside the world score.

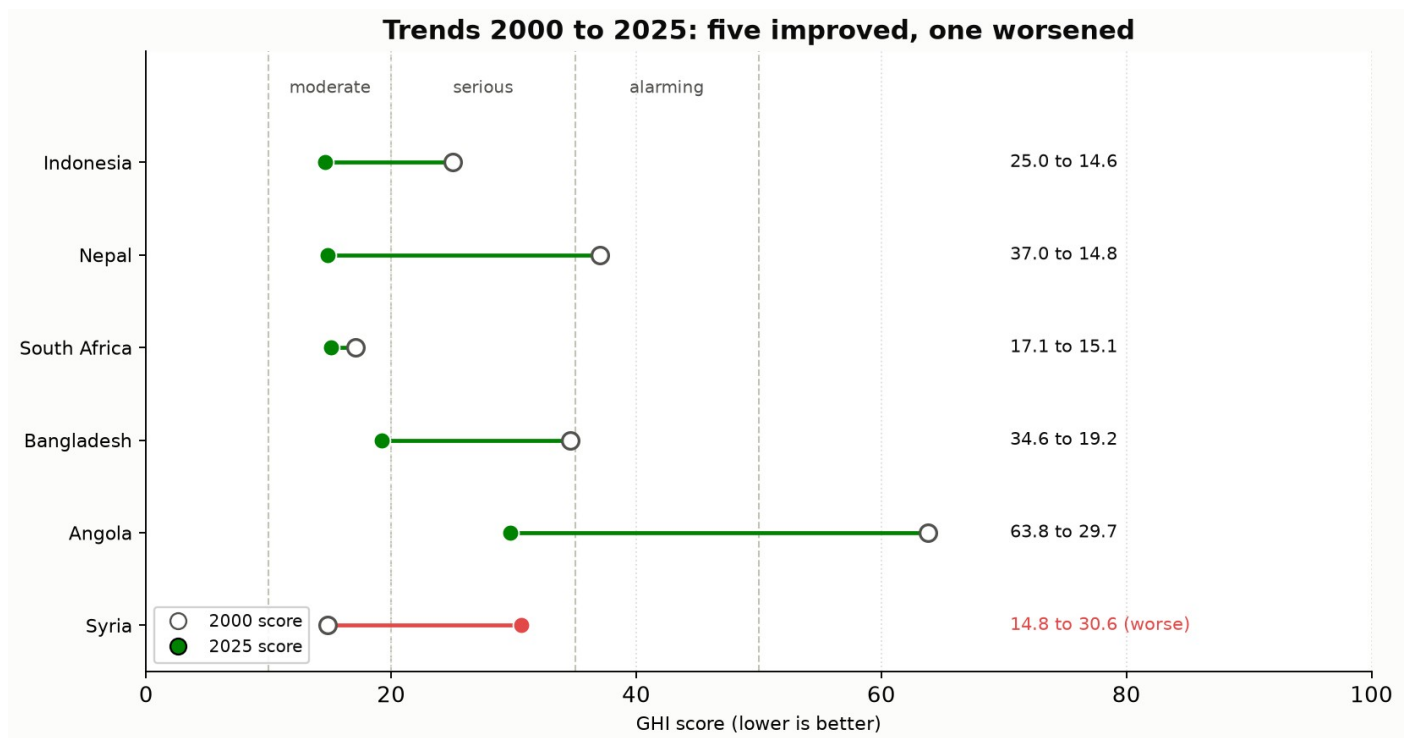


Bar chart of GHI 2025 scores against shaded severity bands: Somalia 42.6, South Sudan 37.5, DR Congo 37.5, Madagascar 35.8 and Haiti 35.7 in the alarming band; Chad 34.8, Niger 33.9, Central African Republic 33.4, Nigeria 32.8 and Papua New Guinea 31.0 in the serious band; and the world score 18.3 in the moderate band

Figure 5. Hunger in 2025: the ten highest scores and the world score (GHI 2025).

Interpret the **pattern**: the alarming band holds seven countries — Somalia, South Sudan, DR Congo, Madagascar, Haiti, Burundi and Yemen — and the high scores cluster in sub-Saharan Africa and in countries at war; conflict and hunger sit together so often that the GHI calls it a recurring pattern, not a coincidence. The world score of 18.3 (moderate) is down from 19.0 in 2000 — a slow improvement.

The **trends** tell a sharper story (Figure 6). Angola halved and halved again (63.8 to 29.7 since 2000, after its civil war ended); Bangladesh fell from serious (34.6) to the edge of moderate (19.2); Nepal and Indonesia improved just as strongly. Syria ran the other way: 14.8 in 2000, 30.6 in 2025 — war reversed two decades of progress. Evaluating the trend means naming its driver: the pattern of hunger follows the pattern of conflict, government and farm systems.



Dumbbell chart of GHI scores in 2000 (open dots) and 2025 (filled dots) for six countries: Indonesia 25.0 to 14.6, Nepal 37.0 to 14.8, South Africa 17.1 to 15.1, Bangladesh 34.6 to 19.2, Angola 63.8 to 29.7 (all improved, green) and Syria 14.8 to 30.6 (worsened, red), drawn against the moderate/serious/alarming band boundaries

Figure 6. Trends 2000 to 2025: five improved, one worsened (GHI 2025).

A second real index looks at hunger from another angle. The Food and Agriculture Organization's **Low Income Food Deficit Countries (LIFDCs)** are countries with low income and a net food-trade deficit — they cannot grow enough food and cannot afford to buy the gap. The 2026 list holds 39 countries: 31 in Africa, 7 in Asia and 1 in the Americas (Figure 7).

Low Income Food Deficit Countries (LIFDCs), 2026: 39 countries

FAO's list - five fewer than the previous list

What puts a country on the list?

1. Low income: GNI per capita below the World Bank's historical threshold (2024: 2,155 US dollars).
2. Food deficit: a net food-trade deficit (food imports measured in calories against exports), averaged over 2022 to 2024.
3. Rules: a country may take itself off the list, and must stay on it for three years before leaving.

39 countries in 2026

5 fewer

Africa (31)

Benin, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros, Congo, Democratic Republic of the Congo, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Rwanda, Senegal, Sierra Leone, Somalia, South Sudan, Sudan, Togo, Uganda

Asia (7)

Afghanistan, North Korea, Kyrgyzstan, Nepal, Syria, Tajikistan, Yemen

Americas (1)

Haiti

Left the list in 2026:

Sao Tome and Principe, Nicaragua, Uzbekistan, Zimbabwe, Tanzania

A list that shrinks by five is itself a trend worth interpreting: more countries are leaving the food-deficit list than joining it.

FAO, LIFDC country profiles page, retrieved 25 August 2026.

Three-panel figure of the 2026 LIFDC list: left panel states the three tests (GNI per capita below the World Bank historical threshold, 2,155 US dollars in 2024; a net food-trade deficit averaged over 2022 to 2024; and rules on self-exclusion and a three-year stay), with chips “39 countries in 2026” and “5 fewer”; right panel lists the 31 African, 7 Asian and 1 American members; bottom panel lists the five countries that left in 2026: Sao Tome and Principe, Nicaragua, Uzbekistan, Zimbabwe and Tanzania

Figure 7. Low Income Food Deficit Countries, 2026 (FAO).

Compare the two lenses (Figure 8). Every country in the GHI's alarming band is also a LIFDC — the instruments agree where hunger is worst. But Nigeria and Papua New Guinea carry serious GHI scores without being LIFDCs: their incomes and food trades do not fail the LIFDC test. Two instruments, two questions — “who is hungry?” and “who cannot afford to close a food gap?” — and evaluating data starts by noticing which question is being answered.

Two lenses on hunger: GHI severity against LIFDC membership

Same countries, two different instruments - comparing them is evaluation

Country	GHI 2025 band	On the 2026 LIFDC list?
Somalia	alarming (42.6)	yes
South Sudan	alarming (37.5)	yes
DR Congo	alarming (37.5)	yes
Madagascar	alarming (35.8)	yes
Haiti	alarming (35.7)	yes
Burundi	alarming (35 to 49.9 band)	yes
Yemen	alarming (35 to 49.9 band)	yes
Syria	serious (30.6)	yes
Nigeria	serious (32.8)	no
Papua New Guinea	serious (31.0)	no

Reading the comparison: every alarming country is on the LIFDC list, but Nigeria and Papua New Guinea carry serious hunger without being on it - the LIFDC test is low income plus a net food-trade deficit, not a hunger score. Two instruments answer two different questions, and evaluating data means noticing which question is being answered.

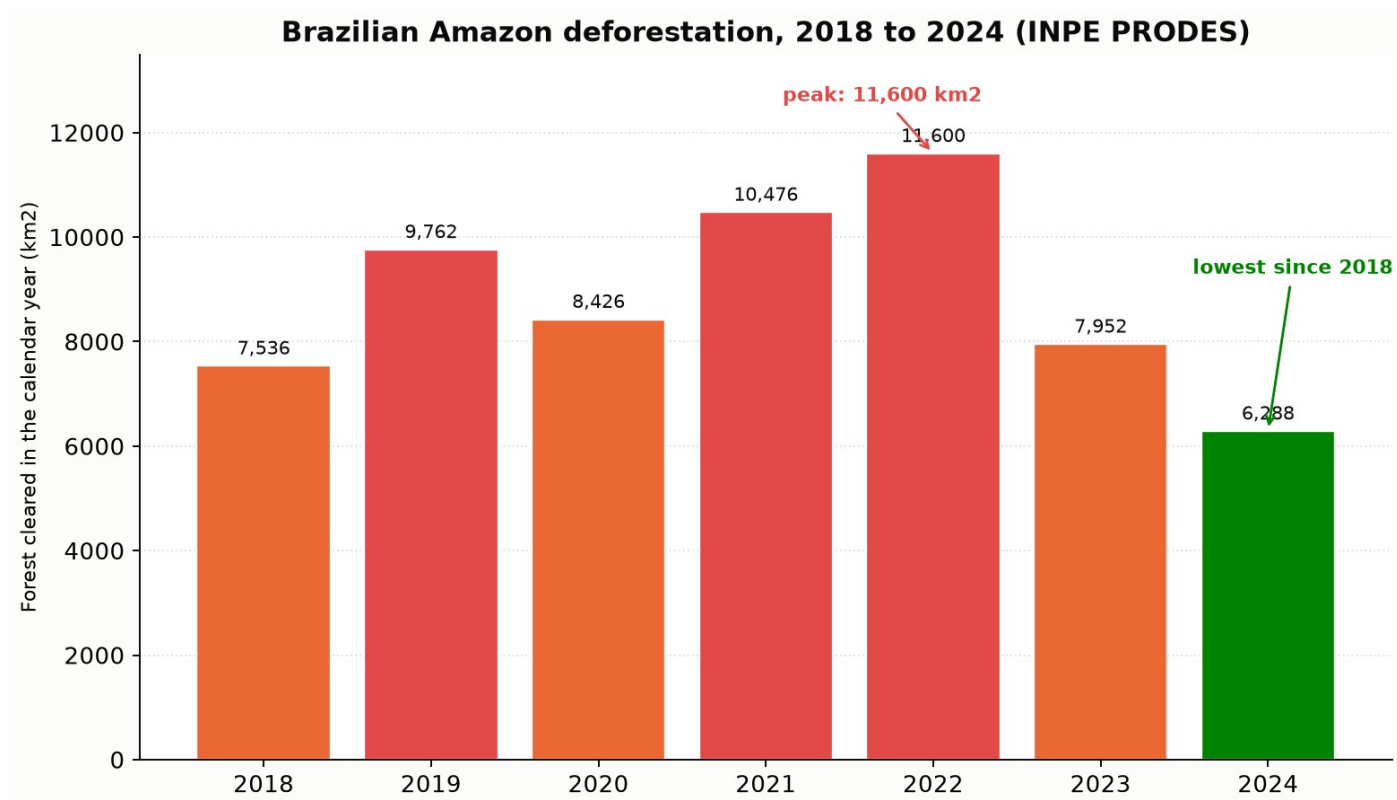
2025 Global Hunger Index; FAO LIFDC list 2026; both retrieved 25 August 2026.

Table of ten countries against two lenses: GHI 2025 band and membership of the 2026 LIFDC list; Somalia, South Sudan, DR Congo, Madagascar, Haiti, Burundi, Yemen (all alarming) and Syria (serious) are yes on both; Nigeria (serious, 32.8) and Papua New Guinea (serious, 31.0) are no on the LIFDC list; a reading panel explains that the LIFDC test is low income plus a net food-trade deficit, not a hunger score

Figure 8. Two lenses on hunger: GHI severity against LIFDC membership (GHI 2025; FAO 2026).

Part 6 — Generalisations from images and surveys (E05)

Satellite images are data you read with your eyes. Before-and-after images of the Amazon show forest in 2018 and cleared land in 2024; Brazil's space agency INPE counts the clearing each year with its PRODES system (Figure 9). The **pattern**: clearing rose from 2018 to a 2022 peak of 11,600 km², then fell to 6,288 km² in 2024, the lowest since 2018. The **generalisation** a geographer offers: the pace of Amazon clearing turns with Brazil's enforcement and policy choices as much as with world demand — a trend that can reverse in two years is a trend driven by decisions. Evaluate: one seven-year series is short, and a good answer says so.



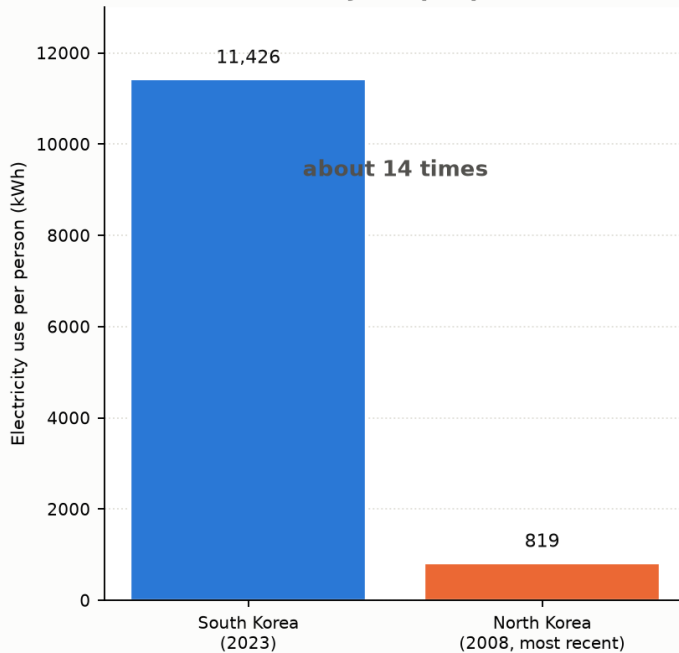
Bar chart of Brazilian Amazon deforestation by calendar year (INPE PRODES): 2018 7,536 km²; 2019 9,762; 2020 8,426; 2021 10,476; 2022 peak 11,600; 2023 7,952; 2024 lowest 6,288, with the peak and the 2024 low arrowed

Figure 9. Brazilian Amazon deforestation, 2018 to 2024 (INPE PRODES, via Wikipedia table).

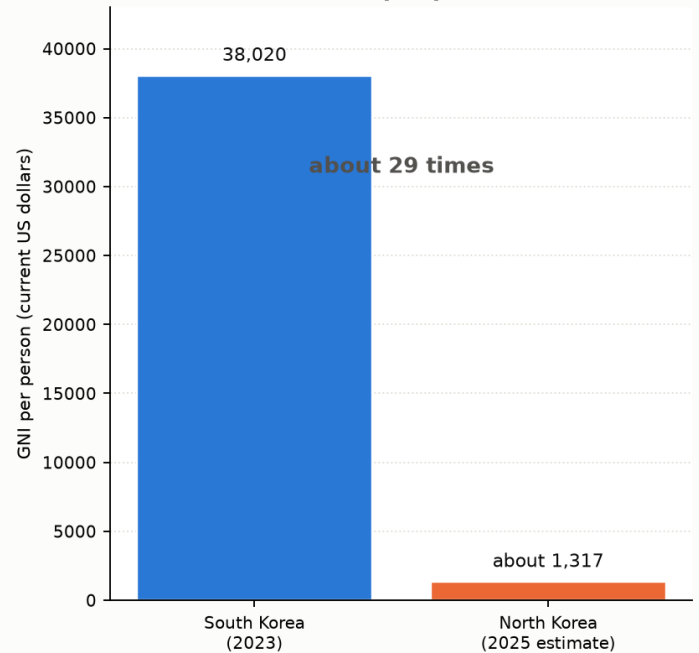
Night lights are the second image set E05 names. Satellite images at night show South Korea blazing and North Korea almost dark, and the ground data behind the picture is just as stark (Figure 10): electricity use per person of 11,426 kWh against 819 kWh (about 14 times), and income per person of about 38,020 US dollars against about 1,317 (about 29 times). The **generalisation**: at night, the brightness of a country roughly traces its electricity use — which is why night-light images are used as stand-in evidence where a government reports little, as North Korea does. Evaluate the method honestly: the 819 kWh figure is from 2008, the most recent reported, so the image is doing real work as a more current check.

One peninsula, two economies: the gap night-light images show

Electricity use per person



Income per person



Night-light images match the ground data: bright south, dark north. Comparing image with data is E05's text-and-image analysis skill.

Two paired bar charts for the Korean peninsula: electricity use per person (South Korea 11,426 kWh in 2023 vs North Korea 819 kWh, most recent 2008, about 14 times) and income per person (South Korea 38,020 US dollars in 2023 vs North Korea about 1,317, 2025 estimate, about 29 times), with the note that night-light images match the ground data: bright south, dark north

Figure 10. One peninsula, two economies: the gap night-light images show (World Bank; Bank of Korea).

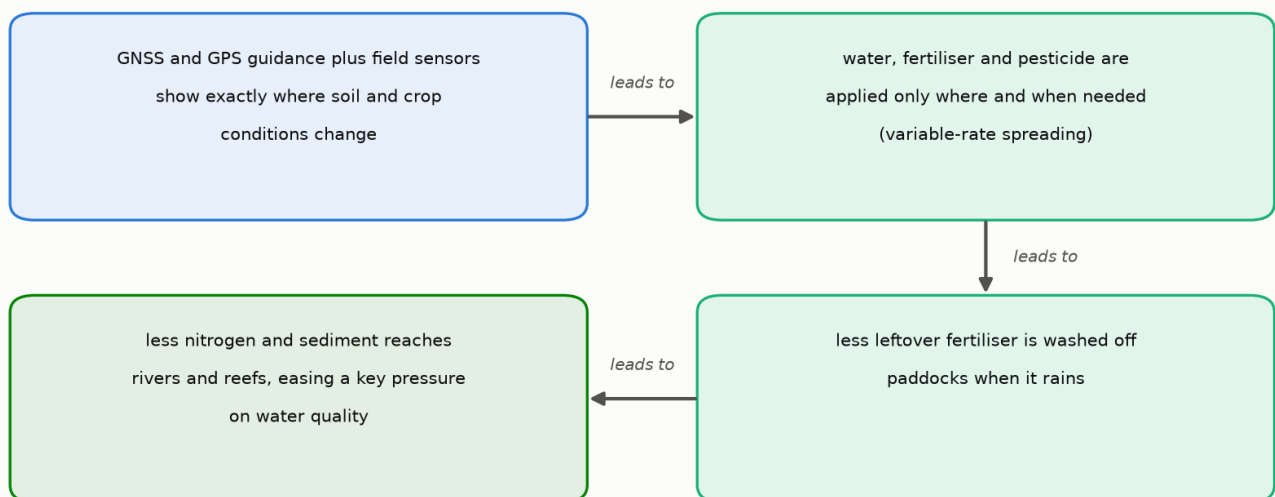
E05's other route to generalisations is the questionnaire or interview — asking people for their perspectives or their access, as with internet access in the local area. You run one in the inquiry task below.

Part 7 — Causes and impacts: geospatial technology (E07)

E07 asks for relationships between causes and impacts in data. **GNSS** (global navigation satellite systems, the satellite families that include GPS) and **GIS** (geographical information systems, software that layers data over maps) let a farmer measure a paddock metre by metre. Figure 11 writes the cause-and-effect chain the elaboration describes.

Cause and effect: precision agriculture and water quality

Reading a relationship: change in one box is followed by change in the next



Evaluation: each arrow is a claim. How strong is the evidence for it, and what else affects reef water quality at the same time?

A second chain (E07): GPS tourist maps know your position, so they suggest routes and stops
- a cause-and-effect link between location data and where visitors go and spend.

Causal chain as taught in E07; reef water-quality pressure per GBRMPA (cited in this book, section 1A).

Zigzag causal chain in four boxes joined by “leads to” arrows: GNSS and GPS guidance plus field sensors show where soil and crop conditions change; water, fertiliser and pesticide are applied only where and when needed (variable-rate spreading); less leftover fertiliser is washed off paddocks when it rains; less nitrogen and sediment reaches rivers and reefs, easing a key pressure on water quality; an evaluation line asks how strong the evidence for each arrow is, and a second strip gives the GPS tourist map chain: location data leads to suggested routes and stops, which changes where visitors go and spend

Figure 11. Cause and effect: precision agriculture and water quality (model; reef pressure per GBRMPA, as cited in section 1A).

Each arrow is a claim to evaluate, not a fact to copy: precision spreading limits run-off *where it is adopted and enforced*, and reef water quality (the Great Barrier Reef’s authority reports run-off remains a threat) also depends on rain, soils and every farm in the catchment. The second chain in the figure — GPS tourist maps changing where visitors go and spend — is the same skill on a smaller stage: location data causes choices, choices cause patterns.

Part 8 — Environmental indicators and sustainability (E08)

An **indicator** is a measured number that stands for a bigger idea; E08 asks you to infer links between the key environmental indicators in the data and how **sustainable** places are at national scale — whether a place can keep its life-support systems working into the future. Figure 12 sets four real World Bank indicators for Australia against Germany.

Environmental indicators and sustainability: Australia vs Germany

Green tint marks the better value on each indicator

Indicator	Australia	Germany
Fine particles in air (PM2.5), 2019 - lower is better	9.3	10.0
Energy use per person, 2023 (kg of oil equivalent) - lower is better	4,928	2,928
Renewable share of electricity, 2021 - higher is better	26.7%	39.8%
Protected share of land area, 2023 - higher is better	20.4%	37.6%

Inferring the relationship: on these four indicators Germany leads on three, yet Australia's air is cleaner. No single indicator settles sustainability - the relationship has to be inferred across the set, and that inference is what E08 asks you to practise.

World Bank open data: PM2.5 2019, energy use 2023, renewable electricity 2021, protected land 2023; retrieved 25 August 2026.

Four-row table comparing Australia and Germany with the better value tinted green: fine particles in air (PM2.5) 2019, 9.3 vs 10.0 (Australia better, lower is better); energy use per person 2023, 4,928 vs 2,928 kg of oil equivalent (Germany better, lower is better); renewable share of electricity 2021, 26.7% vs 39.8% (Germany better, higher is better); protected share of land area 2023, 20.4% vs 37.6% (Germany better, higher is better); a note says no single indicator settles sustainability

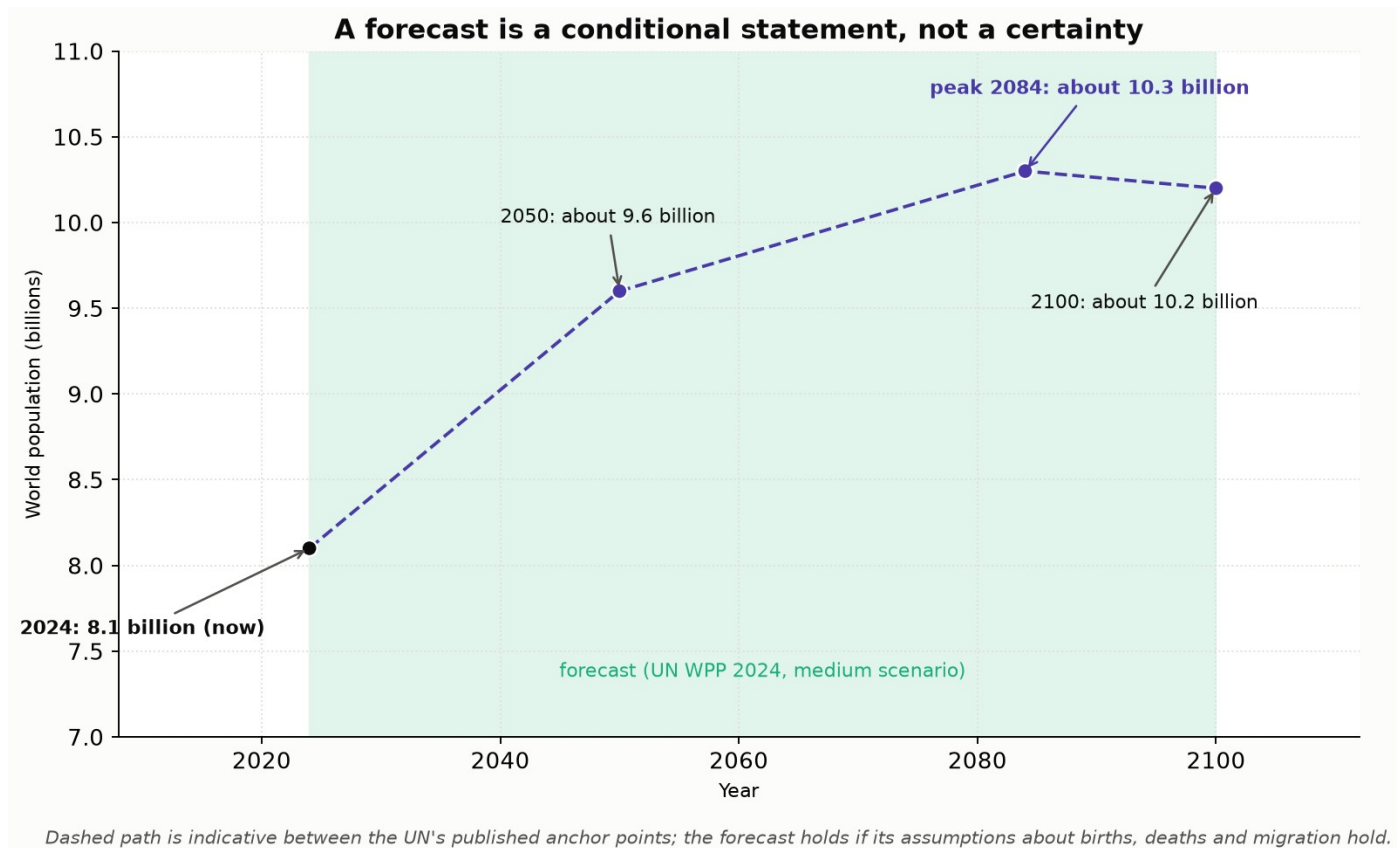
Figure 12. Environmental indicators and sustainability: Australia vs Germany (World Bank).

Infer, then check the inference. Germany leads on three of the four — less energy per person, a bigger renewable share, more protected land — yet Australia's air is cleaner on the PM2.5 indicator. The relationship to sustainability is therefore not a single number but a set: a country can lead on air and lag on energy, and an honest inference holds all four indicators at once and asks what is missing (water quality, fish stocks, waste, biodiversity — the other indicators E08 names).

Part 9 — From generalisation to forecast (E02)

E02's move is to turn generalisations into forecasts about a selected issue. Two generalisations with dated sources:

1. World population is still growing but the rate of growth is slowing: 8.1 billion people in 2024, about 9.6 billion forecast for 2050, a peak of about 10.3 billion in 2084 and about 10.2 billion in 2100 (UN World Population Prospects 2024).
2. Food and animal-feed demand is projected to grow about 50% from 2012 levels by 2050 (FAO, *The Future of Food and Agriculture*, 2017), driven by more people and by diets that keep getting richer.



Line chart of world population with the four UN anchor points (2024: 8.1 billion now; 2050 about 9.6 billion; peak 2084 about 10.3 billion; 2100 about 10.2 billion) joined by a dashed indicative path inside a shaded forecast region labelled UN WPP 2024 medium scenario, titled “a forecast is a conditional statement, not a certainty”

Figure 13. A forecast is a conditional statement, not a certainty (UN WPP 2024).

Join them and you have E02’s forecast: *if* the UN’s medium scenario holds and *if* diets keep getting richer, the world of 2050 must grow roughly half as much food again as it grew in 2012 for about 1.5 billion extra people — on the same land and water. The conditions are the point. A forecast stated without its “if” clause is a rumour; stated with it, it is a tool for planning.

Worked examples

Example 1 — scaffolded (E04: interpret the scatterplot and investigate outliers)

Question: Using Figures 3 and 4, (a) describe the relationship between per capita income and wellbeing, and (b) identify the two strongest outliers and explain, with data, why each lies outside the general pattern.

Step	Reasoning
1. Describe the relationship in one sentence.	Higher income per person goes with higher HDI: the points climb from bottom-left to top-right and tighten at the top.
2. Name the shape and what it means.	The pattern is a curve: above about 50,000 dollars, extra income adds little HDI, so money matters most where there is least of it.
3. Identify the strongest outliers and their direction.	Figure 4: Qatar (income rank 39 places above its wellbeing rank) and Cuba (wellbeing rank 30 places above its income rank).
4. Explain each with component data.	Cuba: 8,415 dollars yet 78.1 years of life and 13.9 expected school years — small income, well used. Qatar: 105,353 dollars but schooling (13.1) only just

Step	Reasoning
	above Cuba's — large income not yet matched by health and schooling gains.

Answer: The general pattern is a strong positive, curving relationship between income per person and wellbeing. The two strongest outliers sit at opposite ends of the gap: Qatar's oil income puts it 4th on income but only 43rd on HDI, while Cuba's health and schooling put it 97th on income but 30 places higher on wellbeing. The outliers support a generalisation the pattern alone would hide: income sets a ceiling, but how a country spends on health and school rooms decides how close it gets to that ceiling.

Example 2 — model response (E02: build a forecast from generalisations)

Question: Using the two generalisations in part 9 and Figure 13, write a forecast for food in 2050 and evaluate it in one sentence.

Model response: Generalisation 1: world population grows more slowly but still grows — 8.1 billion (2024) towards about 9.6 billion (2050). Generalisation 2: food and feed demand tracks people and diets, projected at about 50% above 2012 levels by 2050. Forecast: *if* the UN medium scenario and the FAO diet assumptions hold, then by 2050 farmers must supply about half as much food again as in 2012 for about 9.6 billion people. Evaluation: the forecast is only as good as its conditions — a shock to diets, trade, technology or climate would move both numbers, which is exactly why the “if” clause is part of the forecast.

Practice questions

Scaffolded

- Q1.** Look at Figure 2. (a) Name the three concepts the HDI combines. (b) The arrow from HDI to wellbeing is labelled “is one measure of”. Why “one measure of” and not “is”? (E01)
- Q2.** Read Figure 3. (a) State Australia's GNI per capita and HDI values and its UNDP category. (b) Is Australia above or below the general curve, and by how many ranks does its wellbeing run ahead of its income (Figure 4)? (E03, E04)
- Q3.** Figure 4 compares Qatar and Cuba. State one component on which Cuba beats Qatar and one on which Qatar beats Cuba, and give the income gap between them as a ratio in words. (E04)
- Q4.** (a) Place Somalia's 42.6 and the world's 18.3 in their GHI bands (Figure 5). (b) Name the four measures the GHI combines and the two that each carry a one-third weight. (E06)
- Q5.** Figure 7 lists the tests for the LIFDC list. State the two economic tests and the number of countries on the 2026 list. (E06)
- Q6.** Figure 10 gives electricity use per person for the two Koreas. State the ratio in words and explain in one sentence why night-light images are useful evidence for North Korea. (E05)

Un scaffolded

- Q7.** Describe the trend in Figure 9 (2018 to 2024) with two dated values, and offer one generalisation about what drives the pace of Amazon clearing. Evaluate your generalisation in one sentence. (E05)
- Q8.** Nigeria and Papua New Guinea both sit in the GHI's serious band, yet neither is on the 2026 LIFDC list (Figure 8). Explain what this disagreement tells you about the two instruments. (E03, E06)
- Q9.** Choose two arrows in Figure 11. For each, explain the cause-and-effect claim it makes, and evaluate one of them: what else, besides precision spreading, affects run-off reaching a reef? (E07)
- Q10.** Using Figure 12, infer a relationship between the four indicators and sustainability for Australia and Germany, and explain why no single indicator can settle the question. (E08)

Inquiry task

Interpreting and evaluating, yourself. This task uses E05's questionnaire route and E04's outlier investigation.

- (a) Design a five-question questionnaire about access to the internet in your local area (for example: home access, device sharing, speed, cost, and what happens when it fails). Survey at least 20 people, chart one result, and write one generalisation about internet access in your area. Finish with one sentence evaluating it (who is missing from your sample?).
 - (b) Choose one outlier country from Figure 4 (Qatar, Cuba, Equatorial Guinea or Sri Lanka). Using the Gapminder tool (gapminder.org) or the UNDP data behind Figure 4, investigate it: write three to four sentences on what the income–wellbeing gap looks like over time and one plausible reason for it.
 - (c) For your country, write one prediction and one forecast about its wellbeing by 2035. Your forecast must name its method and its conditions.
-

Answers

Q1. (a) A long, healthy life (life expectancy at birth); knowledge (years of schooling); a decent standard of living (GNI per capita). (b) Because the HDI leaves things out — environmental quality, inequality, safety, freedom — so it is one picture of wellbeing, not the whole thing. **Q2.** (a) 58,277 PPP US dollars; HDI 0.958; very high. (b) Above the curve; wellbeing runs 14 ranks ahead of income. **Q3.** Cuba beats Qatar on expected years of schooling (13.9 to 13.1); Qatar beats Cuba on income (and on life expectancy, 82.4 to 78.1). The income gap is about twelve to one. **Q4.** (a) Somalia: alarming; world: moderate. (b) Undernourishment, child mortality, stunting, wasting; the one-thirds are undernourishment and child mortality. **Q5.** GNI per capita below the World Bank historical threshold and a net food-trade deficit (2022-2024 average); 39 countries. **Q6.** About 14 times; North Korea reports little current data, so the night-light image is a more current stand-in check on its economy. **Q7.** Any correct pair, e.g. rising from 7,536 km² (2018) to a peak of 11,600 km² (2022), then falling to 6,288 km² (2024); generalisation: the pace of clearing follows Brazil's enforcement and policy choices; evaluation: seven years is a short series, so the generalisation needs a longer record. **Q8.** The GHI asks “who is hungry?” and the LIFDC list asks “who is poor and cannot buy its food gap?”; Nigeria and PNG have serious hunger but incomes and food trades that pass the LIFDC test — different questions, different lists. **Q9.** Any two arrows correctly explained; evaluation: rain, soils, and the practices of every farm in the catchment also set run-off, so one farm's precision is a contribution, not a cure. **Q10.** Germany leads on three of four indicators (energy, renewables, protected land) while Australia leads on air quality; sustainability has to be inferred across the set, and a single indicator (clean air alone, or renewables alone) would give a false verdict either way.

Inquiry (a) Check: five questions, 20+ responses, one chart, one generalisation plus a fair limitation sentence. **(b)** Check: three to four sentences using real data for one named country, with one plausible reason (e.g. Cuba: decades of health and schooling investment; Qatar: recent oil income jump). **(c)** Check: the forecast names a method and conditions; the prediction may not.

Fully-worked solutions

Q1. (a) The three concepts are a long, healthy life (measured by life expectancy at birth), knowledge (measured by years of schooling) and a decent standard of living (measured by income per person, GNI per capita). (b) The label is honest: the HDI is one measure of wellbeing, not wellbeing itself. Figure 2's evaluation strip lists what it leaves out — environmental quality, inequality within a country, safety and freedom — so the arrow says “is one measure of”.

Q2. (a) Australia: GNI per capita 58,277 PPP US dollars, HDI 0.958, in the very high category. (b) Australia sits above the general curve: rank 7 on HDI against rank 21 on income, so wellbeing runs 14 ranks ahead of income — a country that turns a high but not extreme income into long, well-schooled lives.

Q3. Cuba beats Qatar on expected years of schooling (13.9 against 13.1); Qatar beats Cuba on income — 105,353 against 8,415 PPP US dollars, about twelve to one — and on life expectancy (82.4 against 78.1). The ratio in words: Qatar's income per person is about twelve times Cuba's.

Q4. (a) Somalia's 42.6 sits in the alarming band (35 to 49.9); the world's 18.3 sits in the moderate band (10 to 19.9). (b) The GHI combines undernourishment, child mortality, stunting and wasting; undernourishment and child mortality each carry a one-third weight (stunting and wasting a sixth each).

Q5. The two economic tests: GNI per capita below the World Bank's historical threshold (2,155 US dollars at 2024) and a net food-trade deficit averaged over 2022 to 2024. The 2026 list holds 39 countries (31 African, 7 Asian, 1 American).

Q6. South Korea uses about 14 times as much electricity per person as North Korea (11,426 kWh against 819 kWh). Night-light images are useful for North Korea because its government reports little current economic data — the 819 kWh figure is from 2008 — so the satellite image is a more current stand-in that matches the ground data (bright south, dark north).

Q7. The series rises from 7,536 km² in 2018 to a peak of 11,600 km² in 2022, then falls to 6,288 km² in 2024, the lowest since 2018. A defensible generalisation: the pace of Amazon clearing turns on Brazil's enforcement and policy choices as much as on world demand. Evaluation: a seven-year series is short, and the fall since 2022 could reverse again, so the generalisation should be held loosely until a longer record confirms it.

Q8. The two instruments ask different questions. The GHI measures hunger in bodies (undernourishment, stunting, wasting, child mortality); the LIFDC list measures hunger in a national ledger (low income plus a net food-trade deficit). Nigeria and PNG answer “serious” to the first question but do not fail the second — their incomes and food trades sit above the LIFDC thresholds. The disagreement is not an error; it tells you which question each list answers, and evaluating data means reading each list as the question it asks.

Q9. Arrow one (guidance and sensors to variable-rate spreading): because the machinery knows its position and the paddock’s condition, inputs go on only where needed. Arrow three (less washed-off fertiliser to less nitrogen and sediment in rivers and reefs): what is not spread in excess cannot run off. Evaluating arrow three: run-off also depends on rain intensity, soil type, drainage and the practices of every farm in the catchment — the Great Barrier Reef authority reports water quality remains a threat — so precision spreading eases a pressure without removing it.

Q10. The inferred relationship: on this set, Germany’s national system runs closer to sustainability on three indicators — it uses less energy per person (2,928 against 4,928 kg of oil equivalent), generates a larger renewable share of its electricity (39.8% against 26.7%) and protects a larger share of its land (37.6% against 20.4%) — while Australia leads on air quality (PM2.5 9.3 against 10.0). No single indicator settles sustainability because each stands for only one system: clean air says nothing about energy or biodiversity, and a country can lead on one while lagging on the rest. The relationship has to be inferred across the set — and E08’s full indicator list (water, fish, waste, biodiversity) would test both countries further.

Inquiry (a) A model generalisation: “Most people in our area get online at home, but a minority rely on phones and lose access when data costs rise.” Evaluation sentence: “The sample over-represents our school community, so it under-represents older residents.” **(b)** Model (Cuba): the income–wellbeing gap is old, not new — replaying Cuba on Gapminder shows life expectancy and schooling climbing steadily for decades while income stays low and jumps only briefly, so the +30 rank gap reflects long-running investment in health and school rooms. **(c)** Model: prediction — “Cuba’s HDI will still sit above its income rank in 2035.” Forecast — “Using the UNDP trend in Cuba’s life expectancy and schooling 2000–2023 and assuming no major shock to its health system, Cuba’s HDI rises into the high 0.7s by 2035.” The forecast names its method (UNDP trend) and its condition (no major shock); the prediction does not need to.

Sources (real, checkable referents; all retrieved 25 August 2026): (1) UNDP, Human Development Report 2025, Statistical Annex Table 1 — HDI 2023 values, GNI per capita in 2021 PPP US dollars, and rank differences (Australia HDI rank 7 / GNI rank 21; Qatar 43 / 4; Cuba 97 / 127; Sri Lanka, Equatorial Guinea, Botswana component values). (2) 2025 Global Hunger Index (globalhungerindex.org, rankings spreadsheet) — 130 countries ranked; severity counts; 2000 and 2025 scores for Bangladesh, Angola, Syria, Nepal, Indonesia, South Africa; world score 18.3 (2000: 19.0); component weights. (3) FAO, Low Income Food Deficit Countries country profiles page — 2026 list of 39 countries (Africa 31, Asia 7, Americas 1), the criteria, and the five exits (Sao Tome and Principe, Nicaragua, Uzbekistan, Zimbabwe, Tanzania). (4) INPE PRODES calendar-year deforestation figures for the Brazilian Amazon, 2018–2024, via the Wikipedia table “Deforestation of the Amazon rainforest”. (5) World Bank open data — South Korea electricity use per capita 2023 (11,426 kWh) and GNI per capita Atlas method 2023 (38,020 US dollars); North Korea electricity per capita 2008 (819 kWh, most recent reported); Australia and Germany PM2.5 2019, energy use 2023, renewable electricity share 2021, terrestrial protected areas 2023. (6) Bank of Korea GNI per capita estimate for North Korea (about 1,317 US dollars, 2025). (7) UN World Population Prospects 2024 revision, via Wikipedia “Projections of population growth” — 8.1 billion (2024), about 9.6 billion (2050), peak about 10.3 billion (2084), about 10.2 billion (2100). (8) FAO (2017), The Future of Food and Agriculture: Trends and Challenges — food and feed demand about 50% higher by 2050 than 2012. (9) Gapminder (gapminder.org) — the free tool named in E04 for replaying income against life expectancy over time. (10) Great Barrier Reef Marine Park Authority water-quality finding, as cited in this book’s section 1A. Figures 1, 2, 4, 7, 8, 11 and 12 are original teaching diagrams computed from sources (1)–(3), (5) and (10); Figures 3, 5, 6, 9, 10 and 13 plot those sources directly.**