

Mathematics Level 7

Chapter 5 — Skills: geographical inquiry

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Building strong questions for your own inquiry

Curriculum link. Victorian Curriculum 2.0, Humanities: Geography, Levels 9 and 10 band. This section owns VC2HG10S01. The section draws on elaborations .E01–.E06 for linkage (they are illustrations, not a teaching order):

- .E01
- .E02
- .E03 — one of the curriculum’s examples in this elaboration is not used in this book (see the scope note at the front of the book)
- .E04
- .E05
- .E06 — one variable in the curriculum’s example list is not used in this book (see the scope note at the front of the book); the id is kept for linkage

This section in one sentence: a strong geographical inquiry starts with strong questions, and strong questions are built, not found — you sharpen a broad question with a concept, a scale and a place, then turn it into a testable hypothesis.

Theory

1. Three words an inquiry can start from. Every investigation in geography starts from one of three things: a **phenomenon** (something that can be observed to exist or happen in the world), an **issue** (a phenomenon that raises a problem people want to address) or a **challenge** (a hard task that needs action and effort to respond to). Figure 1 gives each with a real example.

Phenomenon, issue, challenge — three words an inquiry can start from

Term	What it means	A real example
Phenomenon	something that can be observed to exist or happen	coral bleaching on the Great Barrier Reef (mass bleaching in 1998, 2002 and in 2016–2024) — see Section 3A
Issue	a phenomenon that raises a problem people want to address	falling river health in the Murray–Darling Basin as water is diverted, and salinity rises — see Section 3B
Challenge	a hard task that needs action and effort to respond to	reducing the gap in human wellbeing between nearby Victorian local government areas — see Figure 7

Table of the three words an inquiry can start from — phenomenon, issue and challenge — each with its meaning and a real example: coral bleaching on the Great Barrier Reef, falling river health in the Murray–Darling Basin, and closing the gap in wellbeing between nearby Victorian local government areas

Figure 1. Phenomenon, issue, challenge — with one real example each.

The third example uses the book’s working sense of **human wellbeing**: how well people’s lives are going, measured through things such as income, education, health and housing. The curriculum uses the term without giving one fixed definition — other definitions exist — so this book states the measurable sense it will use, and every question here is answerable on that definition alone.

A **geographical question** is a question about places, environments and the connections between them — and it must be answerable with evidence: data, maps, sources or fieldwork. “Is the reef a nice place to visit?” is not geographical, because no evidence can settle what *nice* means. “How has coral bleaching on the Great Barrier Reef changed since 1998?” is geographical: it names a real phenomenon, and data exists that can answer it.

2. The seven concepts are your question lenses. The curriculum names seven geographical concepts: **place, space, environment, interconnection, sustainability, scale** and **change**. Each concept works like a lens (Figure 2): point it at any phenomenon and a question comes out. A single phenomenon should be looked at through several lenses, because each lens finds a different question.

The seven geographical concepts, used as question lenses

Concept	What it focuses on	Question starter
Place	what makes a place distinctive	What is daily life like in Mildura, and what makes it different from a Melbourne s
Space	where things are located, and why there	Where in Victoria is food grown, and why in those places?
Environment	the natural world and how it works	How does the health of the River Murray affect the towns along it?
Interconnection	how people, places and environments are linked	How are Victorian food producers linked to buyers in other countries?
Sustainability	meeting today's needs without harming what fut	Can the Murray–Darling Basin keep supplying irrigation water without further da
Scale	the size of the lens, from local to global	Is this a local problem, a national problem, or a global one?
Change	what is different over time	How has human wellbeing in this local government area changed between the 201

Table of the seven geographical concepts — place, space, environment, interconnection, sustainability, scale and change — each with what it focuses on and a question starter using a real Victorian example

Figure 2. The seven geographical concepts, used as question lenses.

3. A range of questions: four families. A good inquiry does not ask one question — it asks a **range** of them. Sort possible questions into four families by purpose (Figure 3). Descriptive questions map the phenomenon; explanatory questions look for causes; change-and-prediction questions look through time; evaluative questions weigh up what should be done. An inquiry that only ever asks descriptive questions never reaches causes; an inquiry that jumps straight to evaluative questions never checks the facts first.

Four families of geographical questions, sorted by purpose

Family	Its job	Example questions
Descriptive	say what something is, and where it is	'Where does Australia's food come from?' 'What do we mean by human wellbeing?'
Explanatory	say why something happens	'Why does food security matter?' 'In what ways are people, places and environments linked?'
Change and prediction	say how things are changing, and what may happen next	'In what ways has human wellbeing shifted over time?'
Evaluative	weigh up what should be done	'What should be done about unequal levels of human wellbeing, and why?'

Table of the four families of geographical questions — descriptive, explanatory, change and prediction, and evaluative — each with example questions

Figure 3. Four families of questions, sorted by purpose. The example questions are the book's own.

4. Sharpening a question. Broad questions are not wrong — they open the topic — but they cannot be tested, because they do not say which concept, which place or which scale. Sharpening adds four things: a **concept**, a **scale**, a **place**, and a way to **measure** or check the answer. Figure 4 shows three before-and-after sharpenings.

Sharpening a question: add a concept, a scale, a place, and make it measurable

Before: broad and hard to answer	After: sharpened	What was added
Is food important?	'Why does secure and sustainable food production matter at the national	concept named (sustainability) + scale (national)
Do places affect each other?	'In what ways do links between people, environments and places shape	concept named (interconnection) + scale (global)
Is life good where I live?	'How could we measure human wellbeing in your own neighbourhood?	concept named (wellbeing) + scale (local) + method

Table showing three vague 'before' questions sharpened into focused 'after' questions, each with a note on what was added: a named concept, a named scale, and a way to measure

Figure 4. Sharpening: the same question, made answerable.

5. Choosing a scale. The **scale** of an investigation is the size of the lens: local (your suburb or town), regional (a district, or a group of local government areas), national or global. The choice of scale is a real decision (. E05), because the same theme asks a different question and needs different data at each scale (Figure 5). A local-scale

question can be answered with your own fieldwork and surveys; a national-scale question needs a national data set such as the census; a global-scale question needs data that compares countries.

One theme — human wellbeing — asked at four scales

Each scale asks a different question and needs different data. The scale is a choice, and the choice shapes the inquiry.

Global

'How can we measure and map the world pattern of human wellbeing?'

Data: data that compares countries, such as the UN Human Development Index

National

'Why does human wellbeing differ from country to country, and inside countries?'

Data: national data sets — in Australia, the ABS census and QuickStats, region by region

Regional

Why does wellbeing vary between neighbouring local government areas in Victoria?

Data: ABS QuickStats for a selection of LGAs (Figure 7)

Local

'How could we measure human wellbeing in your own neighbourhood?'

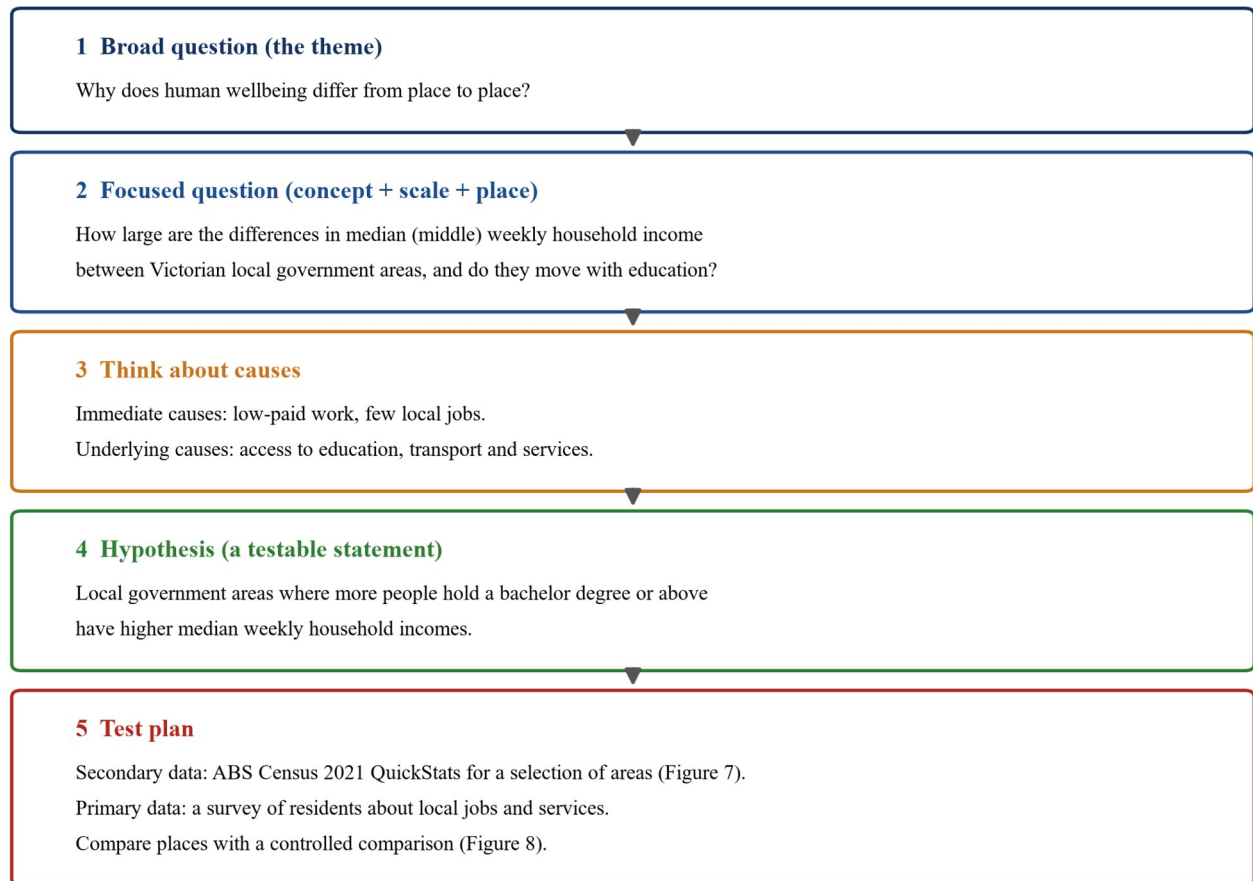
Data: your own fieldwork and surveys in the place itself, as well as local data

Scale ladder showing one theme — human wellbeing — asked at global, national, regional and local scales, with the kind of data each scale needs, from the UN Human Development Index down to your own fieldwork

Figure 5. One theme at four scales: the scale shapes the question and the data.

6. Immediate and underlying causes; the hypothesis. When something differs between places, the causes come in two layers. An **immediate cause** is the direct trigger you can see; an **underlying cause** is the deeper condition sitting behind it. If many households in an area live on low incomes, an immediate cause may be that the work available nearby is low-paid; an underlying cause may be long-run decline in the area's industries, or poor access to training and transport. Naming both layers changes the questions you ask. A **hypothesis** is a testable statement that proposes an answer to a question — it names the relationship you expect to find, so that you know what evidence to look for. A hypothesis is allowed to be wrong; testing is the point. Figure 6 walks one question from broad to testable.

From a broad question to a test plan



Five-step flow diagram: broad question, focused question, immediate and underlying causes, a testable hypothesis, and a test plan using ABS QuickStats as secondary data and a resident survey as primary data

Figure 6. From a broad question to a test plan.

7. Testing a hypothesis with a controlled comparison. Places cannot be tested in a laboratory, so geographers compare places that are already alike in some ways and different in others. A **variable** is something you can measure that differs between places — for example, in Figure 7: **country of birth** (the share of people born in Australia, and the top overseas birthplace), **educational attainment** (the share holding a bachelor degree or above), **median weekly household income** (the *median* is the middle value when all areas are lined up in order) and **housing tenure** (how households hold their home — owned outright, owned with a mortgage, or rented). The data come from the **Australian Bureau of Statistics (ABS) QuickStats**, the ABS's quick profile of a place, built from the **census** — the official count of every person in Australia, run every five years.

Area (Census 2021)	Born in Australia (%)	Top overseas birthplace (%)	Bachelor degree or above (%)	Median weekly household income	Owned outright (%)	Rented (%)
Boroondara (inner-eas	64.6	China, 8.0	52.3	\$2,376	38.7	28.8
Brimbank (west Melb	45.9	Vietnam, 13.0	19.8	\$1,506	36.2	26.7
Mildura (regional city	78.0	Malaysia, 1.9	12.7	\$1,341	33.3	29.8
Latrobe City (regional	79.4	England, 2.6	12.5	\$1,260	37.4	25.4
Victoria (state)	65.0	—	29.2	\$1,759	32.2	28.5

Table of ABS Census 2021 QuickStats for four Victorian local government areas — Boroondara, Brimbank, Mildura and Latrobe City — and the state of Victoria, showing born in Australia, top overseas birthplace, bachelor degree or above, median weekly household income, owned outright and rented

Figure 7. The variables of a controlled comparison, from ABS Census 2021 QuickStats.

A **controlled comparison** compares two or more places while holding some variables as alike as possible, so that the one variable left different can be checked against the outcome. Figure 8 works one hypothesis this way.

Hypothesis: local government areas where more people hold a bachelor degree or above have higher median weekly household incomes.

Pair 1 — similar places

Mildura vs Latrobe City

born in Australia: 78.0% vs 79.4%

bachelor degree or above: 12.7% vs 12.5%

owned outright: 33.3% vs 37.4%

income: \$1,341 vs \$1,260 — both low

Similar places, similar incomes:
consistent with the hypothesis.

Pair 2 — the factor moves

Boroondara vs Latrobe City

owned outright: 38.7% vs 37.4% (similar)

bachelor degree or above: 52.3% vs 12.5%

income: \$2,376 vs \$1,260

Education moves, income moves:
the pattern the hypothesis predicts.

What this comparison can and cannot say

- Lines up is not the same as proves: four areas is a small sample.
- The cause may run the other way: high-paid jobs may attract people who already hold degrees.
- Other factors also differ between these places, such as the kinds of jobs available and distance from Melbourne's centre.

Controlled comparison diagram: Mildura and Latrobe City are similar in birthplace, education and tenure and have similar low incomes; Boroondara and Latrobe City are similar in tenure but different in education, and their incomes differ in the same direction; a note lists what the comparison can and cannot say

Figure 8. A controlled comparison worked with real ABS data.

Read Figure 8 carefully, because this is the heart of the skill. The comparison *lines up*: education moves, income moves. But it does not *prove* the hypothesis, and two readings of the same numbers must be given equal weight. Reading one: higher education in an area leads to higher-paid work and higher incomes. Reading two, running the other way: areas with high-paid work attract people who already hold degrees, so the degrees followed the jobs rather than causing the incomes. Both readings fit the same four rows of Figure 7, and a controlled comparison on four areas cannot choose between them. Other variables also differ between these places — the kinds of jobs available, distance from Melbourne’s centre — and each could be part of the story. That is exactly why the curriculum says a controlled comparison identifies **possible** causal relationships: it produces a well-supported hypothesis to keep testing, not a finished answer.

8. Five checks for a good question. Before a question goes into your inquiry, run it through five checks (Figure 9). A question that passes all five is focused, geographical and answerable — ready to drive the rest of the inquiry.

Five checks for a good geographical question

1 Lens Does the question use at least one geographical concept — place, space, environment, interconnection, sustainability, scale or change?
2 Scale Does the question say at which scale it is asked — local, regional, national or global?
3 Place Does the question name a real place, phenomenon, issue or challenge?
4 Evidence Can the question be answered with data, maps, sources or fieldwork — not just with an opinion?
5 Focus Is the question small enough to test in one inquiry, and clear enough that two people would understand it the same way?

Checklist card of five checks for a good geographical question: it uses at least one geographical concept, it names a scale, it names a real place, it can be answered with evidence, and it is small enough to test in one inquiry

Figure 9. Five checks for a good geographical question.

Worked examples

Example 1 — scaffolded

Building a question ladder about wellbeing in Victoria. Use Figure 7 to build one full ladder from broad question to test plan.

Working	Comment
1. Name the phenomenon: household incomes differ widely between Victorian local government areas — from \$2,376 a week in Boroondara to \$1,260 in Latrobe City (Figure 7).	A ladder starts from something observed, not from an opinion. The numbers are the observation.
2. Broad questions: ‘What do we mean by human	These open the topic but cannot yet be answered with

Working	Comment
wellbeing?’ and ‘In what ways has human wellbeing shifted over time?’	one data set. (Human wellbeing is used in the measurable sense defined in Theory 1.)
3. Sharpen with a concept and a scale: ‘Why does wellbeing vary between neighbouring local government areas in Victoria?’ — concept: space; scale: regional.	Now the question names a lens, a place and a scale. It also says what to compare.
4. Make it measurable: ‘How large is the difference in median weekly household income between Boroondara and Brimbank, and does it line up with educational attainment?’	A measurable question tells you exactly which rows of Figure 7 to read: \$2,376 vs \$1,506, and 52.3% vs 19.8%.
5. Hypothesis: ‘Local government areas where more people hold a bachelor degree or above have higher median weekly household incomes.’	The hypothesis states the expected relationship, so the test has something to check.
6. Test plan: secondary data — ABS Census 2021 QuickStats for a selection of areas (Figure 7); primary data — a survey of twenty residents in each of two areas about local jobs, services and training.	Secondary data shows the pattern; primary data (your own survey, in the place) begins to test <i>why</i> . Planning the fieldwork now is what makes collecting it later possible.

Example 2 — unscaffolded

Reading a controlled comparison from QuickStats. Hypothesis: *local government areas where more people hold a bachelor degree or above have higher median weekly household incomes*. Use Figure 7 to test it with a controlled comparison, and say what the test can and cannot show.

Start by choosing pairs on purpose. Mildura and Latrobe City make the control pair: they are similar in country of birth (78.0% and 79.4% born in Australia), similar in educational attainment (12.7% and 12.5% with a degree or above), and similar in housing tenure (33.3% and 37.4% owned outright) — and their incomes are similar and low (\$1,341 and \$1,260). Places that are alike in the measured factors are alike in the outcome: nothing here disturbs the hypothesis. Then take a pair in which the factor moves: Boroondara and Latrobe City are similar in tenure (38.7% and 37.4% owned outright), but Boroondara’s education figure is four times Latrobe’s (52.3% against 12.5%), and its income is nearly double (\$2,376 against \$1,260). The variable left different lines up with the difference in outcome — the pattern the hypothesis predicts. Brimbank adds a further check: with only 45.9% born in Australia and 13.0% born in Vietnam, its birthplace profile is unlike the other three, yet its income (\$1,506) sits where its education figure (19.8%) would lead you to expect. Country of birth does not move with income across these four areas; education does.

Then state the limits plainly. Four areas is a small sample, and a pattern across four rows is not proof. The cause may run the other way — high-paid work attracts people who already hold degrees — and that reading fits the same numbers equally well. Other factors, such as the kinds of jobs in each area and distance from Melbourne’s centre, also differ and are not controlled. The honest conclusion echoes the curriculum’s caution: the comparison identifies a *possible* causal relationship — a hypothesis worth testing with more areas and with primary data, not a settled answer.

Practice questions

Scaffolded

Q1. Sort each statement under *phenomenon*, *issue* or *challenge* (Figure 1). The first is done for you. (a) Coral bleaching has hit the Great Barrier Reef repeatedly since 1998 — *phenomenon* (it is something observed to happen); (b) feeding a growing world population without further damaging the land that produces the food; (c) river salinity rising in the Murray–Darling Basin as water is diverted for irrigation; (d) reducing the gap in income and education between nearby Victorian local government areas.

Q2. Match each question to its family (Figure 3): descriptive, explanatory, change and prediction, or evaluative. (a) ‘Where does Australia’s food come from?’; (b) ‘In what ways has human wellbeing shifted over time?’; (c) ‘Why does food security matter?’; (d) ‘What should be done about unequal levels of human wellbeing, and why?’; (e) if rainfall keeps declining, what will happen to wheat production in the Murray–Darling Basin by 2050?

Q3. Choose three of the seven concept lenses (Figure 2). For each, write one question starter about a named Victorian place you know (your own suburb, town or school area is fine).

Q4. Sharpen each vague question using the four additions from Figure 4 (concept, scale, place, measurable). The first is done for you. (a) ‘Is the river OK?’ → ‘How has river salinity in the Murray–Darling Basin near Mildura changed since 2016, and is it within safe limits?’ (concept: environment; scale: regional; place: Mildura reach; measurable: salinity readings); (b) ‘Do people travel a lot?’; (c) ‘Is life good in my suburb?’; (d) ‘Does farming hurt the land?’

Q5. Use Figure 7. (a) Which area has the highest share of people born in Australia? (b) Which area has the highest share of people with a bachelor degree or above? (c) Which area has the lowest median weekly household income? (d) Which two areas would you pair as a control pair for a comparison of education and income — that is, which two are most alike in everything except income? Give the numbers that show they are alike.

Q6. In one Victorian local government area, many young people leave soon after finishing school. (a) Give one *immediate* cause and one *underlying* cause for this. (b) Turn one of your causes into a hypothesis (a testable statement naming the relationship you expect).

Un scaffolded

Q7. ‘How could we measure human wellbeing in your own neighbourhood?’ and ‘Why does human wellbeing differ from country to country, and inside countries?’ ask about the same theme at different scales (Figure 5). Explain two ways in which the scale changes the investigation — think about the data you would need and who you would ask or count.

Q8. ‘Is Brimbank a bad place to live?’ is a weak question for a geographical inquiry. Say two reasons why (use the five checks in Figure 9), then rewrite it as *two* strong questions that could be answered with Figure 7.

Q9. A friend looks at Figure 7 and says: ‘This proves that doing a degree makes you rich.’ Give two reasons, using the cautions in Figure 8, why the data cannot carry that claim.

Q10. Test this hypothesis against Figure 7: ‘Local government areas where more homes are rented have lower median weekly household incomes.’ Line the four areas up by rented share and by income. Does the pattern hold? Write a three-sentence conclusion that reports honestly what the data show.

Inquiry

Q11. Build the question set for your own geographical inquiry on one of the four themes of this book — food security, interconnections between people and places, environmental change, or human wellbeing. (a) Name the phenomenon, issue or challenge you are starting from, and give one real, dated fact about it. (b) Write five questions about it, covering at least three of the four families (Figure 3), and tag each with the concept lens it uses (Figure 2). (c) Sharpen two of your questions using the four additions from Figure 4. (d) State the scale of your investigation (Figure 5) and give one reason for choosing it. (e) Write one hypothesis and a test plan for it that includes at least one secondary source (such as ABS QuickStats) and at least one primary method (a survey, count or observation in the place itself). (f) Plan a controlled comparison: name two real places and the variables you will hold as alike as possible, and the one variable you will check against the outcome. Note a source with a retrieval date for every fact you use.

Answers

Q1. (b) challenge; (c) issue; (d) challenge. | **Q2.** (a) descriptive; (b) change and prediction; (c) explanatory; (d) evaluative; (e) change and prediction. | **Q3.** Any three questions, each correctly matched to its lens and naming a real place. | **Q4.** Any sharpening that adds a concept, a scale, a place and a measurable check. | **Q5.** (a) Latrobe City, 79.4%; (b) Boroondara, 52.3%; (c) Latrobe City, \$1,260; (d) Mildura and Latrobe City — alike in birthplace (78.0% vs 79.4%), education (12.7% vs 12.5%) and tenure (33.3% vs 37.4% owned outright). | **Q6.** (a) e.g. immediate: few jobs or training places nearby; underlying: long-run decline of the area's main industry. (b) e.g. 'Areas with fewer training places within an hour's travel lose more young people after school.' | **Q7.** Local: your own survey, counts and observations; you ask individuals about their area. National: census and QuickStats, region by region; you compare areas, not people. The questions also change: local questions name streets and services; national questions name countries and regions. | **Q8.** Weak because it is a judgement (no evidence can settle 'bad') and it names no concept, scale or measurable check. Two strong questions, e.g. 'How does Brimbank's median weekly household income compare with Victoria's?' and 'How does educational attainment in Brimbank compare with the state's?' | **Q9.** Four areas is a small sample; the cause may run the other way (jobs attract degrees); other uncontrolled factors differ between the areas. Any two. | **Q10.** Rented shares are all close (25.4–29.8%) while incomes range widely (\$1,260–\$2,376), so the pattern does not hold across these four areas; the hypothesis is not supported by this data. | **Q11.** Marked on the six parts: a named phenomenon with a dated fact; five tagged questions across three families; two sharpened questions; a scale with a reason; a hypothesis with a mixed primary/secondary test plan; a controlled comparison that names places and variables. |

Fully-worked solutions

Q1. (b) A task that needs action and effort against a hard problem → challenge. (c) A phenomenon (rising salinity) that raises a problem people want to address → issue. (d) A hard task needing action → challenge. (Note: an issue names a problem growing out of something observed; a challenge names the work of responding to it — some statements can sit in both, and naming the reason is what counts.)

Q2. (a) asks what and where → descriptive. (b) asks how something has changed through time → change and prediction. (c) asks why → explanatory. (d) asks what should be done and why → evaluative. (e) asks what will happen under a stated condition → change and prediction.

Q3. Model set for a Melbourne suburb. Place: 'What makes this suburb different from the one next to it?' Space: 'Where are the shops, parks and services located, and why there?' Environment: 'How does the creek in this suburb change after heavy rain?' Interconnection: 'Where does this suburb's food come from?' Sustainability: 'Can this suburb's growth keep its parks and shade?' Scale: 'Is parking here a local problem or a city-wide one?' Change: 'How has this suburb changed since 2016?' Any three, each with a named place.

Q4. Model sharpenings. (b) 'How many trips per week do residents of this town make by car, and how has that changed since 2016?' (concept: interconnection; scale: local; place: named town; measurable: trip counts.) (c) 'How does median weekly household income in this suburb compare with the state's, and how do residents rate local services?' (concept: space and place; scale: local; measurable: income and a services survey.) (d) 'How has soil health on cropping land in the Mallee changed since conservation farming spread, at the regional scale?' (concept: environment and sustainability; scale: regional; place: the Mallee; measurable: soil readings over time.)

Q5. (a) Latrobe City, 79.4% born in Australia. (b) Boroondara, 52.3%. (c) Latrobe City, \$1,260. (d) Mildura and Latrobe City. They are alike in country of birth (78.0% vs 79.4% born in Australia), in education (12.7% vs 12.5% bachelor degree or above) and roughly alike in tenure (33.3% vs 37.4% owned outright) — while their incomes, though both low, still differ by \$81 a week, which is what a comparison would then try to explain.

Q6. Model. (a) Immediate cause: there are few jobs or training places in the area, so leaving is the quickest way to work. Underlying cause: the area's main industry has declined for decades, so the kinds of jobs that once kept young people at home no longer exist. (b) Hypothesis from the underlying cause: 'Local government areas that lost their main industry in the last twenty years lose more young people after school than areas with a mix of industries.' The statement is testable: industry employment and age structure are both in census data.

Q7. Model. First, the data: at the local scale you collect your own — surveys, counts and observations in the place itself, because no published data set describes one suburb street by street; at the national scale you use a national data set such as the census and compare region against region. Second, who is asked: at the local scale you ask individuals about their own lives; at the national scale you never meet a respondent — you work with area summaries. A third difference is acceptable too: at the local scale one person's answers matter; at the national scale only patterns across many areas are visible.

Q8. Model. Two reasons the question is weak: 'bad' is a judgement word — two people can list the same facts and disagree, so no evidence settles it; and the question names no concept, no scale and nothing measurable (it fails checks 1, 2, 4 and 5 of Figure 9). Rewritten as two strong questions: 'How does Brimbank's median weekly household income compare with Victoria's?' (\$1,506 vs \$1,759) and 'How does the share of people with a bachelor degree or above in Brimbank compare with the state's?' (19.8% vs 29.2%). Both are answerable from Figure 7 and name concept, place, scale and measure.

Q9. Model, any two. (1) Four areas is a small sample — a pattern across four rows can be broken by the fifth area you check, so it suggests rather than proves. (2) The comparison cannot tell the direction of cause: high-paid work may attract people who already hold degrees, so the degrees followed the jobs. (3) Other variables are not held constant between these areas — the kinds of jobs available and distance from Melbourne's centre also differ, and either could be doing part of the work. The claim also changes the curriculum's 'possible causal relationship' into a certainty the method never promised.

Q10. Model conclusion. Line the areas up by rented share — Latrobe 25.4%, Brimbank 26.7%, Boroondara 28.8%, Mildura 29.8% — and by income: \$1,260, \$1,506, \$2,376, \$1,341. The orderings do not match: Boroondara, with the second-highest rented share, has by far the highest income, and Mildura, with the highest rented share, has a low income. Across these four areas the hypothesis does not hold, so this data does not support it. That is a successful test — a hypothesis clearly checked and found wanting is a result, and the next step would be to try other variables, such as educational attainment, which lines up far better.

Q11. Model shape (human wellbeing, local scale). (a) Phenomenon: incomes differ between neighbouring Victorian LGAs — Boroondara's median weekly household income (\$2,376, 2021 census) was nearly double Latrobe City's (\$1,260). (b) Questions: descriptive — 'What is the median weekly household income in my suburb?'; explanatory — 'Why does income vary between my suburb and the one next to it?'; change — 'How has my suburb's income changed between the 2016 and 2021 censuses?'; evaluative — 'Which one service would most improve wellbeing in my suburb?'; interconnection lens — 'Where do people in my suburb travel to work?' (c) Sharpened: 'How has median weekly household income in the City of Boroondara changed between the 2016 and 2021 censuses?' and 'Do residents of my suburb rate access to public transport lower than residents of the neighbouring suburb?' (d) Scale: local, because the question names services one suburb at a time and the data (my own survey plus census by suburb) exists at that scale. (e) Hypothesis: 'Residents who give local transport a low rating also report fewer job options.' Test: secondary — census QuickStats on income and journey to work; primary — a twenty-person survey outside the local station. (f) Controlled comparison: two suburbs in the same LGA (holding income and services roughly alike) that differ in distance from a train station; check distance against reported job options. Sources: ABS Census 2021 QuickStats (retrieved 25 August 2026); own survey (date).

Sources

All sources retrieved **25 August 2026** unless stated.

- **Australian Bureau of Statistics**, Census of Population and Housing 2021, QuickStats — Boroondara (LGA21110): born in Australia 64.6%, top overseas birthplace China 8.0%, bachelor degree or above 52.3%, median weekly household income \$2,376, owned outright 38.7%, rented 28.8%; Brimbank (LGA21180): 45.9%, Vietnam 13.0%, 19.8%, \$1,506, 36.2%, 26.7%; Mildura (LGA24780): 78.0%, Malaysia 1.9%, 12.7%, \$1,341, 33.3%, 29.8%; Latrobe City (LGA23810): 79.4%, England 2.6%, 12.5%, \$1,260, 37.4%, 25.4%; Victoria (STE2): 65.0%, 29.2%, \$1,759, 32.2%, 28.5%. Figure 7 and all worked and practice uses.
- Great Barrier Reef mass bleaching years (1998, 2002, and in 2016–2024) — as established in Section 3A of this book.
- Murray–Darling Basin river salinity and irrigation diversion — as established in Section 3B of this book.

- Victorian Curriculum 2.0 Geography, Levels 9 and 10, VC2HG10S01 and elaborations .E01–.E06 (codes kept for linkage; question examples in Figures 3, 4 and 5 are the book’s own).
- Figures 1, 2, 3, 4, 5, 6, 8 and 9 are original teaching models drawn for this section; every example inside them is either the book’s own or one of the real, sourced referents above.

Primary and secondary sources: gathering, processing and comparing data

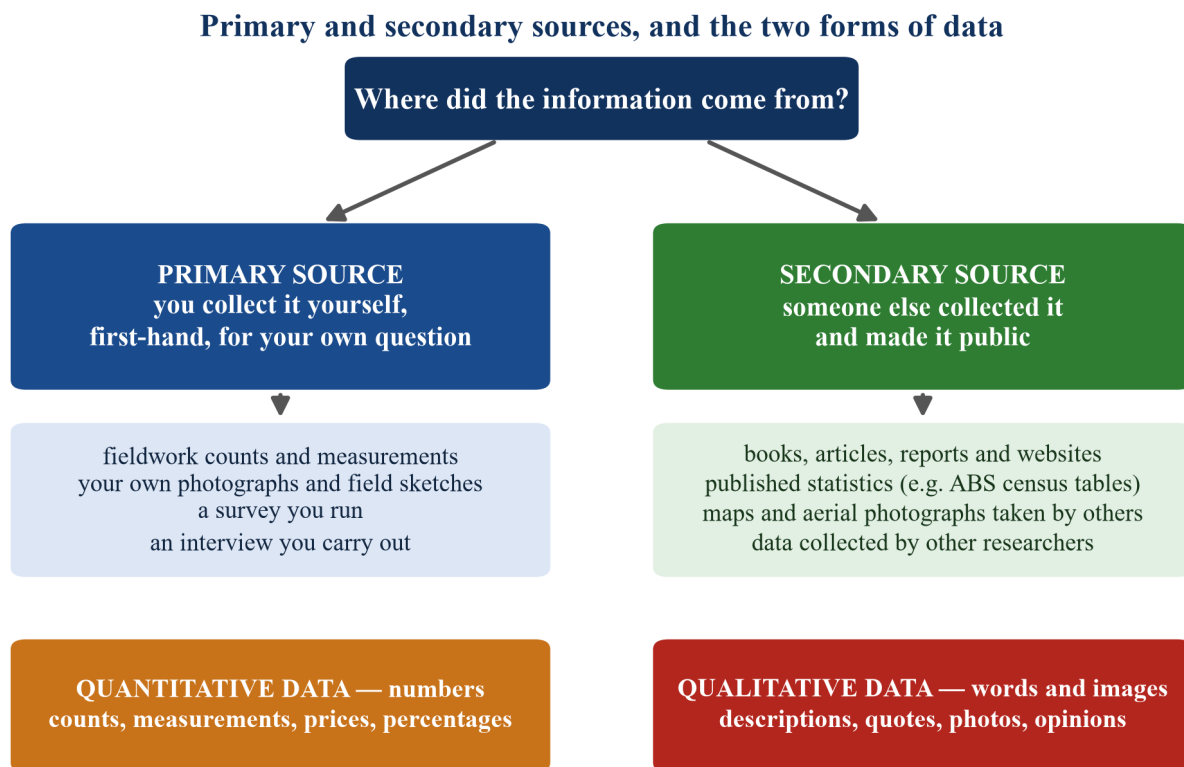
Curriculum: VC2HG10S02. The elaborations are tagged at the end of each part as VC2HG10S02.E01–E03 and E05.

Theory

Part 1 — Primary and secondary sources. Every geographical inquiry runs on information and data that somebody has gathered. There are two kinds of source. A **primary source** is material you collect first-hand yourself, for your own question: your own fieldwork measurements, your own photographs, a survey you run, an interview you carry out. A **secondary source** is material somebody else collected, processed and made public: a book, an article, a report, a website, a map, a set of statistics, or a photograph taken by someone else. The same topic uses both. If you want to know how your suburb has changed, you can walk it and sketch it (primary) and you can also read old aerial photographs and census tables (secondary).

Data itself comes in two forms. **Quantitative data** is data in numbers: counts, measurements, prices, percentages. **Qualitative data** is data in words, images and opinions: descriptions, interview quotes, photographs, the way people say they feel about a place. Most good inquiries mix the two: numbers say *how much*, and words say *what it is like*. Figure 1 sorts the main examples of each source type.

(VC2HG10S02, VC2HG10S02.E03)



Both source types can carry both kinds of data: numbers say how much, words say what it is like.

A classification of geographical sources into primary and secondary, with examples of each and a strip showing quantitative data (numbers, counts, measurements) and qualitative data (words, images, opinions)

Figure 1 — The two families of sources. Primary means you collected it yourself for your question; secondary means someone else collected and published it. Both can carry numbers (quantitative) or words and images (qualitative).

Part 2 — Primary research methods, including fieldwork. **Fieldwork** is data collection that happens by going to the place you are studying — not by reading about it. Five methods do most of the work in Year 9 geography (Figure 2):

- **Observation and measurement.** You count, measure or record what is there: pedestrians passing a crossing in ten minutes, the width of a creek, the number of cars in a car park at 8 am. This gives tidy quantitative data.
- **Field sketches and your own photographs.** You draw or photograph a place and label what you can see. A sketch forces you to decide what matters in the view.
- **Comparing aerial photographs over time.** An **aerial photograph** is a photograph of the ground taken from above, usually from a plane. The same place photographed in two different years records how people have used or changed the land. This is one of the strongest fieldwork methods for documenting change.
- **Surveys.** You ask a group of people the same short set of closed questions (for example, tick-box questions about which digital technologies they use, and how often) and tally the answers. A survey asks *many* people *shallow* questions.
- **Interviews.** You ask one person, or a few people, longer open questions and record what they say. An interview asks *few* people *deep* questions.

(VC2HG10S02.E01)

Five primary research methods (VC2HG10S02.E01)

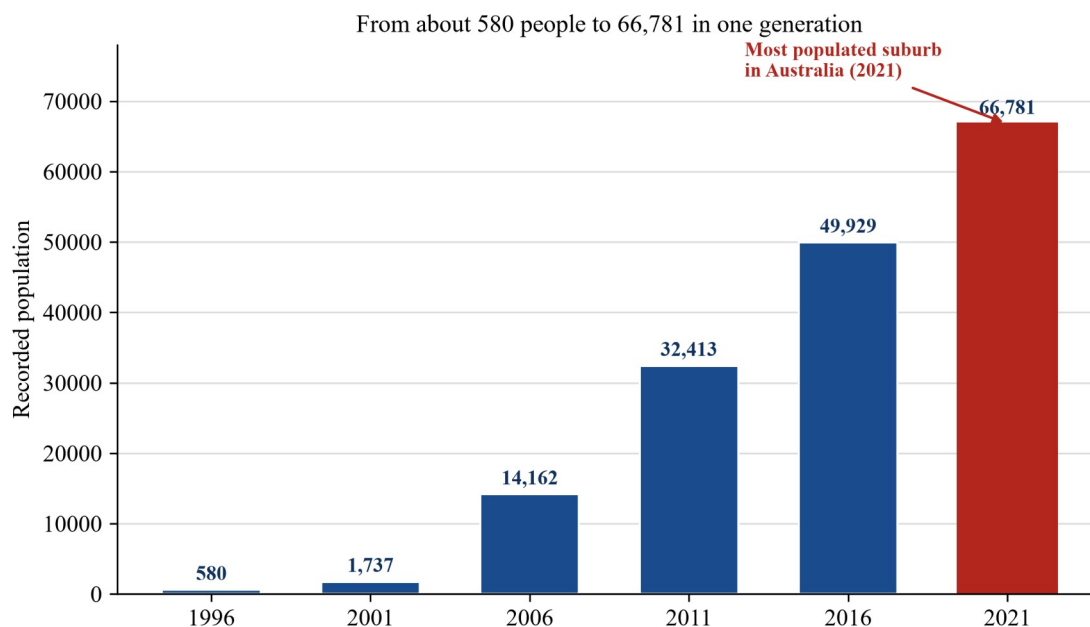
Method	Data it gives	Tools	Victorian example
Observation and measurement	quantitative (counts, sizes, times)	clipboard, tape measure, tally sheet, thermometer	count pedestrians at a crossing for 10 minutes; measure creek width
Field sketches and your own photographs	qualitative (labelled views)	pencil and paper, camera or phone	sketch and label the main street of a nearby town
Comparing aerial photographs over time	qualitative and quantitative (land use, area changed)	aerial/satellite images of the same place, two dates	compare 1996 and 2020 images of Point Cook, Melbourne
Surveys	quantitative, sometimes qualitative (many people, shallow questions)	closed questions on paper or an online survey tool	ask Year 9 students how they use the internet and technologies
Interviews	qualitative (few people, deep answers)	open questions, voice recorder, notes	interview a park manager about how a local reserve is cared for

Choose the method that matches the question: how much, what it looks like, how it changed, what many people do, or why.

A table of five primary research methods — observation and measurement, field sketches, aerial photograph comparison, surveys and interviews — listing the kind of data each gives, the tools used and a Victorian example of each

Figure 2 — Five primary methods, side by side. Choose the method that matches your question: counts and measures for “how much”, sketches for “what does it look like”, photo pairs for “how has it changed”, surveys for “what do many people do”, interviews for “why”.

A real example of the aerial-photograph method: **Point Cook**, on the western edge of Port Phillip Bay in Melbourne. In 1996 Point Cook was still basically a rural community of about 580 people — grazing paddocks, the RAAF air base opened in 1913, and saltworks laid out from 1924. Large-scale housing began in the late 1990s. By the 2021 Census Point Cook recorded 66,781 people, the most of any suburb in Australia. Two aerial photographs of Point Cook, one from about 1996 and one from about 2020, show paddocks and salt pans turning into street grids and houses (Figure 4) — and the census counts give the numbers behind the picture (Figure 3). That is the pattern of a strong primary study: the images *show* the change, and a second source *measures* it.

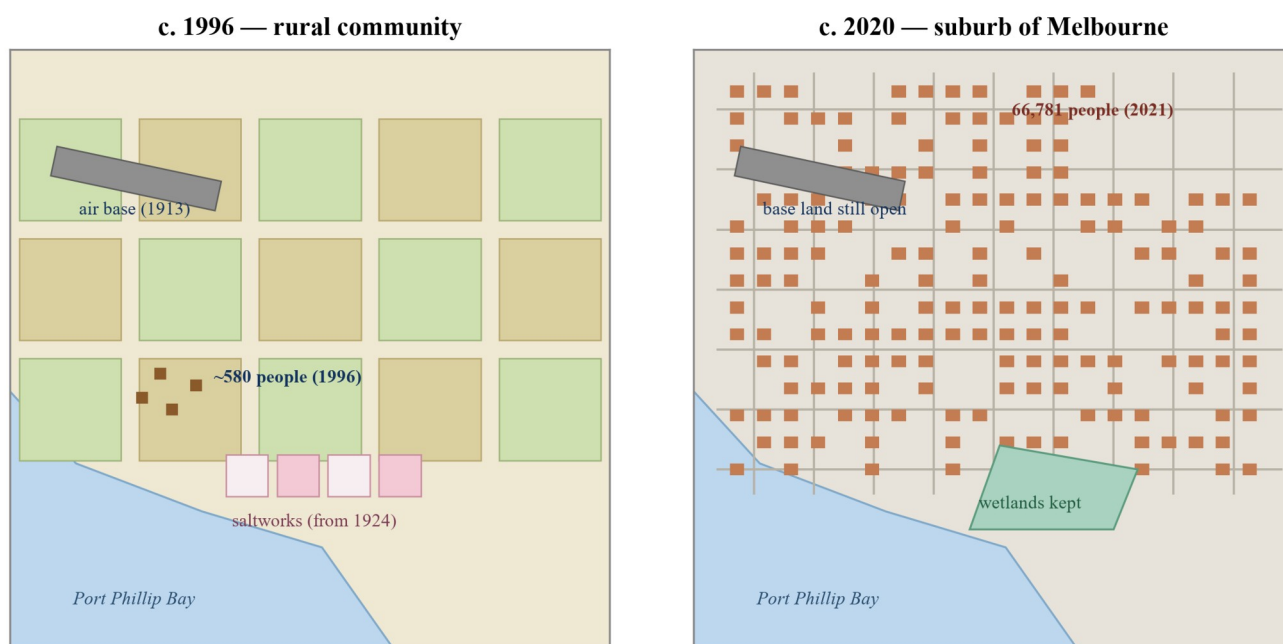


Point Cook, Victoria — recorded population, 1996–2021. Sources: 1996 figure and census counts as published in Wikipedia 'Point Cook, Victoria' (ABS census data); accessed 25 August 2026.

Bar chart of the recorded population of Point Cook, Victoria, rising from about 580 in 1996 to 1,737 in 2001, 14,162 in 2006, 32,413 in 2011, 49,929 in 2016 and 66,781 in 2021, when it became the most populated suburb in Australia

Figure 3 — Point Cook's recorded population, 1996–2021 (census figures). In one generation a rural locality became the most populated suburb in Australia.

Comparing aerial views of Point Cook over time — a stylised sketch model



Stylised sketch drawn from the documented history of Point Cook — not real photographs. Compare: what was there, what replaced it, and what stayed the same.

Two labelled stylised sketch panels of Point Cook: the 1996 view shows grazing paddocks, the air base, salt pans and a thin rural settlement along Port Phillip Bay, and the 2020 view shows street grids, housing estates, parks and protected wetlands in place of most of the farmland

Figure 4 — A stylised sketch model (not real photographs) of what an aerial-photo pair of Point Cook shows, drawn from the place's documented history. When you compare two aerial photographs of your own site, look for the same things: what was there, what replaced it, and what stayed the same.

Part 3 — Planning an investigation across scales with digital tools. A **scale** is the size of the area a question looks at. Strong inquiries are planned across more than one scale, because the causes of a problem often sit at one scale and its impacts land at another. Take climate change, which the curriculum itself offers as a planning example: the causes are best studied at the **global scale** (greenhouse gases mix through the whole atmosphere), while the impacts land at the **national scale** — on Australia, and on countries in Asia and the Pacific such as Bangladesh. A third, **local scale** brings the issue home (your own city’s temperature records, your own household’s energy use).

At each scale the plan names three things: the question, the data that would answer it, and the digital tools and sources that supply that data. **Digital tools** include satellite images and online maps, **geospatial technologies** — tools such as geographical information systems (GIS) that store, layer and display data by location — online survey platforms, and official statistics sites — for example, the Australian Bureau of Statistics (ABS) QuickStats. Figure 5 is a complete plan for the climate-change example, with real, dated data at every scale: the World Meteorological Organization reported that 2024 was the warmest year on record, about 1.55 °C above the 1850–1900 average; CSIRO and the Bureau of Meteorology reported in 2024 that Australia’s climate has warmed by 1.51 °C since 1910; and researchers estimate that sea-level rise of up to 0.30 metres by 2050 could force about 0.9 million people in Bangladesh to move.

(VC2HG10S02.E02)

Planning across scales: causes and impacts of climate change (VC2HG10S02.E02)

Scale	Question	Data to collect	Sources and digital tools
Global	How much has the Earth warmed, and what is causing it?	Global mean temperature record: 2024 was the warmest year on record, about 1.55 °C above the 1850–1900 average	World Meteorological Organization report; satellite data; climate model outputs
National — Australia	How is warming already affecting Australia?	Australia has warmed by 1.51 °C since 1910; more extreme heat days; harsher fire seasons	CSIRO and Bureau of Meteorology, State of the Climate 2024; Bureau of Meteorology records
National — Bangladesh	What does sea-level rise mean for people in Bangladesh?	Up to 0.30 m of sea-level rise by 2050 could displace about 0.9 million people; a 1 m rise could flood 12–16% of the country's land	Research estimates (Davis et al. 2018); government environment reports; satellite images of the coast
Local — your city	What is changing where you live?	Local temperature records; your household's energy use; heat at school at midday	Bureau of Meteorology climate data for your town; your own fieldwork measurements

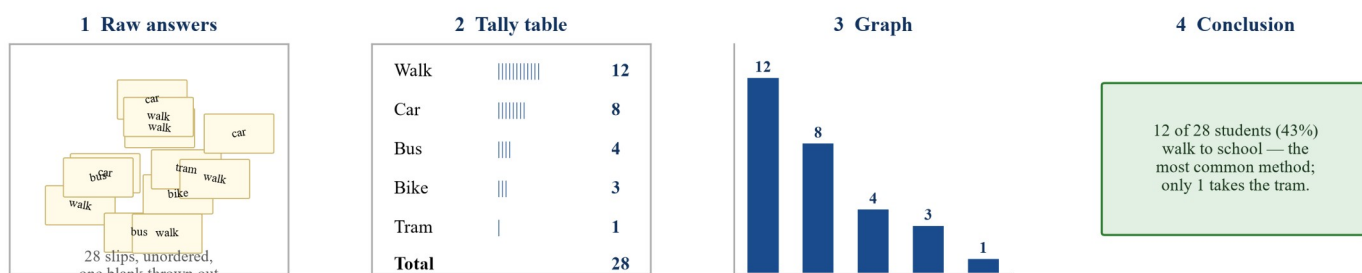
Causes sit at the global scale; impacts land at national and local scales. Each row names its question, its data and its tools before collecting begins.

A three-scale investigation plan table for climate change: at global scale the question is how much the Earth has warmed and why, at national scale the question is how warming affects Australia and Bangladesh, and at local scale the question is what is changing in your own city, each row listing the data to collect and the digital tools and sources to use

Figure 5 — One issue, three scales. Causes sit at the global scale; impacts land at national and local scales. Each row of a plan names its question, its data and its tools before any collecting begins.

Part 4 — Processing data. Collecting is only half the job. Raw answers are messy; **processing** turns them into something you can read. The steps are always the same: check the records (throw out blanks and jokes), sort them into categories, tally them into a table, and if useful turn the counts into percentages. Figure 6 walks one model survey through the steps.

Processing data in four steps



check → sort into categories → tally → graph → conclude

Model data for illustration: one class of 28 students surveyed about travel to school.

A four-step processing flow for a model class survey on travel to school: raw answer slips, a tally table of counts, a bar graph of the counts, and a one-sentence conclusion, with model data for a class of 28 students

Figure 6 — Processing in four steps: check, tally, graph, conclude. The data is model data for illustration; your own surveys will follow exactly this path. (Model data: a class of 28 students.)

Part 5 — Evaluating relevance, reliability and bias. Not every source deserves your trust. Geographers test information with three questions (Figure 7):

- **Relevance** — does it fit *your* question? Is it about the right place, the right people and the right time? A table of how *workers* travel is only relevant in part to a question about how *students* travel. Old data may no longer reflect current thinking or current facts.
- **Reliability** — can the source be trusted? Ask who produced it. Official statistical agencies (the ABS), scientific agencies (the Bureau of Meteorology, CSIRO) and peer-reviewed reports are usually strong sources; an unnamed website is not. Does the author name their own sources? Could someone repeat the study and get the same result?
- **Bias** — does the source lean unfairly to one side? There are two common kinds. **Information bias** is presenting only one side of an issue. **Selection bias** is selecting only the information, or only the people, that suit one story — for example, presenting only what foreign aid achieves and leaving out its social and cultural costs, or surveying only your friends when you claim to speak for the whole school.

The three tests every source must pass before it goes into your work

RELEVANCE	RELIABILITY	BIAS
– Does it fit YOUR question? – Right place and right people? – Recent enough to show what – is true now? – Right scale — local, national – or global?	– Who produced it? – An official agency (ABS, Bureau – of Meteorology, CSIRO) or an – expert report? – Does the author name their – own sources? – Could someone repeat it and – get the same result?	– Information bias: does it – present only one side of – an issue? – Selection bias: does it select – only the information, or only – the people, that suit one story? – Who gains if you believe it?

A source can pass two of the three tests and still be unusable. Ask all three of every source — primary and secondary alike.

A three-column checklist of evaluation questions under relevance, reliability and bias, with the two kinds of bias — information bias and selection bias — named and described

Figure 7 — The three tests every source must pass before it goes into your work. A source can pass two of three and still be unusable.

Two kinds of bias (made-up examples for practice)

A company brochure about a new mine

- + new jobs for the district
- + more income for local businesses
- + a modern road upgrade

Left out of the brochure:

- x dust and noise for nearby homes
- x extra truck traffic on school roads
- x water use in a dry season

INFORMATION BIAS — only one side is written down

A student surveys people about a new skate park

Where the survey was handed out:

- at the skate park — all 30 replies are from skateboarders

Result: 30 of 30 in favour.

But the survey speaks for the whole community, and most of the community was never asked:

- x nearby residents — not asked
- x other park users — not asked
- x people who dislike skate parks — not asked

SELECTION BIAS — only some people made it into the data

Two panels showing information bias and selection bias: one panel shows a report presenting only one side of an issue, the other shows a survey question whose answer options leave out half the picture and a survey sent only to a friendly audience

Figure 8 — The two kinds of bias. Information bias happens inside the writing (one side only); selection bias happens before the writing (only some evidence, or only some people, made it in).

One more rule belongs here, because it protects the people in your data. Research must be run ethically: explain your survey to people before they answer, get their permission, never print anyone’s name, and let anyone skip a question or pull out. Treat places with the same care — leave a fieldwork site as you found it.

Part 6 — Comparing primary and secondary findings. The payoff of doing both kinds of work is the comparison. When your own findings and a published source agree, your conclusion gets stronger. When they disagree, that is not a failure — it is a question: *why?* The usual suspects are differences in who was asked (students versus all adults), in definitions (what counts as “using the internet”), in date (2016 versus 2021), in scale (your class versus the whole country), and in sample size (28 students versus millions of census records). Figure 9 shows two model comparisons, one that agrees and one that does not line up, and what each teaches.

(VC2HG10S02.E05)

Comparing primary and secondary findings (VC2HG10S02.E05)

Topic	Your primary finding	Secondary finding	Verdict	Why
Home internet use	Class survey (model data): 26 of 28 students (93%) have internet access at home	DataReportal, Digital 2025: Australia — 26.1 million of 26.8 million Australians (97.1%) used the internet in January 2025	Broadly agree — within the limits of a small sample	Different populations (one class vs the whole country), different definitions (access at home vs any use)
How people get around	Class survey (model data): most students walk or get a lift to school	ABS 2021 Census, Victoria: travel to WORK — car as driver 49.9%, worked at home 25.7%, walked only 2.3% (employed people aged 15 and over)	Not directly comparable	Different populations (students vs workers), different questions (travel to school vs travel to work)

Agreement builds confidence; disagreement makes you hunt for the difference — population, definition, date, scale or sample. Class survey rows are model data; the ABS and DataReportal figures are real.

A comparison table with two rows: a class survey on home internet use finding 93 per cent against the national figure of 97.1 per cent of Australians using the internet in January 2025, judged as agreeing within the limits of a small sample; and a class travel-to-school survey set beside the ABS 2021 Census travel-to-work figures for Victoria, judged as not directly comparable because the populations differ

Figure 9 — Comparing primary and secondary findings. Agreement builds confidence; disagreement makes you hunt for the difference in population, definition, date, scale or sample. (Class results are model data for illustration; the ABS and DataReportal figures are real.)

Worked examples

Example 1 — scaffolded: documenting change over time at Point Cook

The table below shows the recorded population of Point Cook at each census (real figures; Figure 3). (a) Calculate the total change from 1996 to 2021. (b) Find the five-year period with the largest absolute increase. (c) Explain what a pair of aerial photographs from about 1996 and about 2020 would show, and why the photographs and the census numbers support each other.

Working	Comment
(a) $66,781 - 580 = 66,201$ people.	Final value minus starting value: total change over 25 years.
(b) Increases by period: 1996–2001: $1,737 - 580 = 1,157$; 2001–2006: $14,162 - 1,737 = 12,425$; 2006–2011: $32,413 - 14,162 = 18,251$; 2011–2016: $49,929 - 32,413 = 17,516$; 2016–2021: $66,781 - 49,929 = 16,852$. Largest: 2006–2011 (+18,251) .	Compute each five-year increase and compare them.
(c) The older photo would show paddocks, the air base and salt pans with almost no housing; the newer photo would show street grids and housing estates over most of the farmland, with the wetlands and some open land kept.	The images <i>show</i> the land-use change.
The census numbers <i>measure</i> the same change: about 580 people in 1996 rising to 66,781 in 2021 — the housing had to appear because the people arrived.	Two different source types (images and counts) recording the same change make the finding reliable.

Example 2 — scaffolded: evaluating two sources for relevance, reliability and bias

A student asks: “How do Victorians get to work?” They find two sources.

- **Source A:** ABS 2021 Census, *Method of travel to work*, Victoria — car as driver 49.9%, worked at home 25.7%, car as passenger 3.5%, walked only 2.3%, train 1.6% (real figures).
- **Source B (made-up example for practice):** a 2019 media release from a road-building company saying “research shows 95% of commuters love driving — Victorians will never give up their cars.”

Apply the three tests of Figure 7 to each source and decide which one belongs in the student’s work.

Working	Comment
Source A, relevance: high — it is exactly the question asked, for Victoria, from the 2021 Census.	Right question, right place, recent date.
Source A, reliability: high — the ABS is Australia’s official statistical agency; the census covers the whole population and other researchers can check the same tables.	Official producer; named methods; repeatable.
Source A, bias: low — the table lists all reported methods, including walking, trains and working at home, not just cars.	No side of the issue is hidden.
Source B, relevance: in part — it is about commuting but gives one unsourced percentage, not a picture of all methods.	Too thin to answer the question.
Source B, reliability: low — the producer sells roads, the “research” is not named, and no method or data is shown.	Conflict of interest; nothing to check.
Source B, bias: high — information bias: only the pro-driving message is presented, and the “95%” has no source behind it.	One side only, from a party with money on that side.
Decision: use Source A ; if Source B is mentioned at all, it is only as an example of a biased claim.	A source that fails the tests can still be useful — as evidence of bias itself.

Practice questions

Scaffolded

Q1. (2 marks) In your own words, define (a) *primary source* and (b) *secondary source*, and give one example of each.

Q2. (2 marks) Classify each as quantitative or qualitative data: (a) a count of shopping trolleys in a car park at 9 am; (b) three interview quotes about what residents like about their local park.

Q3. (3 marks) Using Figure 2, choose the most suitable primary method for each question and give one reason: (a) How wide is the creek behind the school? (b) How has the farmland near the airport changed since 1990? (c) How do students in Year 9 use the internet?

Q4. (3 marks) Use Figure 3. (a) State Point Cook's recorded population in 2006 and in 2021. (b) Give the five-year period in which the recorded population first passed 30,000. (c) Name the kind of source the census figures are (primary or secondary) for a student studying Point Cook today, and say why.

Q5. (2 marks) Using Figure 7, write one relevance question and one reliability question you would ask before using a website about water use in your town.

Q6. (4 marks) Read the two scenarios. For each, name the kind of bias (information bias or selection bias) and explain your choice. (a) A mining company's brochure lists the jobs and income a new mine will bring and says nothing about the dust, traffic or water use. (b) A student surveys 30 people about a proposed skate park — all 30 are skateboarders they meet at the skate park.

Unscaffolded

Q7. (4 marks) Your class survey finds that 93% of students have internet access at home; DataReportal reports that 97.1% of Australians used the internet in January 2025. Give two reasons why the two figures can differ even though both were collected honestly, and state whether the difference weakens your survey.

Q8. (4 marks) "Point Cook's recorded population doubled in every five-year period from 1996 to 2021." Use Figure 3 to test this claim period by period, and state whether it is true, true in part or false.

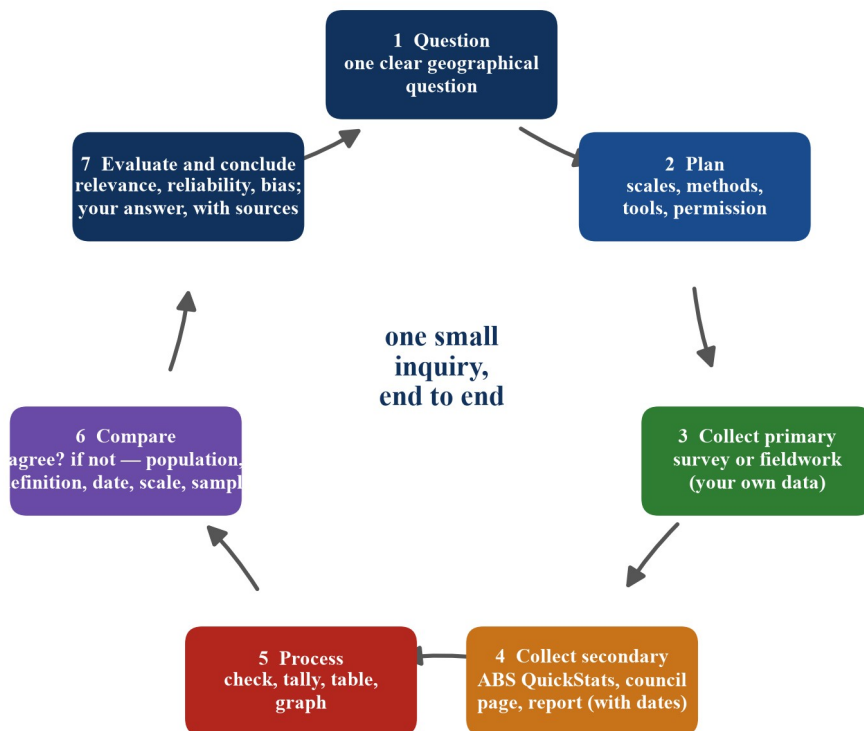
Q9. (5 marks) Choose one issue (for example, food waste at school, sport participation, or traffic near the school gates). Write an investigation plan like Figure 5 with two scales: for each scale give one question, one item of data to collect, and one source or digital tool.

Q10. (4 marks) "Primary data is always honest, because you collect it yourself; secondary data is always suspect, because you don't know who collected it." Make the strongest case you can for each side, then give your own view with one reason.

Inquiry task

Your question, two sources (8 marks). Run one small inquiry of your own, end to end.

The inquiry cycle for section 5B



A circular inquiry cycle with seven steps joined by arrows: question, plan, collect primary, collect secondary, process, compare, and evaluate and conclude

Figure 10 — The inquiry cycle. Steps 1–6 below are one turn of this wheel; the arrows remind you that evaluating one inquiry usually raises the next question.

1. Write one geographical question about your local area (for example: *How do students at my school travel to school?* or *How do people use the local park on weekends?*).
2. Collect **primary** data: either a survey of at least 20 people (closed questions, with their permission, no names recorded) or 20 minutes of structured fieldwork observation (counts, a field sketch, photographs).
3. Find one **secondary** source that touches the same topic (for example ABS QuickStats for your suburb, a council web page, a report). Record who produced it and when.
4. Process your primary data into a table and one graph (Figure 6 shows how).
5. Complete a comparison like Figure 9: do your findings and the secondary source agree? If not, name the reason (population, definition, date, scale or sample size).
6. Evaluate both sources with the three tests of Figure 7 — one sentence per test per source.

Present your inquiry on one page: question, table, graph, comparison table and evaluations.

Answers

Q1. (a) A primary source is information you collect yourself, first-hand, for your own question — e.g. your own fieldwork counts or a survey you run. (b) A secondary source is information someone else collected and published — e.g. a census table, a book or a website.

Q2. (a) Quantitative. (b) Qualitative.

Q3. (a) Observation and measurement — it gives numerical data (width). (b) Comparing aerial photographs over time — it records land-use change between dates. (c) Survey — it asks many people the same closed questions about their behaviour.

Q4. (a) 14,162 in 2006; 66,781 in 2021. (b) 2006–2011 (32,413 in 2011 was the first count above 30,000). (c) Secondary — the student did not collect the census; the ABS collected and published it.

Q5. Relevance: “Is this page about my town, and is the data recent enough to show how water is used now?”
Reliability: “Who produced this page — is it the water authority or an official agency, and does it name where its numbers come from?” (Other wordings acceptable.)

Q6. (a) Information bias — only the positive side of the mine is presented; the costs are left out. (b) Selection bias — only people already likely to support the park were surveyed, so the sample does not represent the community.

Q7. Reasons (any two): different populations (students in one class versus all Australians of every age); different definitions (having access at home versus having used the internet at all in a month); different sample sizes (about 28 versus millions) so small samples swing more; different dates. The difference does not weaken the survey — it is expected between a small local sample and a national measure.

Q8. True in part. 1996–2001: 580 → 1,737 (×3.0, doubled); 2001–2006: 1,737 → 14,162 (×8.2, doubled); 2006–2011: 14,162 → 32,413 (×2.3, doubled); 2011–2016: 32,413 → 49,929 (×1.6, not doubled); 2016–2021: 49,929 → 66,781 (×1.3, not doubled). Doubling held for the first three periods and then growth slowed.

Q9. Open answer; see the fully-worked solution for the marking shape. A sound plan has, for each of two scales, a question that fits that scale, a data item that would answer it, and a realistic source or digital tool (e.g. own survey or counts at the local scale; ABS QuickStats, satellite images or a government report at the national scale).

Q10. Open evaluation; see the fully-worked solution. The strongest case for the statement: your own data is honest about *what you saw*, and some secondary sources are anonymous or biased. The strongest case against: primary data can be biased too (a badly chosen sample, a leading question, counting only at one convenient time), and much secondary data is highly reliable (official agencies, named methods, repeatable). A reasoned view: honesty depends on methods, not on who holds the data.

Inquiry task. Follow the six steps; markers look for a clear question, honest primary data of the required size, a real secondary source with producer and date, a processed table and graph, a comparison that names agreement or its reason, and six evaluation sentences (three tests × two sources).

Fully-worked solutions

Q1 (2 marks). 1 mark per correct definition with a matching example. The key contrast is *who collected it and why*: first-hand for your own question (primary) versus collected and published by someone else (secondary).

Q2 (2 marks). 1 mark each. (a) Quantitative — it is a number. (b) Qualitative — it is words reporting opinions.

Q3 (3 marks). 1 mark per pairing with a reason that matches the method’s strength: measurement for numerical records; photo comparison for change over time; survey for many people’s behaviour. An interview answer for (c) may earn the mark if the student argues for depth over breadth, but a survey suits “how do students use...” best.

Q4 (3 marks). (a) 14,162 and 66,781 (1 mark). (b) 2006–2011 (1 mark). (c) Secondary, because the ABS collected and published it and the student is using it after the fact (1 mark).

Q5 (2 marks). 1 mark for a genuine relevance question (fit to the student's own question: place, topic, date) and 1 mark for a genuine reliability question (producer, named sources, methods).

Q6 (4 marks). 2 marks each: 1 for naming the bias, 1 for the explanation. (a) Information bias — one side only inside the message. (b) Selection bias — the people chosen cannot represent the group the result speaks for.

Q7 (4 marks). 1 mark per distinct reason to 2 marks (population, definition, sample size, date — see Answers). 1 mark for stating the difference does not by itself weaken the survey, 1 mark for the reason: small local samples and national measures answer different-sized questions, and honest methods on both sides is what matters.

Q8 (4 marks). 1 mark for testing each of the five periods (may be grouped: the three doublings 1996–2011; the two non-doublings after); 1 mark for the ratios or statements of doubling; 1 mark for the verdict “true in part”; 1 mark for noting that growth slowed after 2011 even though the suburb kept growing in absolute terms.

Q9 (5 marks). 1 mark for an issue and two scales that make sense for it; 2 marks (1 per scale) for questions matched to their scale; 1 mark for data items that would actually answer those questions; 1 mark for realistic sources/tools (own counts or survey at the local scale; ABS QuickStats, satellite images, a council page or a government report at the larger scale). Plans may use a global plus local pair instead of local plus national.

Q10 (4 marks). 1 mark for a genuine strongest case for the statement (own data is honest about what you saw; some secondary sources really are anonymous or biased); 1 mark for the counter on primary data (sample choice, leading questions, convenient-time counts can all bias data you collect yourself); 1 mark for the counter on secondary data (official statistical and scientific agencies publish named, repeatable methods — e.g. the ABS census); 1 mark for a stated view with a reason — full marks require the view to rest on *methods*, not on who holds the data.

Inquiry task (8 marks). Question clear and geographical (1); primary data: required size, permission and anonymity observed, method fits the question (2); secondary source real, with producer and date recorded (1); processing: table and graph correct and consistent with each other (1); comparison: agreement stated or the disagreement explained by population, definition, date, scale or sample size (1); evaluations: six sentences applying relevance, reliability and bias to both sources, with at least one judgement backed by a specific observation (2).

Sources

- Victorian Curriculum F–10 Version 2.0, Geography, Levels 9–10: content description VC2HG10S02 and elaborations E01–E03 and E05 (E04 excluded per TOC §2 D3).
- Point Cook population figures (1996 ~580; 2001 Census 1,737; 2006 14,162; 2011 32,413; 2016 49,929; 2021 66,781, the most populated suburb in Australia) and history (rural community; RAAF base opened 1913; saltworks from 1924; large-scale housing from the late 1990s), Wikipedia ‘Point Cook, Victoria’; accessed 25 August 2026.
- Australian Bureau of Statistics, 2021 Census All persons QuickStats, Victoria — method of travel to work (car as driver 49.9%; worked at home 25.7%; car as passenger 3.5%; walked only 2.3%; train 1.6%; bicycle 0.7%) and population 6,503,491; retrieved 25 August 2026.
- DataReportal, *Digital 2025: Australia* (January 2025) — 26.1 million of 26.8 million Australians (97.1%) used the internet; retrieved 25 August 2026.
- World Meteorological Organization, *State of the Global Climate 2024* — 2024 the warmest year on record, about 1.55 °C above the 1850–1900 average; retrieved 25 August 2026.
- CSIRO and Bureau of Meteorology, *State of the Climate 2024* — Australia’s climate has warmed by 1.51 ± 0.23 °C since 1910; retrieved 25 August 2026.
- Sea-level-rise displacement estimates for Bangladesh (up to 0.30 m by 2050 displacing about 0.9 million people; Davis et al., 2018), Wikipedia ‘Climate change in Bangladesh’; accessed 25 August 2026.
- All figures in this section are original diagrams drawn for this book from the sources above. Class-survey values in Figures 6 and 9 are model data for illustration and are labelled as such.

Showing data clearly: graphs, maps and geospatial technologies

Theory

Fieldwork, surveys, the Census and satellites all produce **data** — raw numbers, counts and observations. Data on their own tell you very little. A **representation** is any form that turns data into something you can see: a table, a graph, a map, a diagram. Once data can be seen, they can be compared, questioned and analysed — which is exactly what this content description asks you to do: show information and data in a range of forms, from graphs to maps made with geospatial technologies.

Choosing a representation

There is no single “correct” form for a dataset. The right form depends on what the data must show. The guide below matches each job to the representation that does it best, with examples from this book.

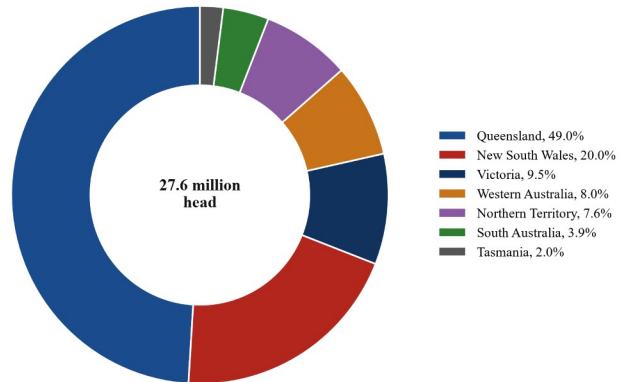
Choosing a representation: match the form to what the data must show

What do you want to show?	Representation that fits	Example in this book
Exact values, or several variables at once	Table	Census wellbeing indicators (Section 4B)
Change over time	Line graph	Wheat yields, 2020–21 to 2026–27 (Section 1B)
Compare amounts between groups	Bar chart	SEIFA scores of ten Victorian LGAs (Section 4I)
Parts of a whole	Pie graph	Australia's beef cattle by state (Section 1C)
Relationship between two variables	Scatterplot	Income and education share (this section)
Where things are — a spatial pattern	Map	Advantage and disadvantage across Victoria (this section)
A process, sequence or daily routine	Flow diagram	A day on a dairy farm (this section)

Decision guide matching what a dataset must show to the representation that fits it, with an example from this book for each form

One dataset can wear several forms. The next figure shows Australia’s beef cattle herd by state as a table and as a pie graph. The table gives exact values; the pie graph makes the big story — that Queensland holds about half the national herd — visible at a glance.

State	Beef cattle ('000 head)	Share (%)
Queensland	13,530.2	49.0
New South Wales	5,528.2	20.0
Victoria	2,609.7	9.5
Western Australia	2,197.5	8.0
Northern Territory	2,100.5	7.6
South Australia	1,082.6	3.9
Tasmania	547.0	2.0
Australia (total)	27,595.7	100.0



The table gives exact values; the pie graph makes Queensland's dominant share (about half the national herd) visible at a glance.

One dataset shown two ways: a table and a pie graph of Australia's beef cattle herd by state at 30 June 2025, with Queensland holding 49.0 percent of the national herd

Maps and cartographic conventions

A map is a representation of space: it shows *where*. A **special-purpose map** shows one particular theme — food production, wellbeing, land use — rather than everything. When a map carries data for areas, such as shading each region by a score, it is called a **statistical map**.

Special-purpose and statistical maps must follow **cartographic conventions** — the agreed rules map-makers follow so that any reader, anywhere, can decode the map. In Australian schools the conventions are remembered as **BOLTSS: Border, Orientation, Legend, Title, Scale and Source**.

BOLTSS — the elements of cartographic conventions checked on every map in this book

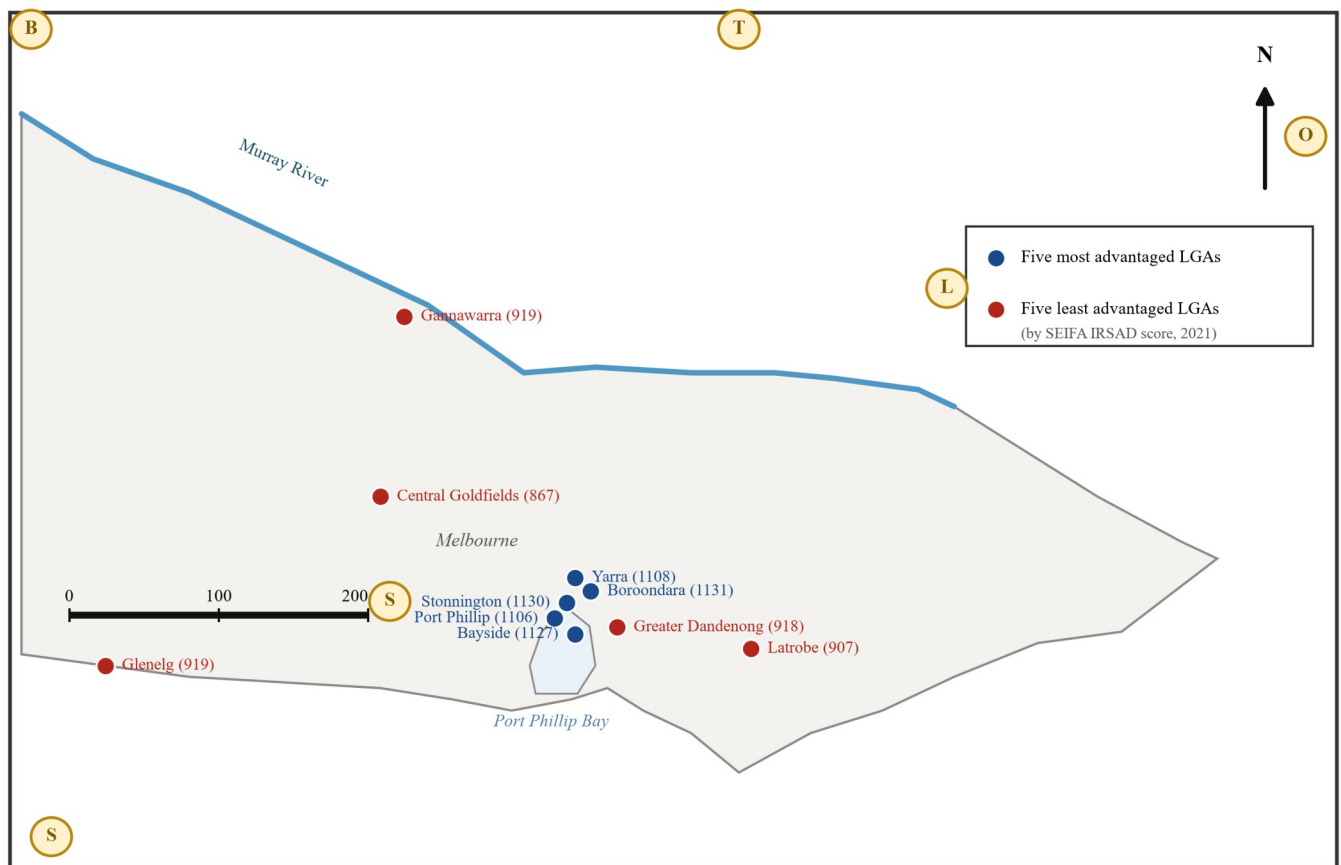
Letter	Element	What it does	When is it needed?
B	Border	A frame around the map that separates the map from the rest of the page.	Always.
O	Orientation	A north arrow showing which way is north.	Always, unless north is already clear.
L	Legend	Decodes every symbol, colour and line used on the map.	Whenever symbols or colours carry information.
T	Title	Says what is mapped, where, and when.	Always.
S	Scale	Links map distance to ground distance.	Always.
S	Source	Names where the data came from, and when it was collected.	Always — a map is only as trustworthy as its source.

Checklist table of the six BOLTSS elements of cartographic conventions: what each element does and when it is needed

The model map below applies every BOLTSS element to real data: the SEIFA IRSAD advantage and disadvantage scores for ten Victorian local government areas (the same scores that Section 4B graphs). Each tagged element is

doing a job — the legend decodes the dots, the scale lets you judge distances, the source tells you who is answerable for the data.

Advantage and disadvantage across Victoria: SEIFA IRSAD scores, 2021



BOLTSS tags: T Title · B Border · O Orientation · L Legend · S Scale · S Source — the two S elements are Scale and Source.

Source: ABS, Socio-Economic Indexes for Areas (SEIFA) 2021, IRSAD, released 27 April 2023. Schematic map: coastline, boundary and dot positions are approximate and NOT to scale.

Model map of Victoria with the six BOLTSS elements tagged: title, border, north arrow, legend, scale bar and source; dots show the five most and five least advantaged local government areas by SEIFA IRSAD score, 2021

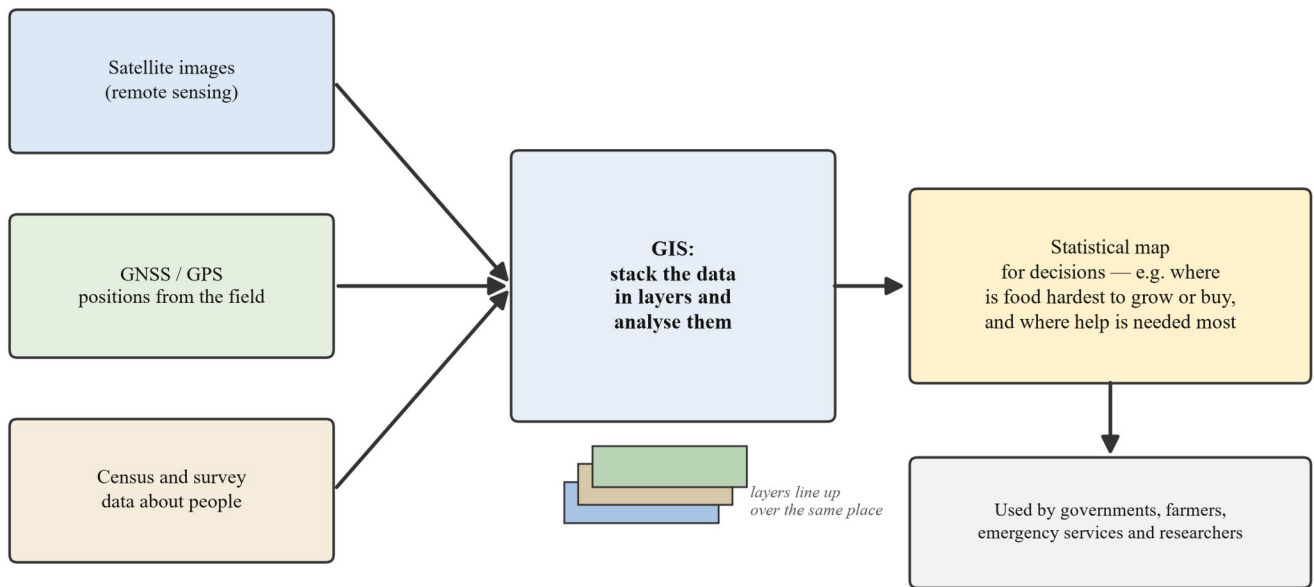
Graphs, tables and diagrams have their own conventions too: a title that says what, where and when; labelled axes with units; a legend when more than one series or colour is used; and a source. A representation without a source cannot be checked, and a representation that cannot be checked should not be trusted.

Geospatial technologies

Geospatial technologies are the digital tools that collect, store, analyse and display data about places. Three families do most of the work:

- **Remote sensing** — images of the Earth taken from satellites or aircraft, used to map crops, bushfire burn scars, flood water and city growth over time.
- **Global navigation satellite systems (GNSS)**, such as GPS — receivers that fix a precise position on the ground, used in fieldwork to place every observation exactly on a map.
- **Geographic information systems (GIS)** — software that stacks different datasets in **layers** over the same place (land use, roads, population) and analyses them together to produce statistical maps.

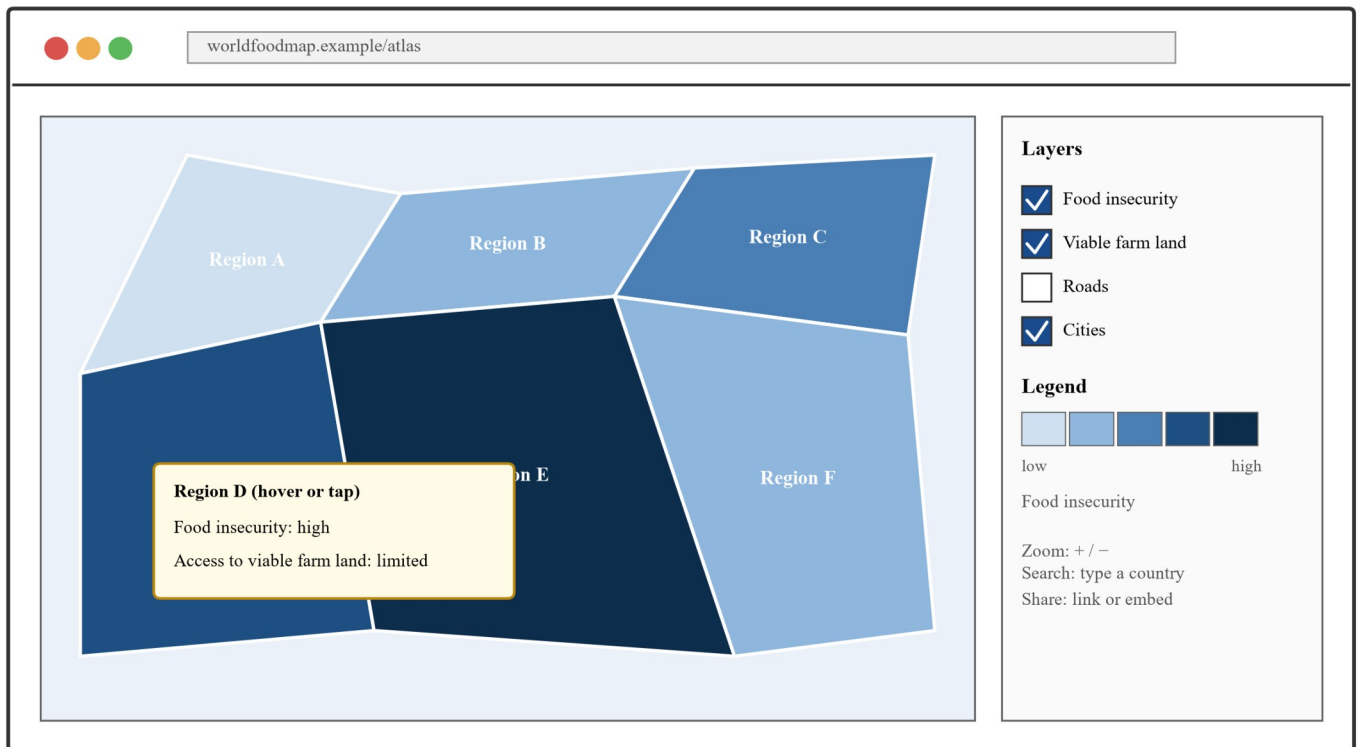
From raw data to statistical map: geospatial technologies at work (model diagram)



Model diagram of geospatial technologies: satellite images, GNSS positions and census or survey data feed a GIS that stacks the data in layers and produces a statistical map for decisions

Because GIS is digital, the maps it builds can be **interactive**. The wireframe below is a model of an interactive statistical map of the kind described in the curriculum — one showing where people lack reliable access to food, and where land suitable for growing food lies.

An interactive statistical map (model wireframe — values are illustrative)



Unlike a paper map, an interactive map can show and hide layers, zoom without losing detail, and answer a click with the data for that place.

Model wireframe of an interactive statistical map in a browser window: shaded regions from low to high food insecurity, a layer panel with tick boxes, a colour legend, and a pop-up box revealing the data for the region under the pointer

An interactive map does three things a paper map cannot: it can show and hide layers, it can zoom without losing detail, and it can answer a click or tap with the data for exactly that place. That last feature is why interactive maps are now the standard way governments and organisations publish statistical maps.

Multi-variable representations: tables and complex graphs

Real geographical questions rarely involve one variable. **Multi-variable** data carry several measurements at once — crop, year, production and change; or income, education and unemployment for the same areas. A table is often the best home for exact multi-variable values, especially when one column is calculated from the others.

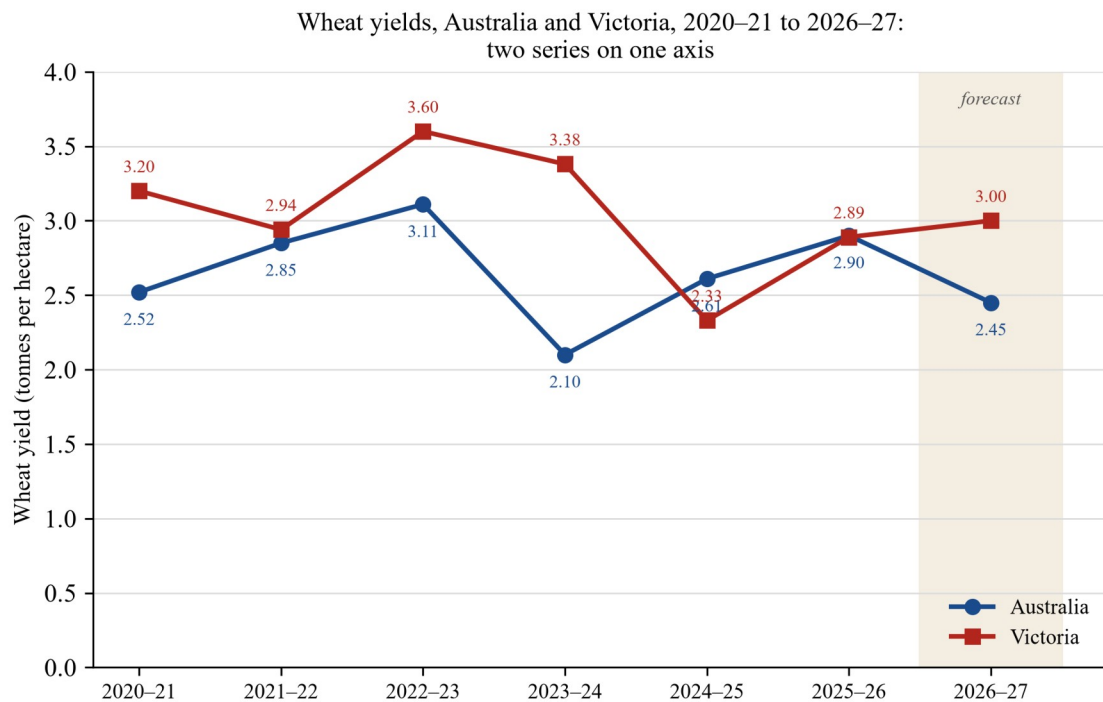
A multi-variable table: crop, two years, and the change between them (kt = thousand tonnes)

Crop	2023–24 production (kt)	2024–25 production (kt)	Change (kt)	Change (%)
Wheat	28,028	34,779	+6,751	+24.1
Barley	10,962	13,733	+2,771	+25.3
Canola	7,505	6,813	–692	–9.2

Source: ABS, Australian Agriculture: Broadacre Crops, 2024–25, released 30 June 2026. Change values are derived: $(2024-25 - 2023-24)$ and $\text{change} \div 2023-24 \times 100$, rounded to one decimal place.

Multi-variable table of Australian wheat, barley and canola production for 2023–24 and 2024–25 with change in thousand tonnes and change in percent as extra columns

A **complex graph** carries two or more series on one set of axes so they can be compared. The figure below plots wheat yields for Australia and Victoria over seven seasons. Reading it, you can compare the two lines season by season and see them rise and fall together after good and poor seasons.

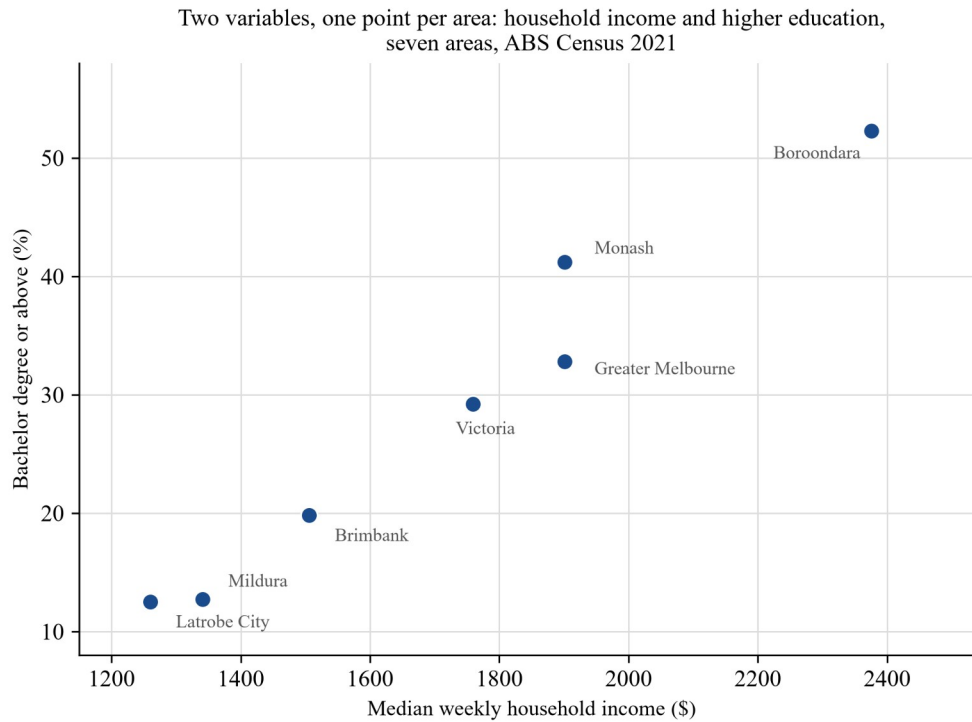


Yields derived as $\text{production} \div \text{area}$ from ABARES, Australian Crop Report, June 2026 No. 218; 2026–27 is a forecast (f). Australia's drought-hit 2019–20 yield (1.47 t/ha) is not plotted here.

Complex line graph with two series, wheat yield in tonnes per hectare for Australia and Victoria from 2020–21 to 2026–27, with the forecast 2026–27 season shaded

Scatterplots and correlation

A **scatterplot** shows the relationship between two variables: one on each axis, one point per case. The figure below plots, by median weekly household income and share of adults with a bachelor degree or above, the same seven areas whose wellbeing indicators appear in the census table of Section 4B. (Your mathematics classes teach how to construct scatterplots and how to describe association between two variables; this section uses the scatterplot the way geographers do — to display a relationship between places.)



Note: Monash and Greater Melbourne share the same median income (\$1,901) but differ in education share — points can sit in a vertical pair. Source: ABS Census 2021 QuickStats (retrieved 25 August 2026).

Scatterplot of median weekly household income against share of adults with a bachelor degree or above for seven areas from ABS Census 2021, showing a positive relationship and a vertical pair of points at the same income for Monash and Greater Melbourne

The points climb from lower left to upper right: areas with higher median income tend to have a higher share of degree holders. When two variables move together like this, they are said to **correlate**, and the relationship is called a **correlation**. A correlation is a pattern worth investigating — but it is not proof that one variable causes the other. High income might attract graduates; graduates might earn high incomes; or a third factor, such as the kinds of jobs near an area, might drive both. The scatterplot raises the question; the analysis in the next section of this book (5D) and the sources you check decide how far it goes.

Pie graphs and parts of a whole

A **pie graph** shows how a whole divides into parts, with each sector's angle in proportion to its share. It suits exactly one job: parts of a whole, as in the beef cattle figure above. It is the wrong form for change over time or for exact values, which is why every pie graph in a good report sits next to the table it was built from. The worked example below shows the arithmetic that turns a table into sectors.

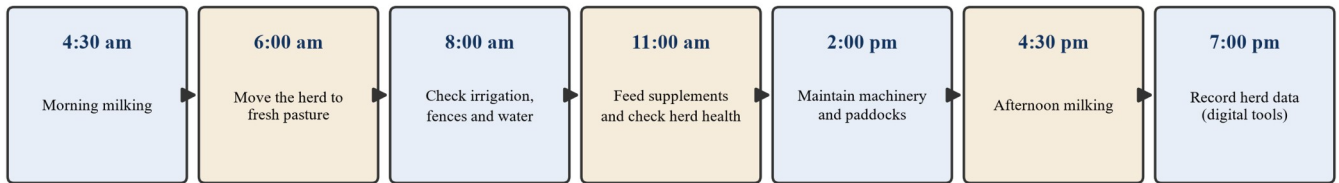
Presentations with digital tools

Digital tools widen the range of forms you can build. As well as the graphs and maps above, presentations of geographical information commonly use:

- **flow diagrams** for data with an order — a routine, a chain of production, causes and effects;
- **3D diagrams** for showing how things interact in space, such as an oil spill reaching a reef;
- **before-and-after diagrams** for showing change, such as satellite images of the same place years apart.

The model below is a student flow diagram of one day on a Victorian dairy farm — a state that holds Australia's largest dairy herd. The times are illustrative; what matters is the form: one box per step, one arrow per “then”.

A flow diagram: one day on a Victorian dairy farm (student model — times are illustrative)



Flow diagrams suit data with an order: routines, chains, causes and effects. Each box is one step; each arrow shows 'then' or 'leads to'.

Model flow diagram of one day on a Victorian dairy farm, seven boxes from 4.30 am morning milking to 7.00 pm recording herd data with digital tools

Choosing a form for a presentation means asking two questions: *who is the audience*, and *what must they see*? A table of exact values serves a report; a pie graph serves a spoken presentation; a flow diagram serves an explanation of a process. Matching the form to the purpose is part of representing data well.

Analysis: reading what you have drawn

A representation is not the end of the work; it is the start of analysis. Three moves read almost any representation:

1. **Describe the pattern.** Say what is shown, where it is high and low (or when it rises and falls), and how large the differences are. “Boroondara’s median weekly household income is nearly double Latrobe City’s” is a description with size in it.
2. **Compare.** Hold two series, two areas or two years against each other, as the wheat-yield graph compares Australia and Victoria season by season.
3. **Look for the exception.** The point off the line, the area that breaks the pattern, the season that goes the other way — exceptions are where understanding grows. In the scatterplot, Monash and Greater Melbourne sit in a vertical pair: the same income, very different education shares. That one pair tells you income alone does not settle education levels.

These moves turn a picture into an argument. The next section (5D) takes them further, into generalisations, predictions and trends.

Worked examples

Example 1 — scaffolded (bar chart and representation conventions, E01)

Question: Represent the 2021 SEIFA IRSAD scores of the five least advantaged Victorian LGAs — Central Goldfields 867, Latrobe 907, Greater Dandenong 918, Glenelg 919, Gannawarra 919 — as a horizontal bar chart with all representation conventions.

Step	What to do	Worked through
1	Choose the form and say why.	A bar chart: five areas, one score each — the job is comparing amounts between groups.
2	Order the data.	Ascending: 867, 907, 918, 919, 919. Ordering makes the pattern visible.

Step	What to do	Worked through
3	Set the axis and its scale.	Score axis from 850 to 950 in steps of 25, labelled “IRSAD score (SEIFA 2021)”. A broken axis starting at 850 is fine if the break is shown; starting at 0 would flatten the differences.
4	Draw one bar per LGA, each labelled.	Five bars; the two 919 bars (Glenelg, Gannawarra) are equal length — equal values must give equal bars.
5	Apply the conventions.	Title with what, where, when: “SEIFA IRSAD scores of the five least advantaged Victorian LGAs, 2021”. Source line: “Source: ABS SEIFA 2021”. No legend needed (one series); BOLTSS itself is the checklist for maps.

Answer: A horizontal bar chart, ordered 867 to 919, axis labelled in IRSAD score, with a title stating what, where and when and a source line naming ABS SEIFA 2021 — matches the Victorian half of the figure in Section 4B.

Example 2 — unscaffolded (pie graph sectors, E07)

Question: Using the beef cattle table, calculate Queensland’s share of the national herd as a percentage and as a sector angle, to one decimal place. Then do the same for New South Wales, and state in one sentence what the pie graph shows that the table does not.

Model answer: Queensland: $13,530.2 \div 27,595.7 = 0.4903$, so 49.0% of the herd, and $0.4903 \times 360^\circ = 176.5^\circ$ of the circle. New South Wales: $5,528.2 \div 27,595.7 = 0.2003$, so 20.0% and 72.1° . The pie graph shows at a glance that Queensland holds about half the national herd — the table holds the exact values, but the eye must work for the pattern the circle gives away immediately.

Practice questions

Scaffolded

Q1. Write out what each letter of BOLTSS stands for, and name the two elements that share the letter S (E01).

Q2. For each dataset, name the representation that fits best and give one reason: (a) the number of visitors to a beach each month for five years; (b) the exact income, education and unemployment values for six LGAs; (c) the share of Australia’s electricity generated by coal, gas, wind and solar in one year; (d) the positions of six supermarkets and ten bus stops in a suburb (E01).

Q3. From the beef cattle figure: which state holds the largest share of the herd and which the smallest, with both percentages? Why is a pie graph a suitable form for this dataset (E07)?

Q4. From the crop table: which crop grew the most in percentage terms between 2023–24 and 2024–25, and which crop fell? State the fall in thousand tonnes (E04).

Q5. From the scatterplot: describe the overall relationship between the two variables in one sentence, and name the two areas that form the vertical pair at the same median income (E06).

Q6. Name the three data inputs shown in the geospatial model diagram, and give one thing an interactive statistical map can do that a paper map cannot (E02).

Un scaffolded

Q7. A student's map of walking times to the nearest train station has a title and a scale bar but no legend, no source and no north arrow. Explain the problem each missing element creates for a reader (E01, E05).

Q8. A student says the scatterplot "proves that higher incomes cause higher education shares". Evaluate this claim. Give one alternative explanation consistent with the same pattern (E06).

Q9. You will present to a Year 7 class how Victorian wheat yields have changed since 2020–21 and how Victoria compares with Australia. Choose two representations for your presentation, justify each for that audience, and name one convention you must check on each (E03, E04).

Q10. Plan a special-purpose map of food access in your local area: what you would measure or count in the field, how you would show it with symbols or shading, and which BOLTSS elements you would check before the map is finished (E04, E05).

Inquiry task

Represent the place around you. Working alone or in pairs, collect and represent simple spatial data about your school's local area, then analyse what you built.

1. **Question.** Choose one observable pattern near your school — for example land use along one street, the position of bins and recycling points, or pedestrian counts at three crossings at the same time of day.
 2. **Collect.** Spend no more than 20 minutes in the field. Record each observation with its position (a GNSS app or a labelled sketch both count) and its value or category.
 3. **Map.** Draw a special-purpose map of your observations that follows cartographic conventions — all six BOLTSS elements, with positions clearly approximate if you used a sketch base.
 4. **Graph or table.** Represent the same data in one other form: a table, a bar chart or a pie graph, whichever suits it best, with title, labels and a source line naming you and the date as the source.
 5. **Analyse.** Write one paragraph using the three reading moves: describe the pattern, compare two places or categories, and look for an exception. Finish with one sentence on which of your two representations shows the pattern better, and why.
-

Answers

Q1. Border, Orientation, Legend, Title, Scale, Source. The two S elements are Scale and Source. **Q2.** (a) Line graph — change over time. (b) Table — several exact values per area. (c) Pie graph — parts of a whole in one year. (d) Map — the data are about where. **Q3.** Queensland largest at 49.0%; Tasmania smallest at 2.0%; a pie graph suits parts of a whole and makes Queensland's near-half share visible at a glance. **Q4.** Barley grew most, +25.3%; canola fell, by 692 kt. **Q5.** Areas with higher median weekly household income tend to have a higher share of adults with a bachelor degree or above; Monash and Greater Melbourne form the vertical pair at \$1,901. **Q6.** Satellite images (remote sensing), GNSS/GPS positions, census and survey data; an interactive map can answer a click with the data for that place (or show/hide layers, or zoom without losing detail). **Q7.** Without a legend the reader cannot decode the symbols or shading; without a source the reader cannot check the data; without orientation the reader cannot tell which way the map faces. **Q8.** A correlation is a pattern, not proof of cause; e.g. the kinds of jobs near an area could drive both income and education. **Q9.** Any two sensible forms with audience justifications and one convention per form — see fully-worked solutions. **Q10.** Any plan with a measurable observation, a symbol scheme, and all six BOLTSS elements.

Fully-worked solutions

Q1. BOLTSS is Border (the frame), Orientation (the north arrow), Legend (the key to symbols and colours), Title (what, where, when), Scale (map distance to ground distance) and Source (who is answerable for the data). The repeated letter is S: Scale and Source.

Q2. (a) Line graph: months over five years is change over time, the line graph's job. (b) Table: six areas each carrying three exact values is exactly what tables hold best. (c) Pie graph: one year split into shares of one whole. (d) Map: positions of supermarkets and bus stops are spatial data, and only a map shows where.

Q3. Queensland holds the largest share at 49.0%; Tasmania the smallest at 2.0%. The dataset is one whole (the national herd) divided into parts (the states), which is the single job a pie graph does well — and the near-half Queensland sector is instantly visible, where the table makes the eye compute it.

Q4. Barley grew the most in percentage terms, +25.3% (wheat +24.1%). Canola fell, from 7,505 kt to 6,813 kt, a fall of 692 kt (−9.2%).

Q5. Overall the points climb from lower left to upper right, so higher median weekly household income is associated with a higher share of adults holding a bachelor degree or above. The vertical pair is Monash (41.2%) and Greater Melbourne (32.8%), both at \$1,901 — same income, different education shares.

Q6. The model diagram shows three inputs: satellite images from remote sensing, GNSS/GPS positions from the field, and census and survey data about people. An interactive statistical map can answer a click or tap with the data for that place; it can also show and hide layers and zoom without losing detail — none of which a paper map can do.

Q7. Missing legend: the reader sees symbols or shading but cannot decode what they mean, so the map's message is lost. Missing source: the reader has no way to check the data or know its date, so the map cannot be trusted. Missing north arrow: the reader cannot orient the map against the real world, so directions and distances mislead.

Q8. The claim overreaches. A scatterplot shows correlation — two variables moving together — and correlation is not proof of cause. The pattern is equally consistent with education driving income (graduates earn more), or with a third factor such as the kinds of jobs near an area attracting both high earners and graduates. The scatterplot justifies investigating the relationship, not declaring a cause.

Q9. A good pair: a line graph of Victorian and Australian yields 2020–21 to 2026–27 (the two-series comparison the audience can follow as rising and falling lines) plus a bar chart or simplified table of two or three seasons for exact values. Audience justification: Year 7 readers follow a line's up-and-down more easily than a table of decimals, while the table gives the exact figures a curious listener may ask for. Conventions to check: on the line graph, a legend distinguishing the two series and labelled axes with units; on the table, a title with what, where, when and a source line.

Q10. A strong plan names one measurable observation (e.g. counting pedestrians at three crossings for ten minutes at 3.30 pm), a symbol scheme (dot size or shading matched to the count, decoded in the legend), and checks all six BOLTSS elements: a border, a north arrow, the legend, a title stating what, where and when, a scale (bar scale or a stated “not to scale, positions approximate”), and a source line naming the observers and the date.

Sources (real, checkable referents; figures computed from the values shown): ABS Census 2021 QuickStats for Boroondara (LGA21110), Monash (LGA24970), Greater Melbourne (GCCSA 2GMEL), Victoria (STE2), Brimbank (LGA21180), Mildura (LGA24780) and Latrobe City (LGA23810), retrieved 25 August 2026 (as plotted in Sections 4B and 5C); ABS, SEIFA 2021 (IRSAD — the ABS area-level index of advantage and disadvantage), released 27 April 2023 (LGA scores as in Section 4B; the model map is schematic and positions are approximate); ABS, ‘Australian Agriculture: Livestock, 2024-25’, released 28 April 2026 — beef cattle by state at 30 June 2025, state values summing to the published national herd of 27.6 million (as in Section 1C); ABS, ‘Australian Agriculture: Broadacre Crops, 2024-25’, released 30 June 2026 — wheat, barley and canola production 2023–24 and 2024–25 (as in Section 1C); ABARES, ‘Australian Crop Report’, June 2026, No. 218 — wheat yields derived as production ÷ area, 2026–27 a forecast (as in Section 1B). The formats guide, BOLTSS checklist, geospatial model, interactive-map wireframe and dairy flow diagram are original teaching models containing no real-world data. All retrieval dates on or before 25 August 2026.

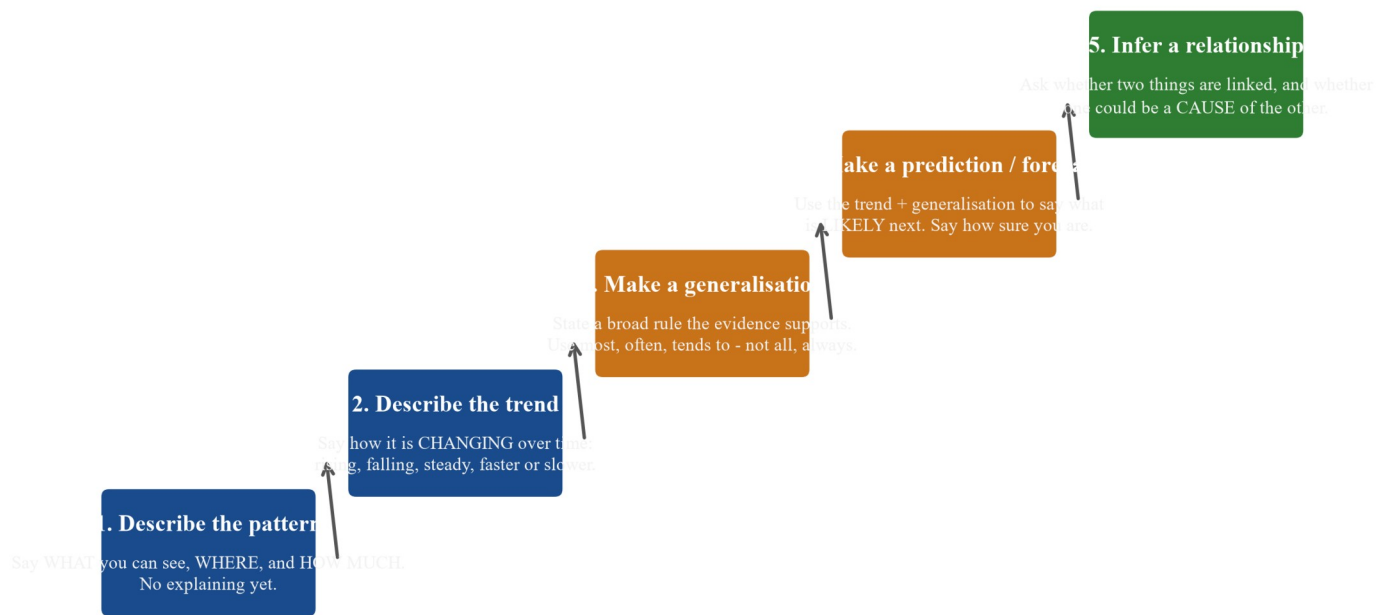
Making sense of data: patterns, trends, generalisations and forecasts

Theory

Data becomes useful only when you **interpret** it (say what it shows) and **evaluate** it (judge how strong the evidence is). This section trains five moves, in order (Figure 1), and gives you real data to practise them on.

The five moves of interpreting and evaluating

The five moves of interpreting and evaluating data



Each move builds on the one before. You cannot forecast well if you have not described the trend; you cannot infer a cause if you have not checked the pattern.

Step diagram with five rising steps: describe the pattern, describe the trend, make a generalisation, make a prediction or forecast, infer a relationship

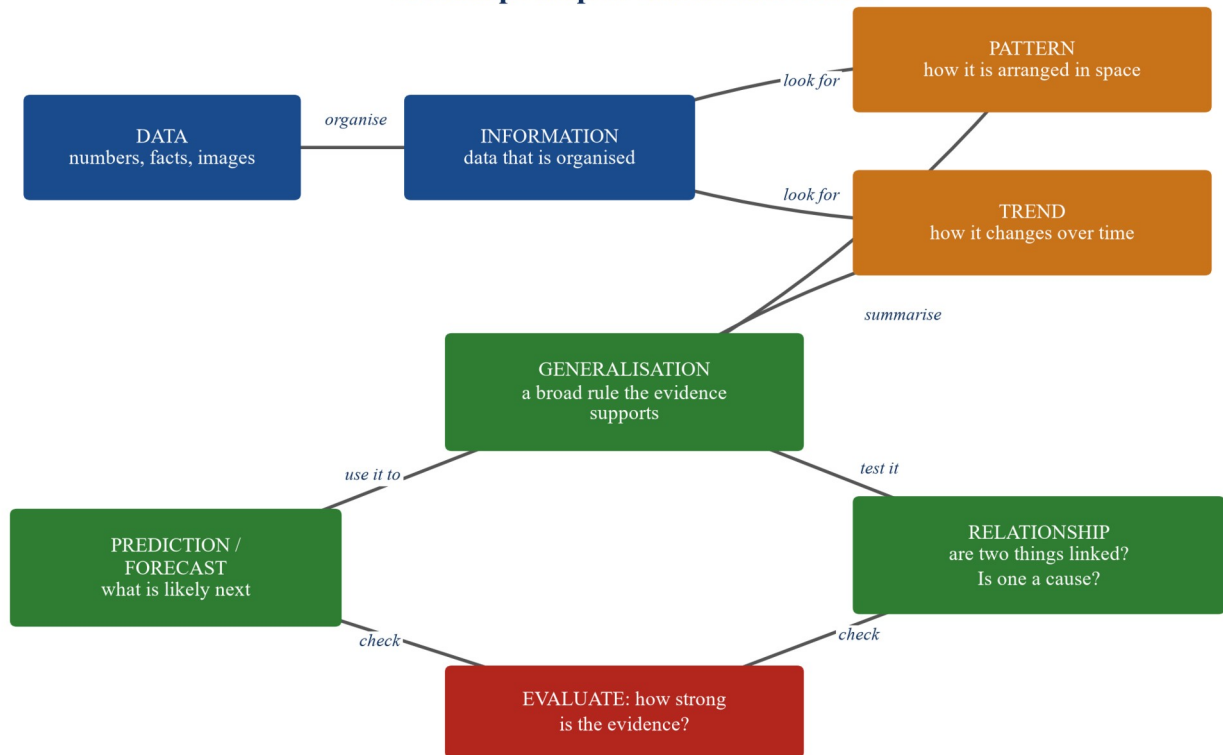
The key words of the section, defined once and used all the way through:

- **Data** are the raw numbers, facts and images you collect or are given. **Information** is data you have organised so it can be read (a table, a map, a graph).
- A **pattern** is how something is arranged *in space*: where it is high, where low, where it clusters. A **trend** is how something changes *over time*: rising, falling, steady, speeding up or slowing down.
- A **generalisation** is a broad rule that the evidence supports - a statement about what is *generally* true, using words like *most*, *often*, *tends to*, never *all* or *always*.
- A **prediction** says what will happen next; a **forecast** is a prediction that states how likely it is, often as a range (for example, “between about 130 and 180 by 2030”).
- A **relationship** is a link between two sets of data: as one changes, the other tends to change too. A relationship is **not** proof of cause - that extra check is part of evaluating.

Concept maps: exploring relationships (E01)

A **concept map** puts ideas in boxes (nodes) and joins them with labelled arrows, so the *relationship* between each pair is written down, not assumed. Building one forces you to sort data from information, and information from the patterns and trends inside it.

A concept map of this section's ideas



Concept map linking data, information, pattern, trend, generalisation, prediction, forecast and relationship with labelled arrows, all checked by an evaluate box

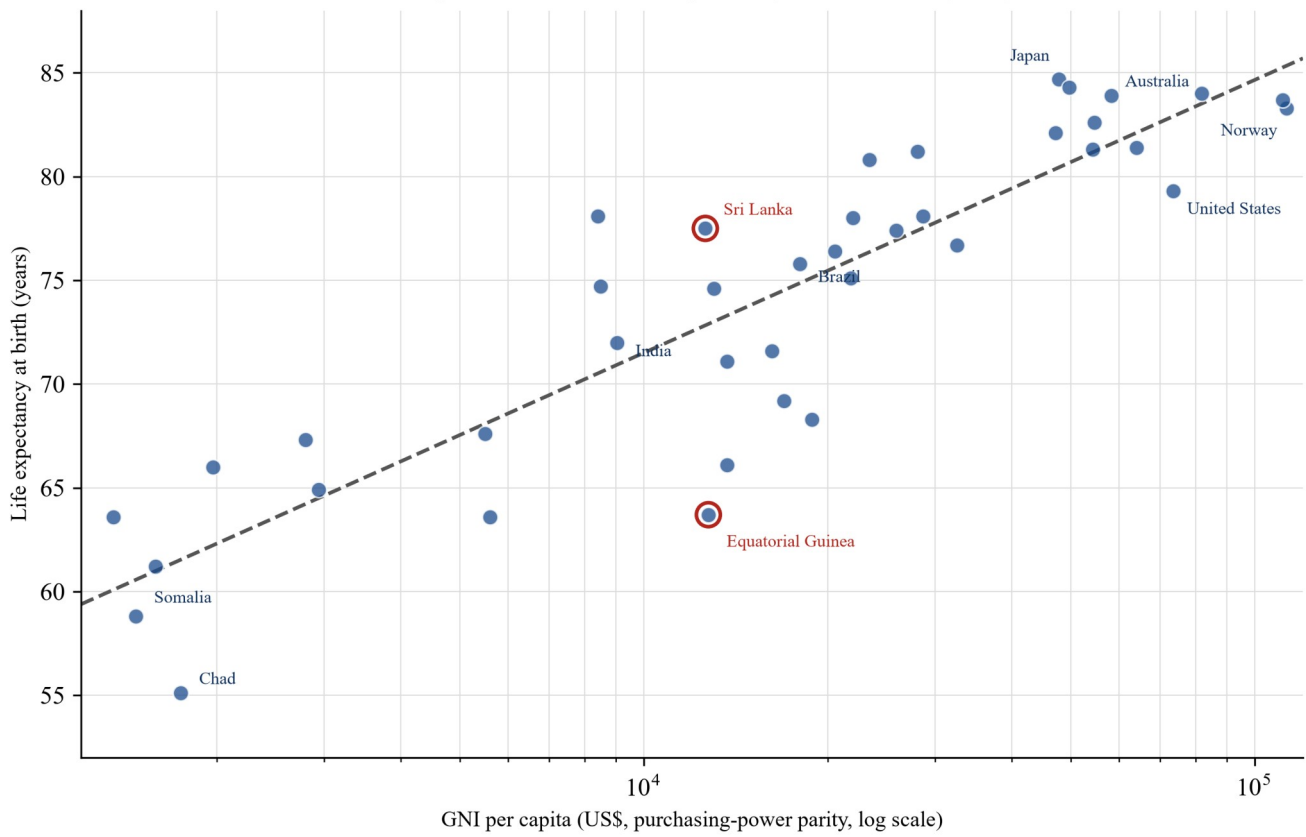
Read Figure 2 as a workflow: you organise **data** into **information**, look for **patterns** and **trends**, summarise them as **generalisations**, use those to **predict** and **forecast**, test **relationships** - and at every step you **evaluate** how strong the evidence is.

Constructing and reading a scatterplot (E03, E04)

A **scatterplot** shows one dot per place, with one number on each axis, so you can see whether two sets of data move together. To construct one: (1) choose two **indicators** (numbers that stand for something, such as income per person or life expectancy); (2) put one on each axis; (3) plot one dot per country; (4) look for the overall shape and draw a **line of best fit** (a single line drawn through the middle of the dots to show the general pattern); (5) circle any **outliers** - dots that sit far from the pattern.

Figures 3 and 4 do exactly this with real data: **GNI per capita** (Gross National Income per person, in **purchasing-power parity** or PPP dollars - dollars adjusted so the same amount buys the same goods in every country) on one axis, and **life expectancy at birth** (how many years a newborn is expected to live - a measure of **wellbeing**, meaning how well people are living) on the other.

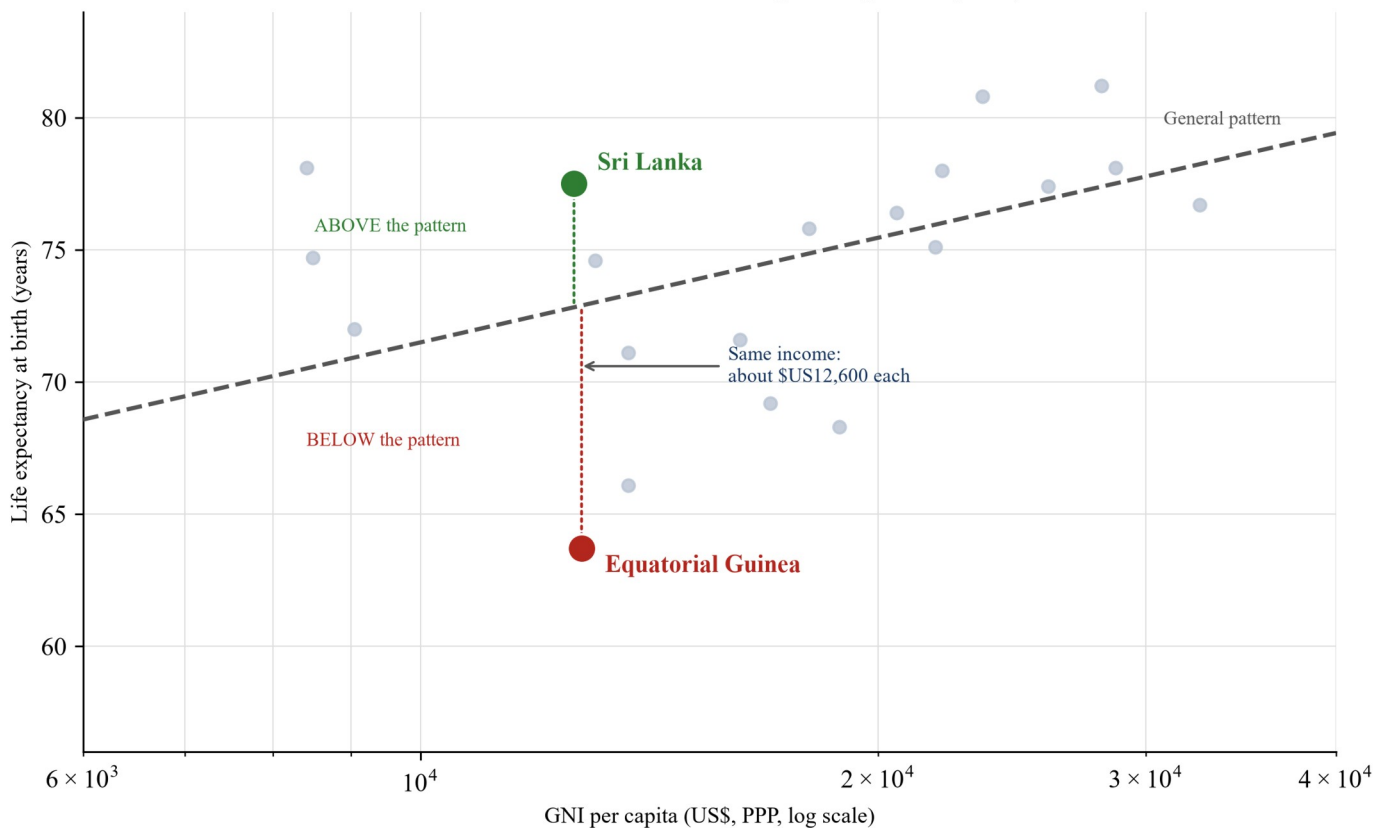
Per capita income and life expectancy, 40 countries (2023)



General pattern: life expectancy rises with income, quickly at low incomes and more slowly at high incomes. Australia sits near the top. Red rings mark two countries far from the pattern.

Scatterplot of life expectancy against GNI per capita for 40 countries, 2023, with a dashed line of best fit; Sri Lanka and Equatorial Guinea are ringed in red

Two countries that sit outside the general pattern (2023)



Sri Lanka lives about 7 years longer than the pattern predicts for its income; Equatorial Guinea about 10 years less. Tools such as Gapminder let you investigate why.

Zoomed scatterplot showing Sri Lanka above the general pattern and Equatorial Guinea below it, at almost the same income of about 12,600 US dollars each

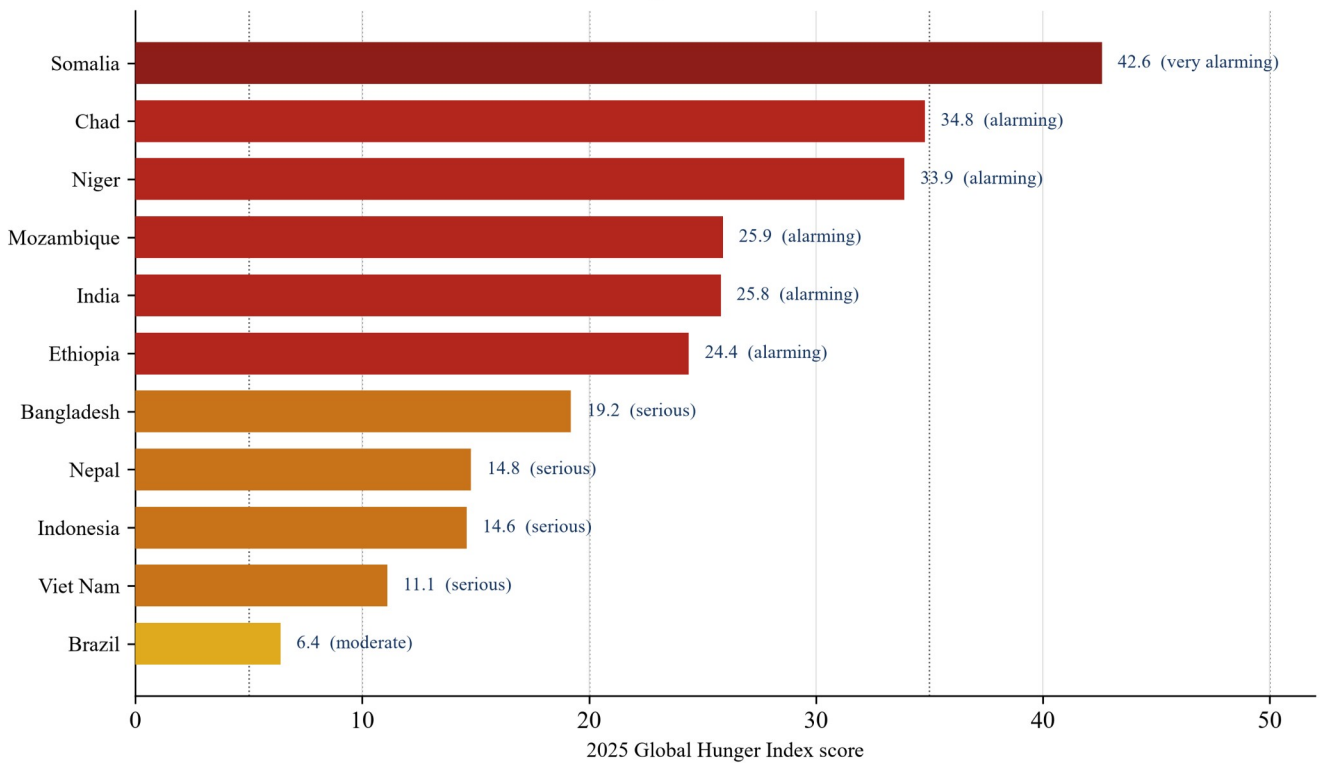
The income axis in Figures 3 and 4 uses a multiplied scale (each equal step is a ten-fold increase, not an equal addition) so that very poor and very rich countries both fit on one graph. Read the pattern first, the outliers second: the pattern tells you what *generally* happens; the outliers tell you where the story is more complicated. Geospatial tools such as **Gapminder** (a free online tool that animates exactly this kind of scatterplot through time) let you investigate *why* a country sits off the pattern.

Explaining patterns: hunger indexes (E06)

A pattern or trend is only described until you explain it. The **Global Hunger Index (GHI)** is a real, updated **index** - several indicators combined into one score. It mixes the share of people not getting enough to eat, how badly children are growing, and how many children die young (**child mortality**). The 2025 bands are: under 5 low; 5-9.9 moderate; 10-19.9 serious; 20-34.9 alarming; 35-49.9 very alarming; 50 and over extremely alarming.

Figure 5 ranks eleven countries by their 2025 score; Figure 6 tracks six of them from 2000 to 2025; Figure 7 maps the severity bands across the world.

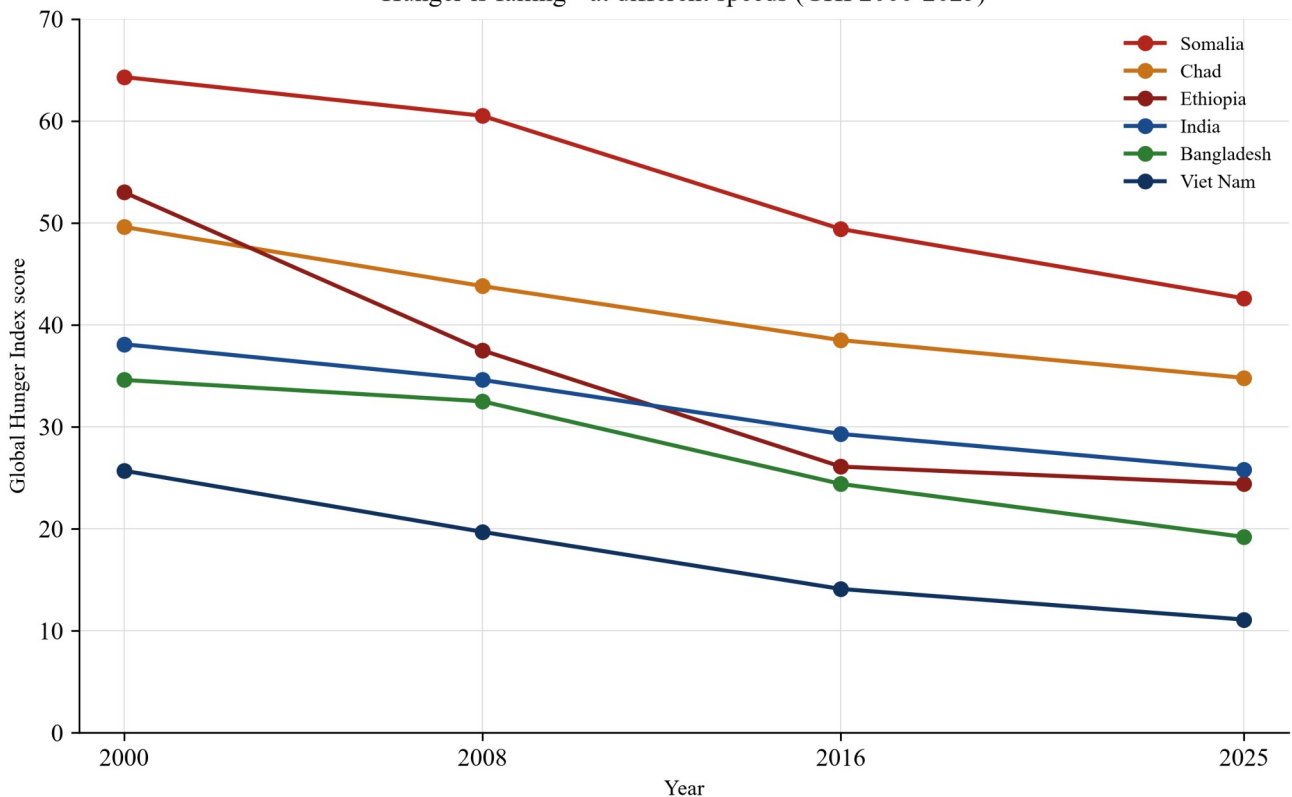
How severe is hunger? Eleven countries, GHI 2025



The score combines undernourishment, child wasting and stunting, and child mortality. Higher is worse. Pattern: the worst scores cluster in sub-Saharan Africa and parts of South Asia.

Bar chart of 2025 Global Hunger Index scores for eleven countries, coloured by severity band, from Somalia at 42.6 down to Brazil at 6.4

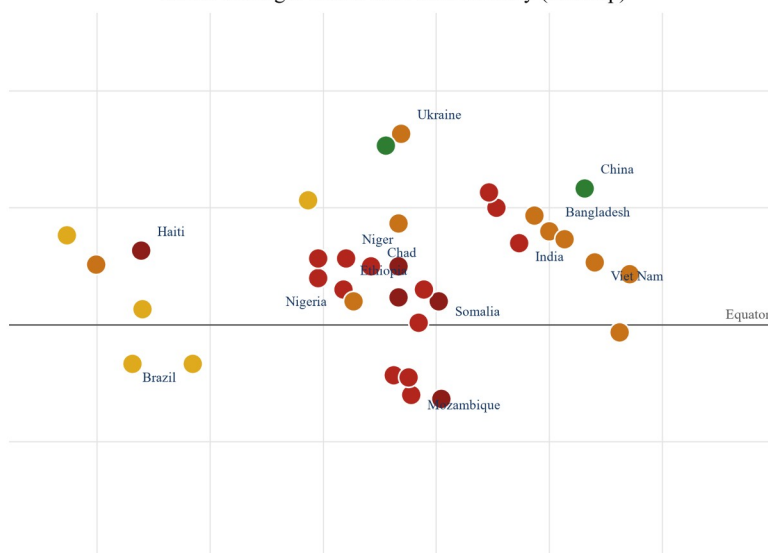
Hunger is falling - at different speeds (GHI 2000-2025)



Trend: every line falls, so hunger has eased this century - but Somalia and Chad started higher and fell more slowly, staying in the alarming bands. A trend's direction and speed both matter.

Line graph of Global Hunger Index scores in 2000, 2008, 2016 and 2025 for six countries; every line falls, at different speeds

Where is hunger worst? GHI 2025 severity (dot map)



● low ● moderate ● serious ● alarming ● very alarming

Each dot is one country with a 2025 score. The alarming and very-alarming dots form a belt across sub-Saharan Africa; serious scores sit in parts of South and South-East Asia and the Pacific; the low dots shown are Ukraine and China.

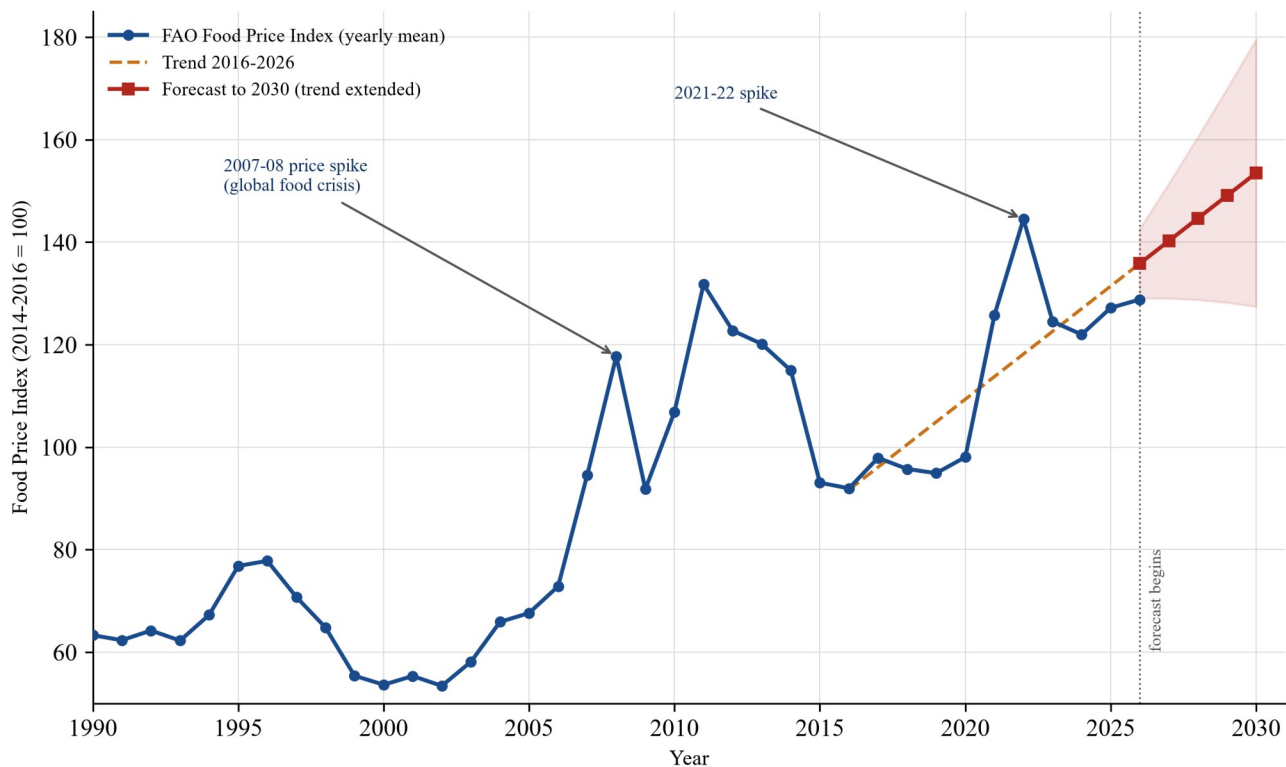
Dot map of the world in which each dot is one country coloured by the severity band of its 2025 hunger score; the worst band forms a belt across sub-Saharan Africa

The FAO (the UN's Food and Agriculture Organization) also keeps an updated list called the **Low-Income Food-Deficit Countries (LIFDCs)** - countries with low incomes that cannot grow or buy enough food to feed their people. Used together, the GHI map and the LIFDC list identify *where* food scarcity and **malnutrition** (ill health caused by not eating enough, or not eating the right foods) concentrate, which is where aid is most needed.

From trend to generalisation to forecast (E02, E05)

A trend becomes a generalisation when you say what it *generally* means, and a generalisation becomes a forecast when you project it forward with stated uncertainty. Figure 8 shows the data behind these three steps. Watch the language at each step: “food prices rose in most years since 2016” (trend); “food prices have *tended to* rise in recent years” (generalisation); “if that trend continues, the index is *likely to* sit between about 130 and 180 by 2030” (forecast). A forecast that gives a single number with no range and no doubt is not a forecast; it is a guess.

Food prices: trend and one possible forecast to 2030



A forecast states what is **LIKELY** if the recent trend continues - the shaded range shows it could be higher or lower. A spike (shock to supply) can break the trend, as 2007-08 and 2021-22 did.

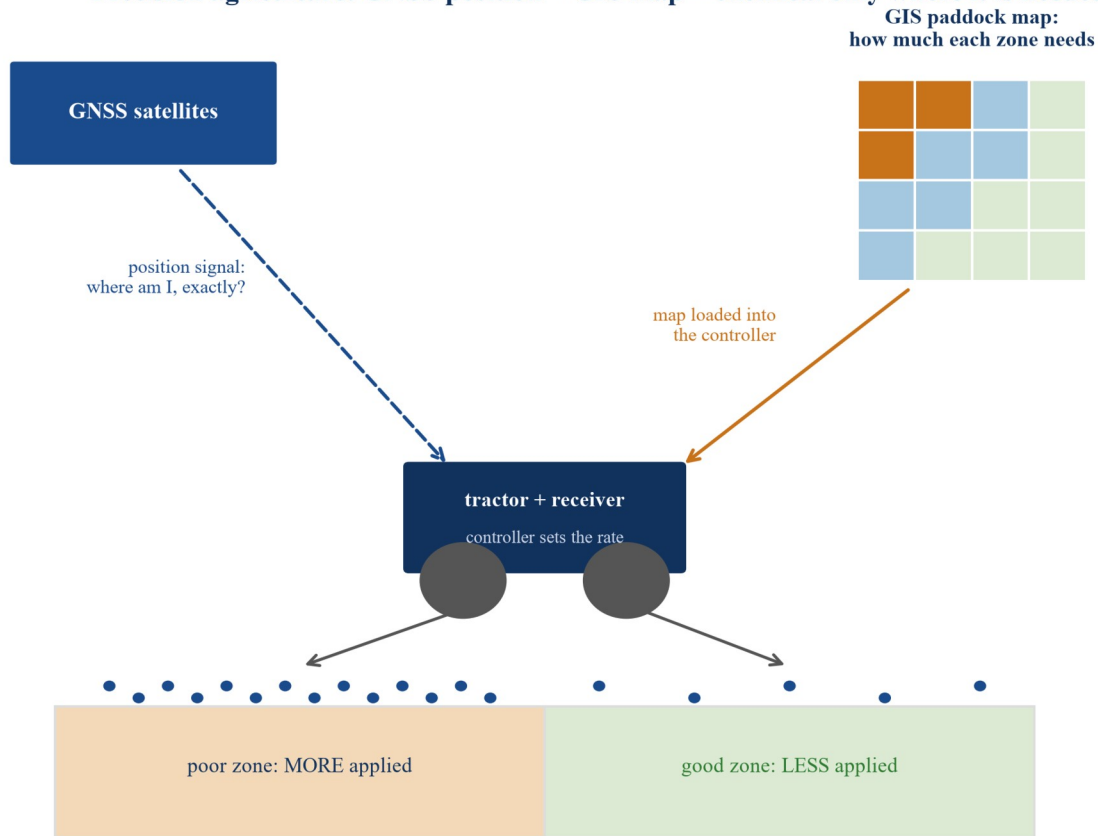
Line graph of the FAO Food Price Index yearly means 1990 to 2026 with the 2016-2026 trend dashed and a red forecast line with shaded likely range to 2030; spikes at 2007-08 and 2021-22 are marked

Generalisations can also come from critically analysing images, not just numbers (E05). Satellite before/after images of Amazon **deforestation** (NASA Earth Observatory) support the generalisation that forest loss has spread along new roads. Night-lights satellite images show South Korea blazing with light and North Korea almost dark (NOAA/NASA Black Marble) - evidence of a huge gap in electricity use and economic activity between the two countries. In both cases the evaluating question is the same: what does the image genuinely show, and what is it only a stand-in for?

Causes, impacts and sustainability (E07, E08)

Interpreting also means linking **causes** and **impacts**. Figure 9 shows how **GNSS** (global navigation satellite systems - the satellite positioning behind GPS) and **GIS** (geographic information systems - software that stores and maps data by location) let a farmer apply **fertiliser** and **pesticide** at changing rates across one paddock.

Precision agriculture: GNSS position + GIS map = chemical only where it is needed

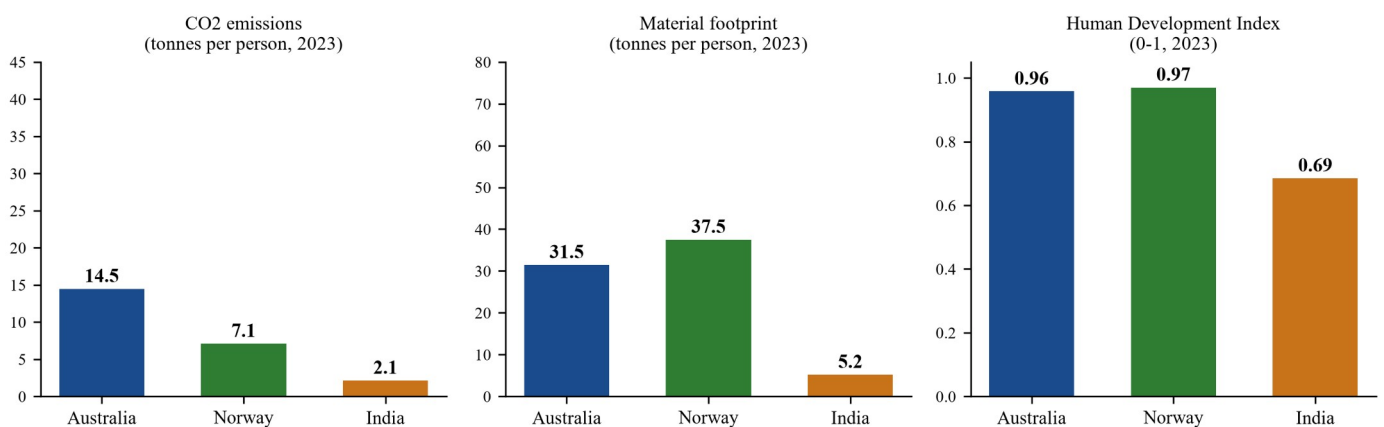


Cause and impact: applying fertiliser and pesticide only where and when the crop needs them lifts yields and limits run-off into creeks and groundwater.

Labelled diagram of precision agriculture: GNSS satellites send a position signal and a GIS paddock map loads into a tractor controller, which sprays more on the poor zone and less on the good zone

Finally, **sustainability** - meeting today's needs without damaging the ability of future generations to meet theirs - can be inferred from **environmental indicators** at the national scale, such as carbon-dioxide (CO₂) emissions per person and the **material footprint** per person (the total raw materials a country's consumption uses, in tonnes per person). Figure 10 compares Australia, Norway and India on both, with the Human Development Index as the wellbeing measure.

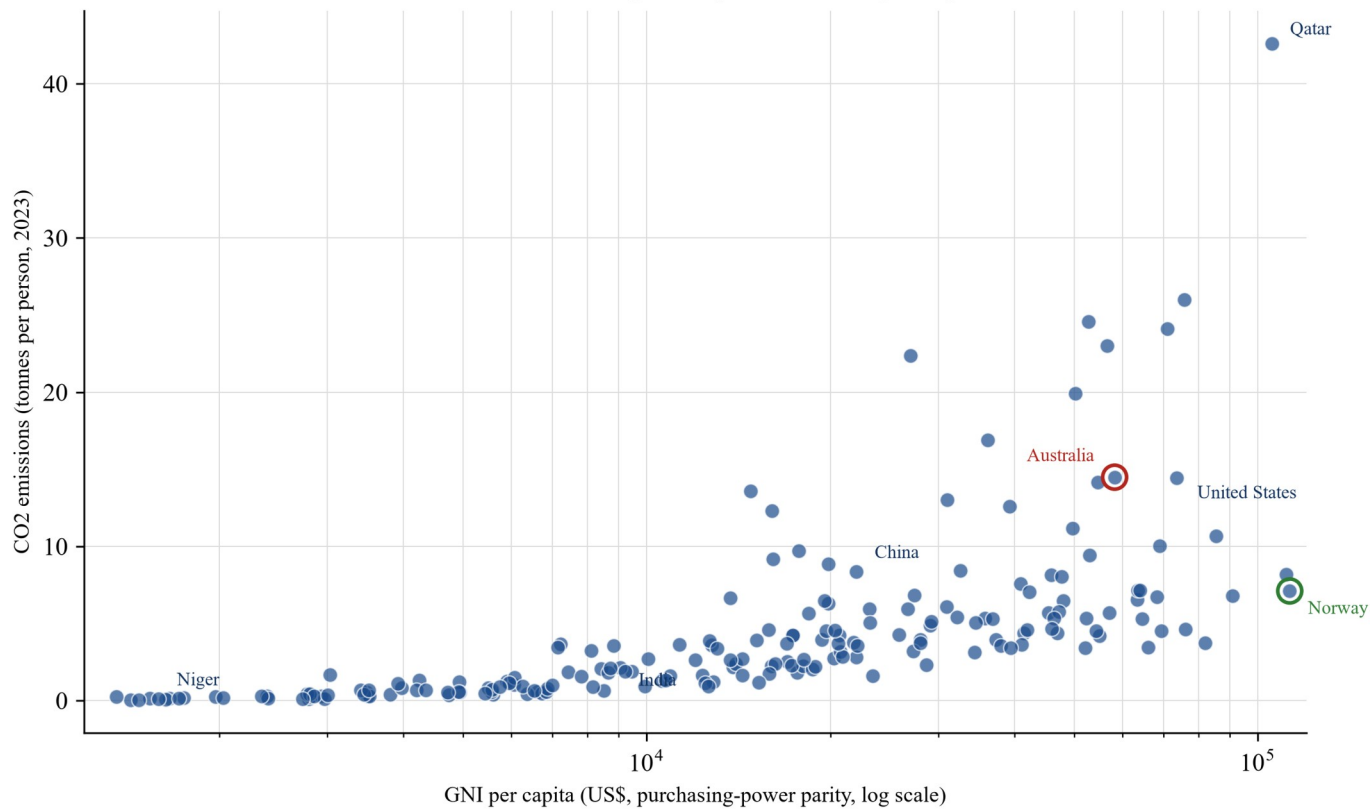
Environment and wellbeing: Australia, Norway, India (2023)



Norway matches Australia's wellbeing with about half the CO₂ per person - a real, measured difference in how sustainably the income is made.

Three bar charts comparing Australia, Norway and India, 2023: CO₂ emissions per person 14.5, 7.1 and 2.1 tonnes; material footprint 31.5, 37.5 and 5.2 tonnes; Human Development Index 0.96, 0.97 and 0.69

Wealth and emissions: general pattern with big exceptions



General pattern: richer countries usually emit more CO2 per person. Relationship to test: Australia and Norway are about equally rich, yet Australia emits about twice the CO2 per person.

Scatterplot of CO2 emissions per person against GNI per capita for the HDR country set; Australia is ringed in red at about 14.5 tonnes and Norway in green at about 7 tonnes, with Qatar highest at over 40

Figure 11’s general pattern is that richer countries usually emit more CO2 per person - but the ringed pair is the evaluation lesson: Australia and Norway are about equally rich and score about equally on wellbeing, yet Australia emits about twice the CO2 per person. Same wellbeing, different environmental cost: that difference is exactly what sustainability comparison at the national scale looks for.

Worked examples

Example 1 — scaffolded (constructing and interpreting a scatterplot, E04 and E03)

Question: Using the 2023 data behind Figure 3, construct and interpret a scatterplot of income per person against life expectancy, then investigate the two ringed countries.

Step	What to do	Worked through
1	Plot one dot per country: income (PPP US\$) on one axis, life expectancy on the other. Use a multiplied scale for income so poor and rich countries both fit.	40 dots, from Somalia (US\$1,475; 58.8 years) and Chad (US\$1,748; 55.1) up to Norway (US\$112,710; 83.3) and Japan (US\$47,775; 84.7).
2	Describe the general pattern and draw a line of best fit.	Life expectancy rises with income: quickly at low incomes, more slowly at high incomes. Australia (US\$58,277; 83.9) sits near the top.
3	Circle the outliers and describe how each one breaks the pattern.	Sri Lanka (US\$12,616; 77.5) sits well ABOVE the line - about 7 years longer than the pattern predicts. Equatorial Guinea (US\$12,762;

Step	What to do	Worked through
4	Investigate the outliers with a geospatial tool such as Gapminder, then write one generalisation with a caution.	63.7) sits well BELOW - about 10 years shorter, at almost the same income as Sri Lanka. Gapminder's time series shows Sri Lanka's life expectancy climbing steadily for a century (wide health and schooling gains for a modest income), while Equatorial Guinea's oil income arrived recently and has not translated into health gains for most people. Generalisation: higher income <i>tends to</i> go with longer life, but how income is earned and how it is spent matter - so income alone is a weak predictor for any single country.

Example 2 — unscaffolded (trend, generalisation and forecast, E02)

Question: Using Figure 8, describe the trend in the FAO Food Price Index since 2016, write a generalisation, and make a forecast for 2030. Then evaluate how much trust your forecast deserves.

Model answer: Trend: from 2016 (about 93) the index rose overall to about 129 by 2026, with a sharp spike to about 144 in 2022 and a smaller one in 2007-08 (about 118). Generalisation: world food prices have *tended to* rise since 2016, but with large short-term spikes when supply is shocked. Forecast: extending the 2016-2026 trend gives roughly 150-155 by 2030, with a plausible range of about 130-180. Evaluation: the forecast deserves only moderate trust, because the record contains two large spikes the trend line cannot predict; any new shock to harvests or supply would break the trend, so the range - not the single number - is the honest part of the forecast.

Practice questions

Scaffolded

- Q1.** Figure 2 is a concept map of this section. Add TWO new nodes of your own (for example, “scatterplot” and “outlier”) with labelled arrows showing how each connects to the existing map (E01).
- Q2.** Using Figure 6, describe the trend in Global Hunger Index scores 2000-2025 for Ethiopia and for Chad. Use the words *direction* and *speed* (E03, E06).
- Q3.** Using Figure 5, write ONE generalisation about hunger in the eleven countries shown. Your sentence must use *most* or *tends to*, and must not use *all* or *always* (E02, E06).
- Q4.** Figure 3: state the general pattern, then read off the values for Australia and for Somalia (income rounded to the nearest thousand US dollars; life expectancy to one decimal place) (E03, E04).
- Q5.** Figure 8: the forecast to 2030 is drawn from the 2016-2026 trend. State the forecast value for 2030 to the nearest 5 index points, and the wider plausible range shown by the shading (E02).
- Q6.** Figures 10 and 11: Norway and Australia have almost the same Human Development Index (0.97 and 0.96). Compare their CO2 emissions per person and state what the comparison suggests about the sustainability of the two countries' ways of producing income (E08).

Unscaffolded

- Q7.** Compare Figure 7 (the hunger dot map) with Figure 3 (the income scatterplot). What relationship between income per person and hunger do the two displays together suggest? State the relationship as a generalisation and name ONE country that fits it and ONE that does not fully fit it (E03, E06).

Q8. A student writes: “Richer countries always have longer lives, so income is all that matters.” Evaluate this claim using the two ringed countries in Figure 4. In your answer, explain what a geospatial tool such as Gapminder adds to the evaluation (E04, E05).

Q9. Night-lights satellite images show South Korea bright at night and North Korea almost completely dark. (a) State ONE generalisation about the two economies that this evidence supports. (b) Explain ONE reason why night lights are only a stand-in for economic activity, not a direct measure of wellbeing (E05).

Q10. Figure 9 shows GNSS and GIS used in precision agriculture. Explain the cause-and- impact chain: how does applying fertiliser and pesticide only where each zone needs them raise yields while cutting run-off? (E07)

Inquiry task

An outlier investigation with Gapminder (E04). Working alone or in pairs, investigate one country that sits outside the general pattern of Figure 3, and present your findings as a half-page report with one sketch scatterplot.

1. Choose ONE country from Figure 3 that sits clearly above or below the line of best fit (for example Sri Lanka, Equatorial Guinea, Cuba, Costa Rica or the United States).
 2. Open Gapminder (or the World Bank’s data site) and load income per person against life expectancy. Animate your country’s path from 1960 to today and note two dated events or long-term changes (for example: a war, a disease crisis, an oil discovery, a big expansion of schooling or health care) that shaped that path.
 3. Sketch your own scatterplot for the most recent year with about ten countries, including yours, and ring your outlier.
 4. Write 150 words that (a) describe how far your country sits from the pattern, (b) explain why, using your two dated events or changes, and (c) state whether your explanation makes the country’s position a temporary exception or a long-standing one.
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Answers

Q1. Any two nodes with sensible labelled arrows, e.g. “scatterplot - organises - data into information” and “outlier - tests - generalisation”. **Q2.** Both fall: Ethiopia from 53.0 to 24.4 (fast fall, steepest 2000-2008); Chad from 49.6 to 34.8 (slower fall). Same direction, different speed. **Q3.** e.g. “Most of the countries with the worst hunger scores tend to be in sub-Saharan Africa or South Asia.” **Q4.** Pattern: life expectancy rises with income, quickly at first then more slowly. Australia about US\$58,000 and 83.9 years; Somalia about US\$1,000 and 58.8 years. **Q5.** About 150-155; plausible range roughly 130-180. **Q6.** Norway 7.1 t CO₂ per person versus Australia 14.5 t at almost identical HDI - Norway produces the same wellbeing with about half the emissions, so its way of producing income is the more sustainable of the two. **Q7.** Generalisation: countries with lower income per person tend to have higher hunger scores. Fits: Chad (low income, very alarming). Does not fully fit: India (middle income but still an alarming score) or Viet Nam (modest income, far lower hunger than its income would predict). **Q8.** The claim fails: Sri Lanka and Equatorial Guinea have almost the same income yet life expectancies 14 years apart, so income is not all that matters. Gapminder adds time: animating each country’s path shows whether the gap is long-standing (health and schooling systems) or recent (oil income), which is evidence the single-year scatterplot cannot give. **Q9.** (a) South Korea’s economy uses far more electricity and is far more active at night than North Korea’s - a generalisation about the gap in economic activity. (b) Lights measure electricity use, not health, education or how income is shared; a country can be dark yet healthy, or bright yet unequal. **Q10.** GNSS tells the tractor exactly where it is; the GIS map tells the controller what each zone needs; the sprayer then puts more on poor zones and less on good zones, so crops get what they need (higher yields) and excess chemical does not wash into creeks and groundwater (limited run-off).

Fully-worked solutions

Q1. A concept map is only as good as its labelled arrows. Adding “scatterplot” with the arrow “organises data into information” places it between the data and information nodes; adding “outlier” with the arrow “tests the generalisation” places it beside the generalisation node, because one dot far from the pattern is exactly the evidence that can force a generalisation to be rewritten. Any two nodes earn full marks when each arrow names a real relationship.

Q2. Direction is the same for both countries: down. Ethiopia fell from 53.0 (2000) to 24.4 (2025), a fall of 28.6 points, steepest between 2000 and 2008 (15.5 points). Chad fell from 49.6 to 34.8, a fall of 14.8 points at a steadier, slower speed. So hunger eased in both countries but at different speeds - and because Chad started only 3.4 points below Ethiopia and fell more slowly, Ethiopia overtook it. A complete trend description needs both direction and speed.

Q3. Model generalisation: “In 2025, most of the countries with alarming or very alarming hunger scores tended to be in sub-Saharan Africa or South Asia.” The wording matters: *most* and *tends to* allow exceptions (Brazil’s moderate score, Viet Nam’s serious one), while *all/always* would be falsified by the same figure. A generalisation that the evidence can break is not a generalisation; it is an overclaim.

Q4. General pattern: as GNI per capita rises, life expectancy rises quickly at low incomes and more slowly at high incomes, so the dots form a rising band around the line of best fit. Australia: about US\$58,000 per person and 83.9 years. Somalia: about US\$1,000 per person and 58.8 years - a 25-year gap in life expectancy for roughly a fifty-fold gap in income.

Q5. The red forecast line reaches about 150-155 index points by 2030; the shaded likely range widens to roughly 130-180. Both numbers are needed: the line states the most likely path if the 2016-2026 trend continues, and the range states the uncertainty.

Q6. At almost the same wellbeing (HDI 0.97 versus 0.96), Norway emits 7.1 tonnes of CO₂ per person and Australia 14.5 - about double. The comparison suggests that high wellbeing does not *require* high emissions: Norway reaches the same outcome with about half the carbon, largely because its electricity comes mainly from hydropower while Australia’s has come largely from coal. In sustainability terms, Norway’s way of producing income is the more sustainable one; Australia’s income carries the heavier environmental load. (Material footprint complicates the picture - Norway’s 37.5 t per person is above Australia’s 31.5 t - which is exactly why several indicators must be used together.)

Q7. Together the displays suggest: countries with lower income per person tend to have higher hunger scores. Chad fits cleanly (US\$1,748 per person; alarming 34.8). India does not fully fit the relationship: its income (US\$9,047) is well above the poorest group, yet its score (25.8, alarming) is worse than several poorer countries - so income is a real but imperfect predictor of hunger, and the generalisation must say *tends to*, not *always*.

Q8. The claim is evaluated as false as stated. Figure 4 holds two countries at almost the same income (about US\$12,600 each): Sri Lanka at 77.5 years, about 7 above the pattern, and Equatorial Guinea at 63.7, about 10 below - a 14-year gap income cannot explain. What fills the gap is how income is earned and spent: Sri Lanka's long investment in schooling and public health versus Equatorial Guinea's recent oil wealth concentrated in few hands. Gapminder adds the time dimension: animating 1900-2025 shows Sri Lanka's life expectancy climbing steadily for decades while Equatorial Guinea's income jumped only recently, turning a static outlier into an explained story. That is the evaluation step: the pattern gives the generalisation, the outliers and the time series test it.

Q9. (a) The contrast supports the generalisation that South Korea's economy is far more active and electrified than North Korea's - most of one country glows at night while most of the other is dark. (b) Night lights are a stand-in, not a direct measure: they record electricity use, not health, schooling, safety or how evenly income is shared. A place can be brightly lit by industry while its workers live badly, and a largely rural, healthy country can be dark. Evaluating the image means saying what it shows *and* what it cannot show.

Q10. The chain runs in three links. Cause 1: GNSS satellites give the tractor its exact position at all times, so the machine always knows which zone of the paddock it is in. Cause 2: the GIS paddock map - built from yield records and soil tests - tells the controller how much fertiliser and pesticide each zone needs. Impact 1 (yields): each zone receives what it lacks, so poor zones improve and good zones are not over-treated, lifting the overall harvest. Impact 2 (run-off): because excess chemical is never applied, there is little surplus to wash into creeks and groundwater. The data relationship is cause and impact, not two changes that just happen together: the rate changes *because* the position and the map change it.

Sources (real, checkable referents; figures computed from the values shown): UNDP Human Development Report 2025 statistical tables (2023 reference year: GNI per capita in 2017 PPP US\$, life expectancy at birth, CO2 emissions per person, material footprint per person, Human Development Index - Australia 58,277/83.9/14.5/31.5/0.96; Norway 112,710/83.3/7.1/37.5/0.97; India 9,047/72.0/2.1/5.2/0.69; Sri Lanka 12,616/77.5; Equatorial Guinea 12,762/63.7; Somalia 1,475/58.8; Chad 1,748/55.1; Qatar CO2 42.6), retrieved 25 August 2026; Concerned and Welthungerhilfe, Global Hunger Index 2025 (scores for 129 countries at 2000/2008/2016/2025 and the severity bands - Somalia 42.6, Chad 34.8, Niger 33.9, Mozambique 25.9, Ethiopia 24.4, India 25.8, Bangladesh 19.2, Nepal 14.8, Indonesia 14.6, Viet Nam 11.1, Brazil 6.4), retrieved 25 August 2026; FAO Food Price Index, monthly January 1990 to July 2026 (2014-2016 = 100; yearly means plotted; 2008 about 118, 2022 about 144, 2026 to July about 131), FAO, retrieved 25 August 2026; FAO Low-Income Food-Deficit Countries (LIFDCs) list as maintained by FAO GIEWS, concept and purpose only, retrieved 25 August 2026; Gapminder (gapminder.org) income-life-expectancy tool; NOAA/NASA Black Marble night-lights imagery for the North and South Korea contrast; NASA Earth Observatory before/after satellite imagery of Amazon deforestation. All retrieval dates on or before 25 August 2026.