

Science 7–8

Chapter 18 — Use and influence of science

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Socio-scientific issues: taking a proposed scientific response and weighing its ethical, environmental, social and economic considerations

Book: Science, Levels 7 and 8 (VC2) — one banded volume · **Chapter 18** — Use and influence of science · **Subtopic 18A**

What we teach here — VC2S8H03 (Victorian Curriculum F–10 Version 2.0, Science, Levels 7 and 8), whole CD: “*proposed scientific responses to socio-scientific issues impact on society and may involve ethical, environmental, social and economic considerations*” **In our words:** science can propose a response to a big issue — grow meat from cells, ban a weapon, build against earthquakes, replace a wasteful material. But whether a society *adopts* that response is never settled by science alone. The proposal has to be weighed through four lenses — **ethical** (what is right and wrong), **environmental** (what happens to living things and their surroundings), **social** (what happens to people and communities) and **economic** (what it costs and who pays). This subtopic practises that weighing on four real cases, and marks the quality of your reasoning, not the conclusion you reach. **Achievement-standard extract served here (D13):** “*They discuss the relevant ethical, environmental, social and economic considerations associated with a proposed scientific response to a selected socio-scientific issue.*” **Elaborations drawn on:** VC2S8H03.E01 (examining how laboratory-grown meat might reduce impacts on ecosystems, and considering any social, ethical and economic implications of developing laboratory-grown meat for wide consumption), VC2S8H03.E04 (researching how properties of gases were used in relation to gas warfare in World War I, and the subsequent development of the Geneva Protocol and later adoption of the Chemical Weapons Convention international arms control treaty), VC2S8H03.E05 (investigating how scientific responses, including new building materials, improved predictions and early warning systems, have supported communities living in countries in the Asia–Pacific region located near plate boundaries, such as Japan, Indonesia and New Zealand) and VC2S8H03.E06 (exploring how the development of biodegradable materials has led to more sustainable packaging and reductions in landfill). These are a context bank, not a checklist (D12). **ICIP (D10):** VC2S8H03.E02 and VC2S8H03.E03 place this content description in Aboriginal and Torres Strait Islander contexts. Both are reserved under the ICIP decision and are **not** taught here; no Aboriginal or Torres Strait Islander content is delivered in this subtopic. See the teacher-facing note at the foot. **Interlocks:** 13D built the weighing habit — benefits against risks, both sides at full strength — and hands it to this subtopic; the four lenses here are that habit made precise. 12A teaches what plate boundaries are and what they build; Case 3 assumes it and applies it (the figures cite Ch 12). 18B, the sibling subtopic, takes the next step: how science communication shapes a viewpoint, a policy and a rule. **Scope (D9):** the cases stay qualitative. No chemical equations, no genetics, no greenhouse mechanism — the chemistry and biology each case needs are described in words, at the level this band teaches them.

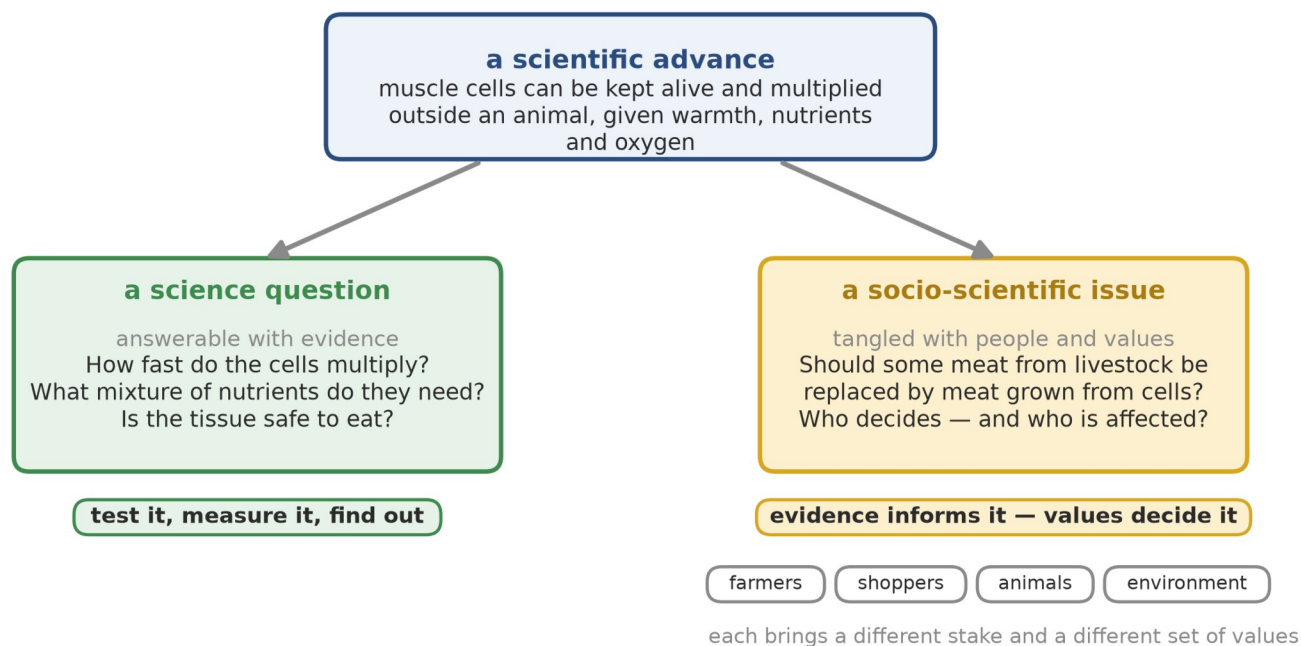
Theory

Every case in this subtopic has the same shape: science proposes a response to an issue, and society has to decide what to do with it. The subtopic answers four questions, in order:

1. **What makes an issue socio-scientific** — and who has a stake in it?
2. **What are the four lenses** — ethical, environmental, social, economic — and what does each one ask?
3. **How does the weighing run on real cases** — cultured meat, gas warfare and its treaties, living near plate boundaries, and biodegradable materials?
4. **How should a weighing be set out** — so that two careful students can disagree and both be right?

1. What makes an issue socio-scientific?

A **socio-scientific issue** is a question that science can *inform* but cannot, on its own, *answer*. The science in it is real and testable; the decision in it reaches into people’s lives, jobs, values and rights — and that part is not something a laboratory can measure.



science can tell you what could happen — it cannot, on its own, tell you what should be done.

A diagram with one box at the top labelled a scientific advance — muscle cells can be kept alive and multiplied outside an animal, given warmth, nutrients and oxygen — and two arrows down to two panels. The left green panel is a science question, answerable with evidence: how fast do the cells multiply, what mixture of nutrients do they need, is the tissue safe to eat, with the chip test it, measure it, find out. The right gold panel is a socio-scientific issue, tangled with people and values: should some meat from livestock be replaced by meat grown from cells, who decides and who is affected, with the chip evidence informs it — values decide it, and beneath it four stakeholder chips — farmers, shoppers, animals, environment — each bringing a different stake and a different set of values. A footer line reads: science can tell you what could happen — it cannot, on its own, tell you what should be done.

The people, groups, places and living things an issue touches are its **stakeholders** — the ones with a *stake* in how it is decided. Farmers, shoppers, animals and the environment each bring a different stake to the cultured-meat question, and each stake is looked after by one or more of the four lenses below. Naming the stakeholders *first* is the habit that stops a weighing from missing someone.

2. The four lenses

The content description names exactly four kinds of consideration. Each one is a lens — a question you hold the proposal up to.



four lenses, one proposal — every weighing in this subtopic looks through all four.

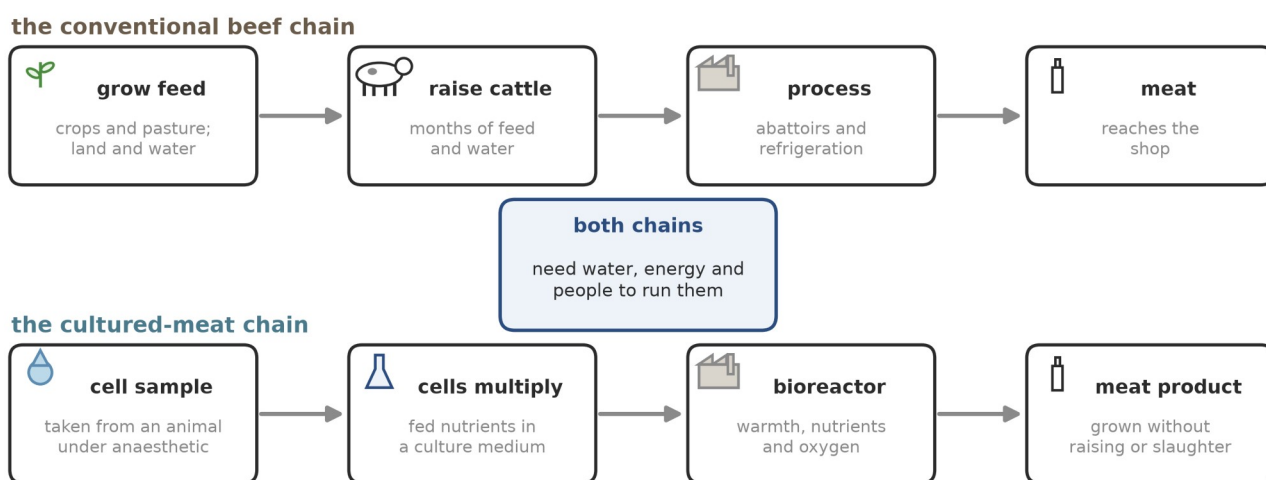
Four tall cards side by side, one per lens. The purple ethical card asks what is right and wrong, with the examples Is it fair, does anyone get hurt and can that be justified. The green environmental card asks what happens to living things and their surroundings, with the examples land, water, air, waste, wildlife. The orange social card asks what happens to people and communities, with the examples health, jobs, culture, everyday life. The blue economic card asks what does it cost and who pays, with the examples money, work, trade, who gains and who loses. A footer line reads: four lenses, one proposal — every weighing in this subtopic looks through all four.

Two habits keep the lenses honest. First, **keep the lenses separate**: “it costs too much” is an economic claim, “it is not fair” is an ethical one, and mixing them into a blur hides which one you actually mean. Second, carry over from 13D the split between the **measured** and the **view-dependent**: litres, dollars and lives are measured; fairness, culture and who *should* pay are view-dependent. A good weighing reports both and says which is which.

Defining a contested term — *cultured meat*. The meat grown from animal cells in Case 1 is called different names by different camps: its supporters often say *clean meat*, its critics say *fake meat* or *lab meat*. Every one of those names is already an argument — they tell you how to feel before you have weighed anything. This subtopic therefore uses the descriptive name **cultured meat** — meat grown from animal cells in a culture medium — and notes that the other names exist and signal a stance. The same care applies to the weighing itself: each side gets stated at its strongest, in its own best words, before anyone picks a side.

3. Case 1 — *cultured meat* (VC2S8H03.E01)

The proposal: **replace some of the meat that comes from raising and killing livestock with meat grown from cells**. The science behind it is straightforward at this level: a small sample of cells is taken from an animal without hurting it, the cells are fed nutrients in a culture medium, and in a bioreactor — a warm, controlled tank — they multiply into tissue that can become a meat product [S2]. The first burger made this way was shown in London in 2013 and cost more than US\$325 000 to produce; by 2020 the first cultured-meat product was approved for sale in Singapore, with approvals following in other countries through the 2020s [S2].



both chains end in meat. What differs is what goes in — land, feed and water on one side; nutrients, energy and cells on the other. Those different inputs are what the weighing is about.

Two four-step chains drawn one above the other. The top chain, the conventional beef chain, runs grow feed (crops and pasture; land and water) to raise cattle (months of feed and water) to process (abattoirs and refrigeration) to meat (reaches the shop). The bottom chain, the cultured-meat chain, runs cell sample (taken from an animal under anaesthetic) to cells multiply (fed nutrients in a culture medium) to bioreactor (warmth, nutrients and oxygen) to meat product (grown without raising or slaughter). A box between the chains notes that both chains need water, energy and people to run them. A footer line reads: both chains end in meat; what differs is what goes in — land, feed and water on one side, nutrients, energy and cells on the other, and those different inputs are what the weighing is about.

Conventional beef carries heavy measured loads: producing one kilogram of beef takes about 15 415 L of water on the global average [S13], and raising livestock occupies vast areas of land for grazing and feed crops. Now hold the proposal up to the four lenses — this is the move the elaboration asks for [S2]:

	ethical	environmental	social	economic
potential benefits	no animals need to be slaughtered	could use far less land and water than raising cattle	could help feed growing cities; fewer food-poisoning risks from abattoirs	cost is falling — the first burger (2013) cost about US\$325 000
what must still be weighed	people disagree about what is right here — both views must be heard	bioreactors need energy — and that energy has to come from somewhere	jobs and towns that depend on livestock; will shoppers accept the product?	scaling up is still costly; livestock incomes could fall

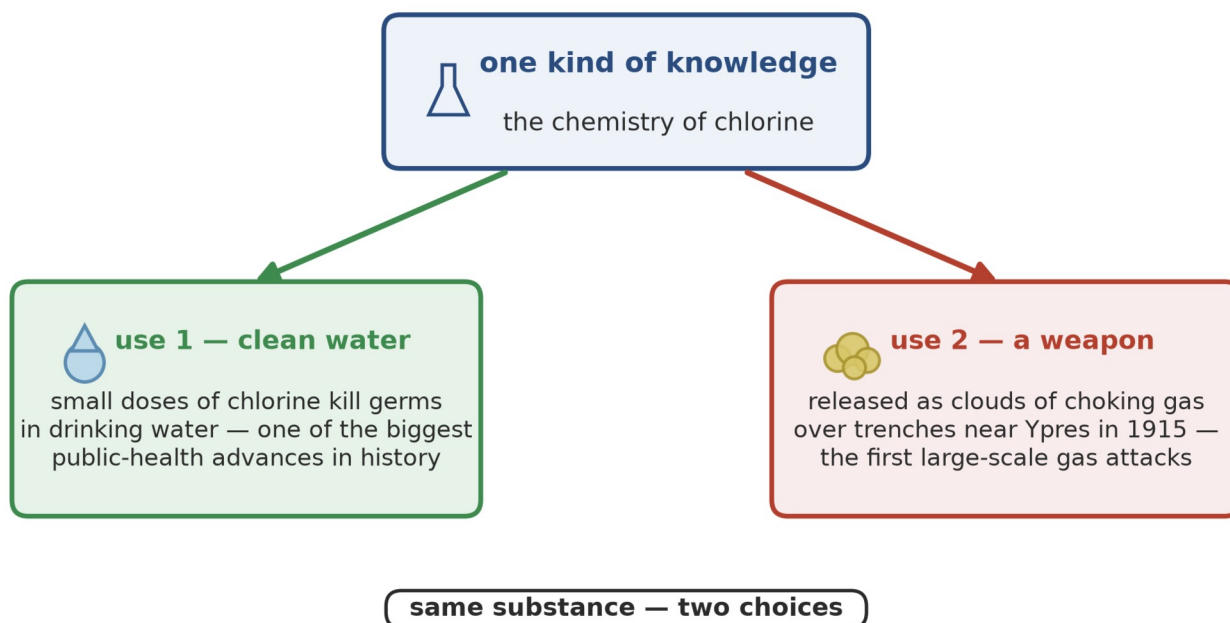
the same four lenses, applied to one proposal: laboratory-grown meat for wide consumption.

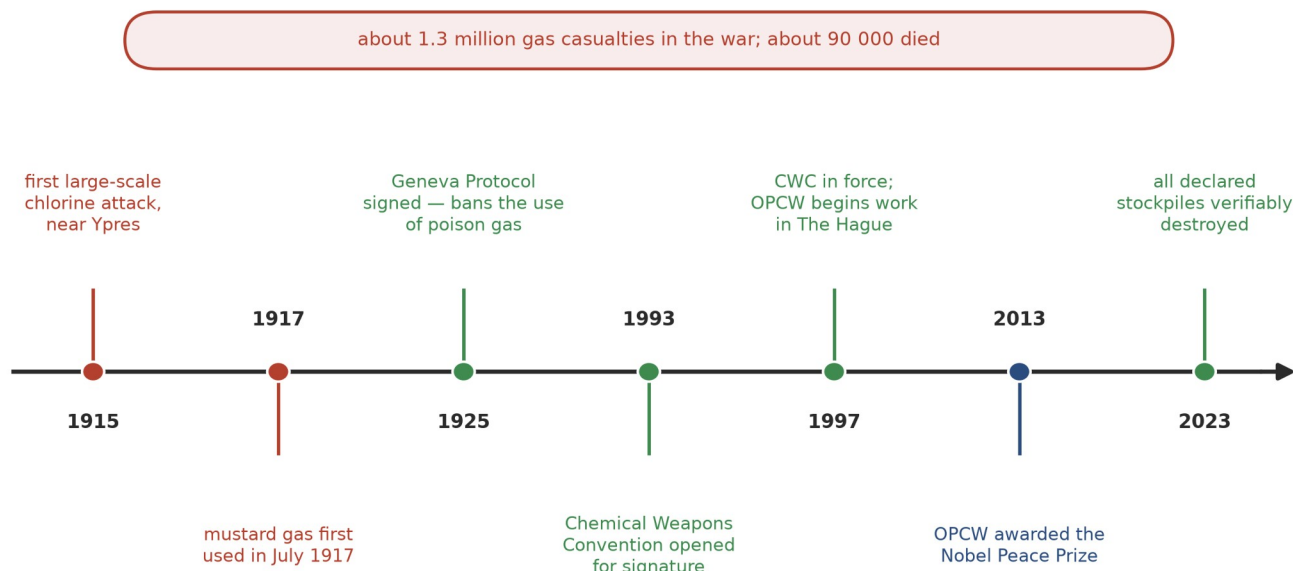
A four-column grid with the lenses ethical, environmental, social and economic across the top and two rows. The potential-benefits row reads: ethical — no animals need to be slaughtered; environmental — could use far less land and water than raising cattle; social — could help feed growing cities, with fewer food-poisoning risks from abattoirs; economic — cost is falling, and the first burger in 2013 cost about US\$325 000. The what-must-still-be-weighed row reads: ethical — people disagree about what is right here, and both views must be heard; environmental — bioreactors need energy, and that energy has to come from somewhere; social — jobs and towns that depend on livestock, and will shoppers accept the product; economic — scaling up is still costly, and livestock incomes could fall. A footer line reads: the same four lenses, applied to one proposal — laboratory-grown meat for wide consumption.

Put both sides at their strongest before weighing. **For**, at its strongest: no animals need to be slaughtered, the land and water freed could go back to native vegetation or food crops, and cities could feed themselves with less risk of the infections that spread in crowded yards and abattoirs. **Against**, at its strongest: farming is the income and the culture of whole towns, and a shift that ruins those towns is a social harm even if the meat is fine; the bioreactors need large amounts of energy, so the environmental gain depends on where that energy comes from; and many people doubt that meat grown in a tank is something they should eat at all. Notice what kind of disagreement this is: the two sides disagree about *values* — animals, towns, choice — not about whether the cells multiply. That is the signature of a socio-scientific issue.

4. Case 2 — one chemistry, two choices (VC2S8H03.E04)

Chlorine is a yellow-green gas that kills germs. Dosed into drinking water, it stops the diseases that once killed more people in cities than almost anything else — one of the greatest public-health advances in history. The same chemistry, released as choking clouds over trenches near Ypres in 1915, became the first large-scale use of poison gas in war [S3]. One substance; two choices. That is **dual use** — knowledge that serves or harms depending on what people decide to do with it.





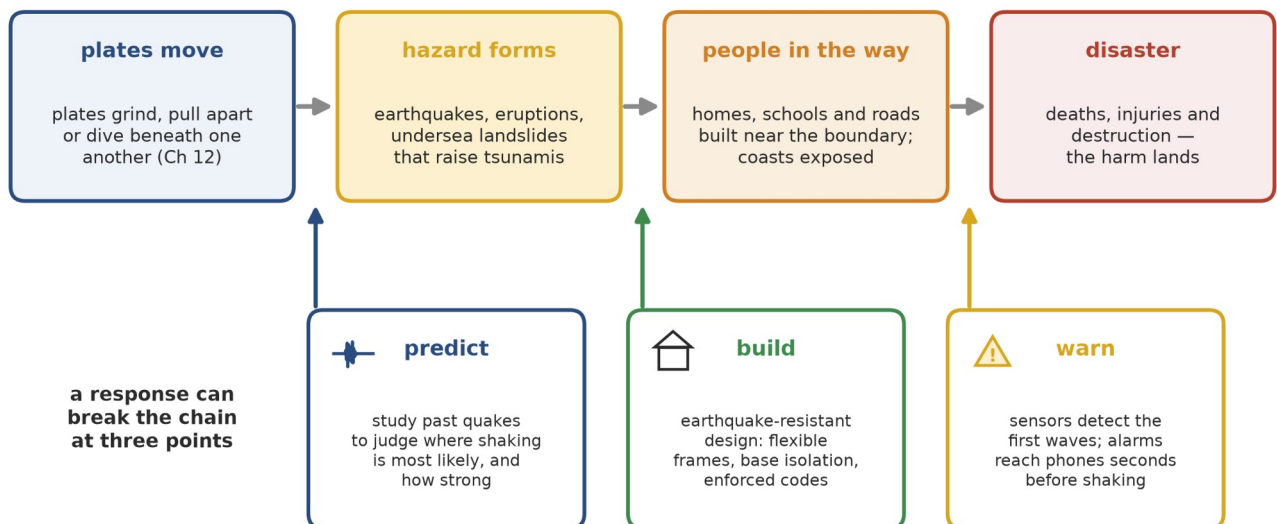
A horizontal timeline of seven evenly spaced events, alternating above and below the line. 1915: first large-scale chlorine attack, near Ypres. 1917: mustard gas first used in July 1917. 1925: Geneva Protocol signed — bans the use of poison gas. 1993: Chemical Weapons Convention opened for signature. 1997: CWC in force; OPCW begins work in The Hague. 2013: OPCW awarded the Nobel Peace Prize. 2023: all declared stockpiles verifiably destroyed. A banner across the top reads: about 1.3 million gas casualties in the war; about 90 000 died. A footer line reads: the science made the gas possible; the ethical, social and economic weighing made it unacceptable — and then made it verifiably gone.

Weigh the chain through the lenses. **Ethical:** the attacks made a case that poison gas is a weapon the world should refuse at all — a judgement about what is right, made in response to measured harm. **Social:** gas attacks harmed soldiers and later civilians alike, and the fear of gas changed how whole societies thought about science — the same chemistry that cleans water could choke a city. **Economic:** making and storing chemical weapons costs nations enormously, and the treaties created checks — inspections by the Organisation for the Prohibition of Chemical Weapons (OPCW) in The Hague — that member states pay for together [S5]. **Environmental:** declared stockpiles had to be destroyed safely, without poisoning the land and water around the destruction sites [S4].

Notice the shape of the answer: the Geneva Protocol of 1925 banned the *use* of poison gas in war [S3]; the Chemical Weapons Convention, opened for signature in 1993 and in force from 1997, went further — it bans developing, producing, stockpiling and using chemical weapons, and it requires declared stockpiles to be destroyed under verification [S4]. By 2023, all declared stockpiles had been verifiably destroyed [S4][S5]. The 2013 Nobel Peace Prize went to the OPCW for that work [S5]. Science proposed the gas; society’s weighing — ethical first, then social, economic and environmental — proposed the rules. In this case the “scientific response” in the content description is not a machine or a material at all. It is a treaty.

5. Case 3 — living near a plate boundary (VC2S8H03.E05)

Ch 12 teaches what plate boundaries are and what they build: at them, plates grind past, pull apart from, or dive beneath one another, and earthquakes, eruptions and tsunamis follow. For the communities of Japan, Indonesia and New Zealand, the boundary is not a diagram — it is where their homes, schools and roads already are. A **hazard** like an earthquake is natural; a **disaster** is what happens when the hazard meets people in the way. That difference is where every response in this case aims.



the hazard is natural — the size of the disaster is not. Build, warn and decide where people should live, and the same earthquake kills far fewer people.

A chain of four boxes left to right: plates move (plates grind, pull apart or dive beneath one another, Ch 12) to hazard forms (earthquakes, eruptions, undersea landslides that raise tsunamis) to people in the way (homes, schools and roads built near the boundary; coasts exposed) to disaster (deaths, injuries and destruction — the harm lands). Below the chain, three response boxes each send an arrow up into a gap in the chain: predict (study past quakes to judge where shaking is most likely, and how strong) breaks the chain between plates move and hazard forms; build (earthquake-resistant design: flexible frames, base isolation, enforced codes) breaks it between hazard forms and people in the way; warn (sensors detect the first waves; alarms reach phones seconds before shaking) breaks it before disaster. A side label reads: a response can break the chain at three points. A footer line reads: the hazard is natural — the size of the disaster is not; build, warn and decide where people should live, and the same earthquake kills far fewer people.

The elaboration names three countries and three kinds of response — new building materials, improved predictions and early warning systems [S6][S7][S8][S9][S10]. Each country leans on a different mix:

Japan	Indonesia	New Zealand
build + warn the lesson the 1995 Kobe earthquake (M 6.9) killed about 6 400 people — older buildings suffered most the response building codes tightened; structures built to the 1981 code fared far better the warning Earthquake Early Warning on phones, TV and speakers since 1 October 2007 — seconds of notice	warn the lesson the 2004 tsunami killed about 228 000 people across 14 countries; there was no warning system the response Indian Ocean warning network active from mid-2006: sensors, buoys, sirens the warning an alert only helps if it reaches people in time — sirens delayed 20 minutes in Aceh in 2012	build the lesson the 2011 Christchurch earthquake (M 6.2) killed 185 people the response strict building codes; unreinforced masonry is the weakest stock the warning codes limited the disaster — a 50-year building is designed to survive a 500-year earthquake

three countries on or near plate boundaries (Ch 12), three different mixes of the same responses.

Three country cards. Japan, chip build + warn: the lesson — the 1995 Kobe earthquake (M 6.9) killed about 6 400 people, and older buildings suffered most; the response — building codes tightened, and structures built to the 1981 code fared far better; the warning — Earthquake Early Warning on phones, TV and speakers since 1 October 2007, giving seconds of notice. Indonesia, chip warn: the lesson — the 2004 tsunami killed about 228 000 people across 14 countries and there was no warning system; the response — an Indian Ocean warning network active from mid-2006, with sensors, buoys and sirens; the warning — an alert only helps if it reaches people in time, and sirens were delayed 20 minutes in Aceh in 2012. New Zealand, chip build: the lesson — the 2011 Christchurch earthquake (M 6.2) killed 185 people; the response — strict building codes, with unreinforced masonry the weakest stock; the warning — codes limited the disaster, because a 50-year building is designed to survive a 500-year earthquake. A footer line reads: three countries on or near plate boundaries (Ch 12), three different mixes of the same responses.

Weigh one of these responses — early warning — through the lenses, and the case's socio-scientific shape appears. **Ethical:** a warning system saves lives regardless of who can pay, which most people call right; but a system whose sirens fail (Aceh, 2012) raises a fairness question about who is protected and who is not [S8]. **Environmental:** the hazards themselves — earthquakes and tsunamis — are environmental events the response cannot stop, only survive. **Social:** drills, trust and clear messages decide whether an alert actually moves people; an alert that is not understood saves no one [S6][S8]. **Economic:** sensors, buoys, sirens and the people who maintain them cost money every year, and that cost is carried by the community that pays for it [S6][S8].

And the deepest economic question in the case is also a social one: **building codes cost more up front**. A building designed to survive a 500-year earthquake costs more to put up than one designed for a 50-year earthquake [S10]. Who pays that extra — the builder, the buyer, the renter, the taxpayer? — is a distribution question the science cannot answer. What the science *can* say is measured and stark: in Christchurch the unreinforced masonry buildings caused most of the deaths [S10]; in Kobe the older stock suffered most while buildings under the newer code stood [S9]. The same shaking, different buildings, different outcomes. The hazard is natural; the size of the disaster is not.

6. Case 4 — biodegradable materials (VC2S8H03.E06)

The proposal: **replace ordinary plastic packaging with materials that biodegrade**, to cut landfill and litter. The measured background is heavy: of all the plastic ever made — about 8.3 billion tonnes — only about 9% has been recycled, and about 79% has gone to landfill or into the natural environment, where ordinary plastic persists for hundreds of years, breaking slowly into microplastics [S12].

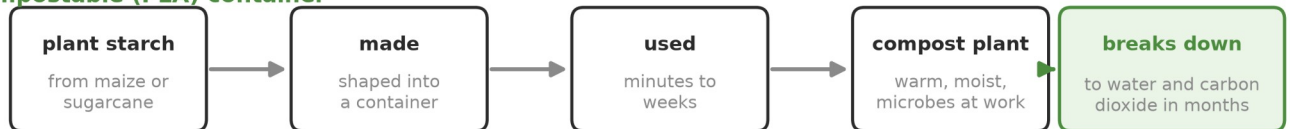
of all plastic ever made, about 9% has been recycled

about 79% has gone to landfill or nature

a conventional plastic bottle



a compostable (PLA) container

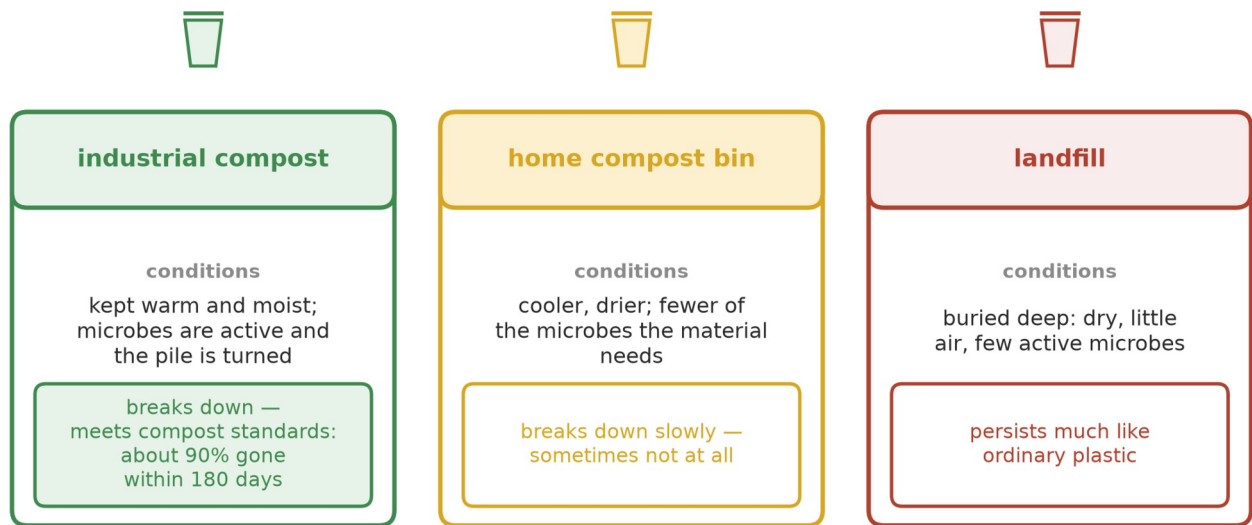


same job — two very different endings. Which ending happens depends on where the thing actually lands, not on the promise printed on it.

Two four-step chains. The top chain, a conventional plastic bottle, runs crude oil (pumped and refined) to made (shaped into a bottle) to used (minutes to weeks) to landfill (buried — and it stays), with a long grey bar stretching right and the note: persists for hundreds of years, breaking slowly into microplastics. The bottom chain, a compostable (PLA) container, runs plant starch (from maize or sugarcane) to made (shaped into a container) to used (minutes to weeks) to compost plant (warm, moist, microbes at work) to a green box, breaks down (to water and carbon dioxide in months). Chips above the chains note that of all plastic ever made, about 9% has been recycled, and about 79% has gone to landfill or nature. A footer line reads: same job — two very different endings; which ending happens depends on where the thing actually lands, not on the promise printed on it.

Biodegradable is the contested term here, and the care it needs is about *conditions*. A biodegradable material is one that living things — mostly microbes — can break down **in the right conditions**. It is not a promise the material keeps on its own. Take PLA, a compostable plastic made from plant starch such as maize or sugarcane. In an industrial compost plant — kept warm and moist, turned so air gets in — it meets the compost standard: about 90% broken down within 180 days [S11]. In a home compost bin, cooler and drier with fewer of the microbes the material needs, it breaks down slowly — sometimes not at all. Buried in landfill — deep, dry, airless — it persists much like ordinary plastic [S11].

the same compostable cup, in three different places



'biodegradable' describes what a material can do in the right conditions — it is not a promise the material keeps on its own.

Three cards for the same compostable cup in three different places. Industrial compost: conditions — kept warm and moist, microbes are active and the pile is turned; result — breaks down, meeting compost standards, about 90% gone within 180 days. Home compost bin: conditions — cooler, drier, fewer of the microbes the material needs; result — breaks down slowly, sometimes not at all. Landfill: conditions — buried deep, dry, little air, few active microbes; result — persists much like ordinary plastic. A footer line reads: 'biodegradable' describes what a material can do in the right conditions — it is not a promise the material keeps on its own.

Weigh the proposal through the lenses. **Environmental:** where industrial composting exists, compostable packaging can cut landfill and litter and return material to the soil [S11]; where it does not, the same cup ends in landfill and the gain disappears — so the environmental case depends on infrastructure, not on the cup. **Economic:** compost plants, collection trucks and separate bins cost councils and households money, and compostable products still cost more to make than ordinary plastic; who pays that difference is the economic question. **Social:** shoppers are asked to sort waste correctly, and a cup labelled “compostable” that ends in landfill can teach people to doubt labels altogether — trust is a social thing a policy can spend. **Ethical:** is it right to spend that money on packaging when the same money could repair things that last longer? Reasonable people differ — which is exactly what makes it a socio-scientific issue and not a shopping decision.

7. How to weigh — the method of this subtopic

Every weighing in this subtopic is set out on the same grid, in the same order. Learn the grid and you have the method.

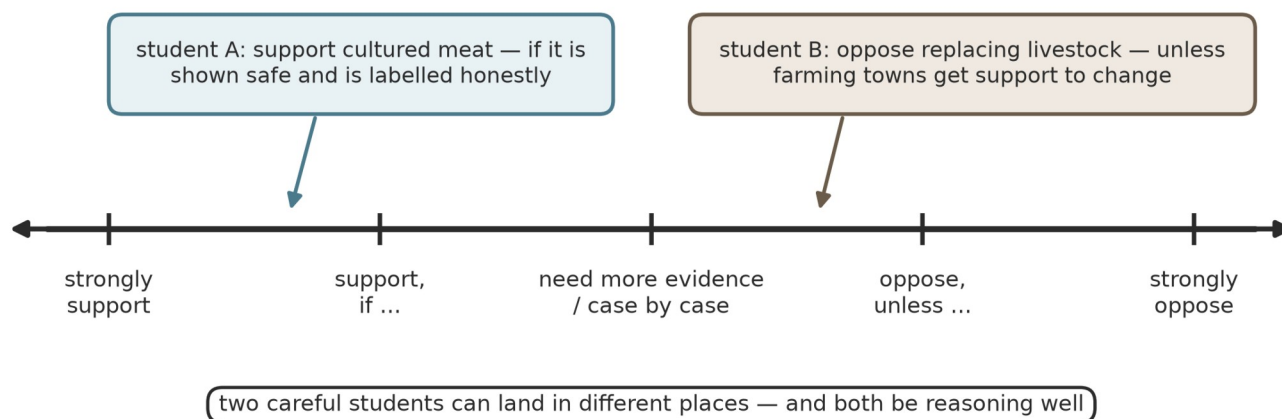
the four-lens weighing grid

the proposal	one sentence — what is suggested, and by whom	
who is affected?	list the people, groups, places and living things with a stake	
ethical lens	for:	against:
environmental lens	for:	against:
social lens	for:	against:
economic lens	for:	against:
tensions	where do the lenses pull in different directions?	
my position	a reasoned position — and the 'if' or 'unless' it carries	

fill one of these for any proposed scientific response — that is the method of this subtopic.

A worksheet grid titled the four-lens weighing grid. Down the left side run label boxes: the proposal; who is affected?; ethical lens; environmental lens; social lens; economic lens; tensions; my position. Beside the proposal, a wide box reads: one sentence — what is suggested, and by whom. Beside who is affected: list the people, groups, places and living things with a stake. Each lens row has a wide box split into for: and against: halves. Beside tensions: where do the lenses pull in different directions? Beside my position: a reasoned position — and the 'if' or 'unless' it carries. A footer line reads: fill one of these for any proposed scientific response — that is the method of this subtopic.

1. **State the proposal in one sentence** — what is suggested, and by whom.
2. **List who is affected** — people, groups, places, living things. Miss no stakeholder you can name.
3. **Run the four lenses** — for each, one consideration *for* the proposal and one *against*, stated at their strongest (both sides at full strength).
4. **Name the tensions** — where the lenses pull in different directions. In every case above they do: jobs against environment, cost against lives, trust against convenience.
5. **Take a position — with its condition.** Real positions are rarely all-or-nothing. They carry an *if* or an *unless*.



real positions are rarely all-or-nothing. They usually carry conditions: 'yes, if ...' or 'no, unless ...'

A horizontal five-point scale from strongly support through support if ..., need more evidence / case by case, and oppose unless ... to strongly oppose. Two example positions point to it: student A supports cultured meat — if it is shown safe and is labelled honestly; student B opposes replacing livestock — unless farming towns get support to change. A chip below the line reads: two careful students can land in different places — and both be reasoning well. A footer line reads: real positions are rarely all-or-nothing; they usually carry conditions — 'yes, if ...' or 'no, unless ...'.

The content description does not tell you the answer to any weighing, and neither does this book. Different people, reasoning well from the same facts, can reach different conclusions — that is not a flaw in the topic; it *is* the topic.

Marks are awarded for the quality of the reasoning, not for the conclusion reached: stakeholders named, all four lenses used, the measured kept separate from the view-dependent, both sides at full strength, and a position that owns its condition.

Activity — the four-lens hearing (VC2S8H03.E01, E06)

Your class holds a **hearing** — a structured discussion in which a proposal is heard through all four lenses before anyone votes. Choose **one** proposal:

- **Proposal A:** “From next year, our school canteen replaces all single-use plastic packaging with compostable packaging.”
- **Proposal B:** “If cultured-meat products are approved for sale in Australia, our local supermarket chain should stock them alongside conventional meat.”

Run the hearing in five moves:

1. **The proposal (one sentence)** — write it on the grid exactly as chosen; say who is proposing it.
2. **Stakeholders** — as a class, list who is affected on the grid. Keep going for one minute after you think you are done; the last names are usually the ones a weighing misses.
3. **Lens panels** — four groups, one per lens. Each group fills its row with one consideration *for* and one *against*, each stated at its strongest. A consideration may be measured (“compostable packs cost about twice as much”) or view-dependent (“the school should set an example”) — label which.
4. **Tensions** — the class names where the lenses pull apart (for example: the environmental *for* against the economic *against*).
5. **Positions with conditions** — each student marks the five-point scale (strongly support ... strongly oppose) and writes one sentence giving their position *with its if or unless*. No bare “yes” or “no” is accepted.

A hearing is well run if a student who holds the opposite position can hear their own side stated fully and honestly in steps 3 and 4. That is the test 13D set and this subtopic keeps.

Worked examples

Example 1 — scaffolded

Four considerations about cultured meat are listed below. Name the lens each one belongs to.

Working	Comment
(a) “No animals need to be slaughtered.” → ethical lens.	It is a claim about what is right and wrong — about how we may treat animals.
(b) “Bioreactors need large amounts of energy.” → environmental lens.	It is a claim about resources and surroundings — where the energy comes from and what it costs the environment.
(c) “Farming towns could lose their main income.” → social lens.	It is a claim about people and communities — jobs, towns, everyday life.
(d) “Scaling up production is still costly.” → economic lens.	It is a claim about money — what it costs and, with (c), who loses.

Example 2 — scaffolded

Use the weighing grid to set out the first three rows for this proposal: “*A national government installs an earthquake early-warning system covering all its cities.*”

Working	Comment
Proposal: the government installs a nationwide earthquake early-warning system of sensors and alarms.	One sentence, what and by whom — no weighing yet.
Who is affected: city residents; schools and hospitals; farmers near sensors; the taxpayers who fund it; visitors who do not know the alarms.	Stakeholders first — including the easy-to-miss (visitors, taxpayers).
Ethical lens — for: warnings go to everyone at once, rich and poor alike; against: if maintenance lapses (as Aceh’s sirens did), the people who trusted the system are the ones harmed.	One for and one against, at full strength; the against uses a real case [S8].

Example 3 — unscaffolded

Put both sides of Proposal A from the Activity — compostable packaging in the canteen — at their strongest, and give a reasoned position with its condition.

For, at its strongest: the canteen’s plastic is used for minutes and then persists for hundreds of years, and compostable packaging that actually reaches composting cuts that waste and shows the school acting on what it teaches. Against, at its strongest: without a compost stream the cups go to landfill and persist anyway, the extra cost comes out of the canteen’s budget (or out of lunch prices), and a “compostable” label over a bin that leads to landfill teaches students that green labels are empty. ∴ a reasoned position: support the change **if** the school also arranges real composting and says plainly where the cost falls; without that condition, the proposal spends money and trust for no environmental gain. The position is conditional — that is what makes it a weighing, not a slogan.

Example 4 — unscaffolded

Two students give positions on early-warning spending. Student A: “I strongly support it — saving lives is worth any cost.” Student B: “I oppose it unless the same money could save more lives spent on building safety — compare the cost per life saved.” Which student is reasoning better through the lenses, and why? (Marks are for the quality of *your* reasoning, not for picking a side.)

Both positions are allowable; the reasoning is not equal. Student A uses the ethical lens at full strength (“saving lives is right”) but closes the economic lens by declaration — “any cost” refuses to ask who pays and what else that money could do, so one lens is doing all the work. Student B keeps the ethical lens (lives saved still matter) *and* runs the economic lens as a comparison — cost per life saved across two responses — which is exactly the weighing move this subtopic teaches. ∴ Student B’s reasoning is stronger: more lenses used honestly, the measured kept beside the view-dependent, and a position that carries its condition (“unless”). A student who supported A’s conclusion with B’s method would earn the same marks.

Practice questions

Scaffolded

Q1. A question that science can inform but cannot, on its own, answer is called, in this subtopic, a ... issue. Name the two-word term.

Q2. Name the four lenses of this subtopic in the order the content description gives them.

Q3. Classify each consideration about cultured meat under one lens: (a) the first burger cost more than US\$325 000 to produce; (b) some people doubt it is right to eat meat grown in a tank; (c) freeing grazing land could let native vegetation return; (d) shoppers may simply refuse the product.

Q4. The 1925 Geneva Protocol and the 1993 Chemical Weapons Convention both respond to gas warfare. State what the Protocol banned, and one thing the Convention added.

Q5. Japan’s Earthquake Early Warning gives only seconds of notice. State (a) what the sensors detect that makes those seconds possible, and (b) one thing people can do with the seconds.

Q6. Complete the explanation: “A compostable cup breaks down in an industrial compost plant because the conditions are ..., but the same cup in landfill persists because landfill is ...”

Un scaffolded

Q7. Give the strongest environmental consideration *for* replacing some beef with cultured meat, and the strongest environmental consideration *against* — each in one sentence, each labelled with what makes it environmental.

Q8. “The gas story shows that science cannot be trusted, because the same chemistry cleans water and kills people.” Discuss this claim using the idea of dual use. Marks are for reasoning, not for the conclusion.

Q9. The 2004 Indian Ocean tsunami killed about 228 000 people across 14 countries, and there was no warning system; the warning network built afterwards was active from mid-2006. Explain why an alert system is a *social* project as well as a scientific one, using one piece of evidence from Aceh in 2012.

Q10. In Christchurch in 2011, an M 6.2 earthquake killed 185 people, and the unreinforced masonry buildings caused most of the deaths. Explain how this fact pulls the building-code question in two directions at once — one economic, one social.

Q11. A city on a plate boundary can spend its disaster budget on (i) an early-warning system or (ii) stronger building codes. Name one lens that favours (i), one that favours (ii), and the consideration each lens is weighing.

Q12. Two identical compostable (PLA) cups are discarded: one reaches an industrial compost plant, one reaches landfill. Compare what happens to each, and say what the comparison shows about the word *biodegradable*.

Q13. Fill two rows of the weighing grid for Proposal B from the Activity (stocking cultured meat if approved): the **social** lens row and the **economic** lens row, each with one for and one against at full strength.

Q14. Take your own position on Proposal A or Proposal B. Mark where you land on the five-point scale and give (a) your position with its *if* or *unless*, (b) the stakeholder your condition protects, and (c) the lens that pulls hardest against your position.

Answers

Q1. A socio-scientific issue. **Q2.** Ethical, environmental, social, economic. **Q3.** (a) Economic. (b) Ethical. (c) Environmental. (d) Social. **Q4.** The Protocol banned the *use* of poison gas in war. The Convention added bans on developing, producing and stockpiling chemical weapons, and required declared stockpiles to be destroyed under verification (any one). **Q5.** (a) The sensors detect the first, fast-travelling waves of an earthquake before the stronger shaking arrives. (b) Any one: drop, cover and hold; stop trains and surgery; move away from shelves and glass. **Q6.** ... warm and moist with active microbes and air; ... deep, dry and airless, with few active microbes, so the right conditions are missing. **Q7.** For: cultured meat could use far less land and water than cattle, so ecosystems carry a lighter load — an environmental claim about land, water and living things. Against: bioreactors need large amounts of energy, so if that energy comes from burning fuels the environmental gain can shrink or vanish — an environmental claim about resources and waste. **Q8.** The claim confuses knowledge with choice. The chemistry of chlorine is one kind of knowledge; cleaning water and choking trenches are two *choices* about it (dual use). The gas story therefore shows that ethical, social and economic weighing must sit beside science — which is precisely why the world built the Geneva Protocol and the CWC. Trusting or distrusting “science” as a block misses that the same facts served both uses. **Q9.** An alert only saves people if it reaches them in time and they know what it means — drills, trust, messages, maintenance are social things. In Aceh in 2012 the sirens were delayed about 20 minutes: the science was present, the social delivery failed. **Q10.** Economic pull: codes cost more up front, and someone — builder, buyer, renter, taxpayer — pays the difference, so the economic lens asks whether that cost is worth it and who carries it. Social pull: the deaths concentrated in the weakest buildings show that the cost of *not* building well is paid in lives, and not evenly — older, cheaper buildings harmed their occupants most, a fairness question for the community. **Q11.** Any coherent pairing; for example: the social lens favours (i) — a warning reaches everyone at once and moves people out of harm’s way in seconds; the economic lens favours (ii) — codes are paid once at construction and keep saving lives for decades with no system to fund each year (or the ethical lens favours (ii) — a safe building protects people whether or not they hear an alarm). **Q12.** In the plant the cup meets warm, moist, microbe-rich conditions and about 90% is gone within 180 days; in landfill it is buried deep, dry and airless and persists much like ordinary plastic. ∴ *biodegradable* describes what a material can do **in the right conditions** — it is not a promise the material keeps on its own. **Q13.** Social — for: shoppers get an honest new choice and farming communities see demand change gradually rather than collapse; against: jobs and towns that depend on livestock may still shrink, and some shoppers will reject the product as not real meat. Economic — for: early stocking lets the chain learn the market while the product’s cost is falling; against: cultured meat is still costly to make, shelf space has a price, and falling livestock incomes would hit local suppliers. **Q14.** Any position on the scale is acceptable if the reasoning is there: (a) a position carrying an if/unless; (b) a named stakeholder the condition protects; (c) a named lens with a genuine against-consideration.

Fully-worked solutions

Q1. The term is a **socio-scientific issue** — science informs it; values and people decide it (1 mark).

Q2. **Ethical, environmental, social, economic** — in that order, as the content description lists them (1 mark).

Q3. (a) **Economic** — a claim about money and cost (1 mark). (b) **Ethical** — a claim about what is right (1 mark). (c) **Environmental** — a claim about land and living things (1 mark). (d) **Social** — a claim about people’s acceptance and everyday life (1 mark).

Q4. The Geneva Protocol banned the **use** of poison gas in war (1 mark). The Chemical Weapons Convention went further — it also bans developing, producing and stockpiling chemical weapons, and requires declared stockpiles to be **destroyed under verification** (either addition) (1 mark).

Q5. (a) The sensors detect **the first waves of the quake**, which travel fast and do little damage, before the stronger shaking arrives — the gap between the two buys the seconds (1 mark). (b) Any one sensible use: **drop, cover and hold; halt trains and surgery; move from shelves and glass** (1 mark).

Q6. In the plant the conditions are **warm and moist, with active microbes and air** (1 mark); in landfill the cup is **deep, dry and airless, with few active microbes**, so the conditions the material needs are missing (1 mark).

Q7. For: **cultured meat could use far less land and water than raising cattle**, lightening the load on ecosystems — environmental, because it is about land, water and living things (1 mark). Against: **bioreactors need large amounts**

of energy, so the gain depends on where the energy comes from — environmental, because it is about resources and waste (1 mark).

Q8. The claim **confuses knowledge with choice** (1 mark): chlorine’s chemistry is one kind of knowledge, and clean water and gas attacks are two choices made with it — that is dual use (1 mark). The correct reading is that science proposes and informs, while the ethical, social and economic weighing decides — which is why the response to gas warfare was not less chemistry but rules: the Geneva Protocol and the CWC (1 mark).

Q9. An alert saves people only if it **reaches them in time and they know what to do** — drills, trust, messages and maintenance are social delivery, not science (1 mark). Aceh 2012: **the sirens were delayed about 20 minutes**, so the science existed and the social delivery failed (1 mark).

Q10. Economic direction: codes **cost more up front**, and the question of who pays that extra — builder, buyer, renter or taxpayer — is an economic weighing (1 mark). Social direction: the deaths **concentrated in the weakest, often cheapest buildings**, so the harm of under-building is paid in lives and paid unevenly — a social and fairness question (1 mark). The two pulls against each other are exactly a tension row on the grid.

Q11. One lens for (i): the **social** lens — a warning reaches a whole city at once and moves people out of harm’s way within seconds (1 mark). One lens for (ii): the **economic** lens — codes are paid once at construction and keep saving lives for decades, with no system to fund each year (an ethical-lens answer for (ii) also accepted) (1 mark).

Q12. Compost plant: warm, moist, microbe-rich — **about 90% gone within 180 days** (1 mark). Landfill: deep, dry, airless — **persists much like ordinary plastic** (1 mark). The comparison shows *biodegradable* means **can break down in the right conditions** — a description of conditions, not a promise (1 mark).

Q13. Social row: a for and an against about people and communities, each at full strength (1 mark). Economic row: a for and an against about cost, work and who gains or loses, each at full strength (1 mark). (Answers that swap the strengths of the two sides lose no marks — symmetry is required, agreement is not.)

Q14. (a) A position on the scale **carrying its if or unless** (1 mark). (b) The **stakeholder** the condition protects, named (1 mark). (c) The **lens** pulling hardest against the position, with a genuine against-consideration (1 mark). A conclusion opposite to the marker’s own view loses no marks if the reasoning is there.

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- **Elaboration uses:** VCAA, Victorian Curriculum F–10 Version 2.0, Science Levels 7 and 8, elaborations VC2S8H03.E01, VC2S8H03.E04, VC2S8H03.E05, VC2S8H03.E06, as recorded in S : \Files\projects\mcq-system\data\vc2_books\science_7-8.json (the operative authority file, D15). VC2S8H03.E02 and VC2S8H03.E03 are reserved under the ICIP decision and not used.
- The definition of *sustainable* used in 13D (World Commission on Environment and Development, *Our Common Future*, 1987) is carried over by reference where the word appears; this subtopic does not re-litigate it.

Teacher-facing note — reserved elaborations (not student text). VC2S8H03.E02 (Aboriginal and/or Torres Strait Islander Peoples’ knowledges in identifying medicinal properties of endemic plants, and the implications of others using these knowledges) and VC2S8H03.E03 (the implications of proposed scientific responses that build on Aboriginal and/or Torres Strait Islander Peoples’ land management techniques) are reserved under the ICIP decision (D10; CONTENT_POLICY rule 1): no Aboriginal or Torres Strait Islander content is delivered in this book, and those contexts are held back pending the community-authorisation pathway the TOC’s ICIP decision describes. All four lenses of this subtopic are accordingly exercised only on the general contexts of VC2S8H03.E01, .E04, .E05 and .E06. Teachers seeking the reserved contexts should refer to the TOC’s D10 decision and to whichever future book delivers them with authorisation; nothing in this subtopic assesses them.

Science communication and its consequences: how it shapes an individual viewpoint, a community policy and a regulation

Book: Science, Levels 7 and 8 (VC2) — one banded volume · **Chapter 18** — Use and influence of science · **Subtopic 18B**

CD: VC2S8H04 (whole CD; 18B is the sole owner). Full CD text (verbatim): “communication of scientific knowledge has a role in informing individual viewpoints, and community policies and regulations.”

Achievement-standard extract: “They analyse the importance of science communication in shaping viewpoints, policies and regulations.” **Elaboration ids drawn on:** VC2S8H04.E01–.E07 — a context bank, not a checklist (D12). **Maths interlock (D11):** percentages and simple whole-number calculations from earlier bands only. **Aboriginal and Torres Strait Islander content (D10):** VC2S8H04.E06 is delivered from named published sources only — the Gunaikurnai Land and Waters Aboriginal Corporation’s own pages and the *Victorian Traditional Owner Cultural Fire Strategy*. A teacher-facing note at the foot of this subtopic records what is and is not reproduced.

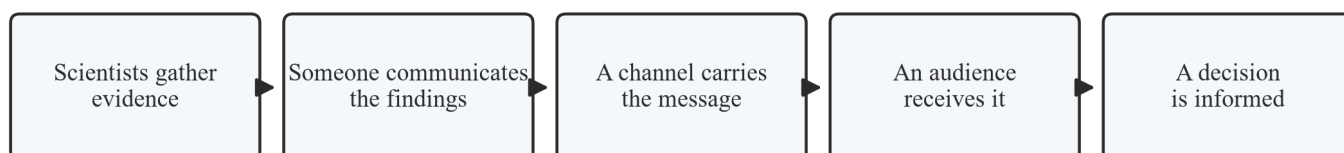
Theory

A scientific finding kept in a lab notebook changes nothing. The same finding, reported clearly, can change what one person buys, what a whole community agrees to do together, and even the law. This subtopic follows science on that journey — from the people who gather evidence to the decisions the evidence informs. One skill runs through the whole subtopic: **trace a piece of communicated science from its source to a decision, and judge whether the communication is strong enough to carry that decision.**

1. The communication chain and the three scales of decision

Every case in this subtopic is the same chain of five links (Figure 1).

The science communication chain



The same chain can end at three different scales of decision:



Example: what you choose about 'biodegradable' products



Example: kerbside bins and warning systems



Example: bag limits and banned plastic items

The science communication chain: evidence, message, channel, audience, decision, ending at three scales

The parts, defined:

Part	Meaning
Evidence	Observations and data gathered and checked by scientific methods.
Message	What someone says about the evidence — the claim and the reasons offered for it.

Part	Meaning
Channel	What carries the message: a label, a news story, a broadcast, a sign, a social media post, a campaign.
Audience	The people who receive the message.
Decision	What the audience then thinks, chooses or rules.

The chain can end at three different **scales of decision** (Figure 2). An **individual viewpoint** is what one person thinks or chooses. A **community policy** is what a community agrees to do together — a council service, a warning system, a community program. A **regulation** is a rule with legal force, made by government: breaking it can carry a penalty. These three scales are exactly the three named in VC2S8H04, and the same communicated science can act at more than one of them at once.

Three scales of decision, one skill

	Individual viewpoint	Community policy	Regulation
	what one person thinks or chooses	what a community agrees to do together	a rule with legal force, made by government
Case in this subtopic	'Biodegradable' claims and your choices (section 2)	Kerbside bins; fire danger ratings; DonateLife Week (section 3)	Duck bag limits; kingfish bag limit; banned single-use plastics (section 4)
Who decides	you	councils, agencies and community programs	government, through regulations
How science gets there	evidence reported in media, labels, campaigns	evidence turned into services and campaigns	evidence reviewed before the rule is set, and monitoring afterwards

Three scales of decision compared: individual viewpoint, community policy, regulation

To **analyse** — the verb the achievement standard uses — is to pull the chain apart: name the source, the message, the channel, the audience and the decision, and show how each link does its job. That is what every worked example and question in this subtopic asks you to do.

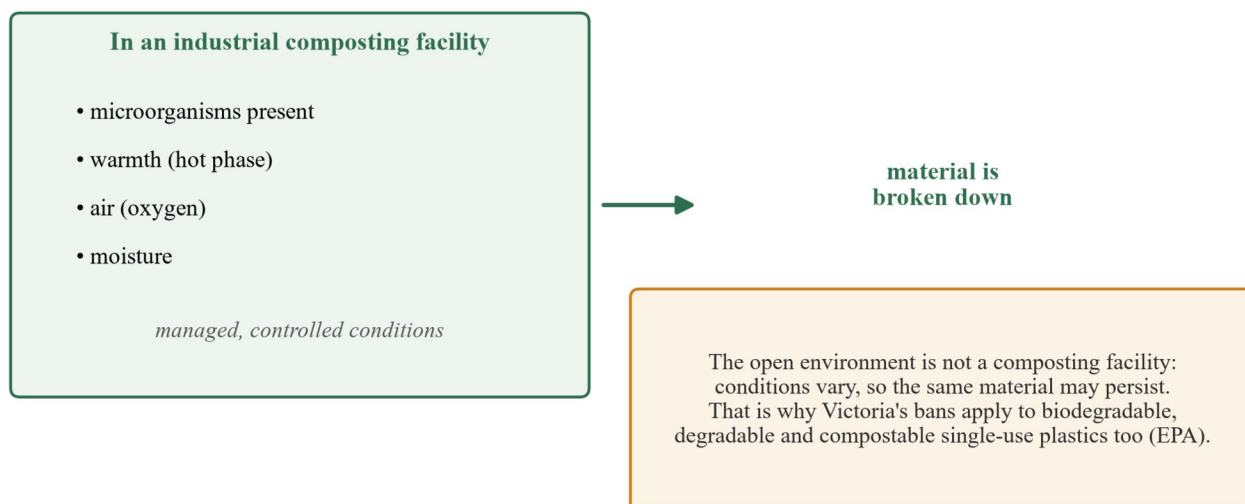
2. An individual viewpoint: what 'biodegradable' actually means

Stand in any supermarket and you will see labels saying **biodegradable** (VC2S8H04 . E05). Most readers take the everyday meaning: *breaks down in nature, so it is harmless*. That reading is honest — the word itself suggests it — and plenty of products are sold on exactly that feeling. This is the strongest version of the everyday view, and it deserves to be stated in full before it is tested.

Word watch — *biodegradable, a term with a set meaning*. In everyday talk, *biodegradable* means “breaks down in nature”. In this subtopic we follow EPA Victoria, the environment protection regulator, and treat it as a **set-meaning term**: a material is biodegradable only if micro-organisms (tiny living things such as bacteria) break it down into natural substances **under named conditions** — warmth, moisture, air and time [S7]. The test is not “does it break down somewhere, someday?” but “does it break down under the conditions in the standard?”

Figure 3 shows why the conditions do the real work. In an industrial composting facility the conditions are managed: micro-organisms are present, a hot phase runs, air and moisture are supplied. Under those conditions the material is broken down. The open environment is not a composting facility — conditions vary, so the same material may simply persist [S7].

'Biodegradable' means broken down by living things — under the right conditions



Composting phases and conditions after EPA Victoria, 'Industrial composting of organic waste'.

Biodegradable means broken down by living things under the right conditions, after EPA Victoria

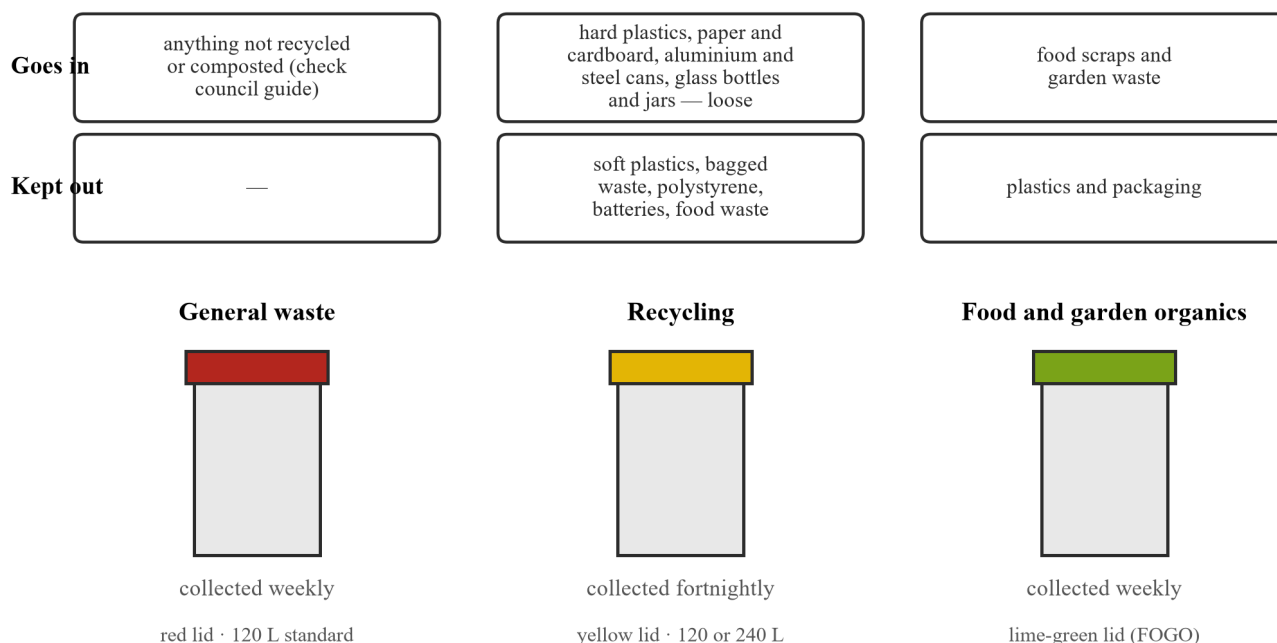
Now trace the consequence for an **individual viewpoint**. If you learn that a 'biodegradable' fork only breaks down under managed conditions, your view of the label changes, and so does your choice: the fork in the general waste bin going to landfill will not do what the label seems to promise (VC2S8H04.E05). The communication did its job only because it told you the *conditions*, not just the word. A label that leaves the conditions out shapes the viewpoint on weak evidence — the chain's message link is weak even when the science behind it is real.

The same point explains who you hear it from (VC2S8H04.E07). Science organisations communicate too, and the source is part of the chain. CSIRO describes itself as a leader in STEM education in Australia, providing evidence-based STEM education experiences [S18]; Museums Victoria supports schools and teachers with high-quality education experiences, resources and professional development [S19]. When the source is an organisation whose job is checking evidence, the message carries a weight an anonymous post does not — and when the source is a famous personality, the right move is not to dismiss them but to follow the chain one link back and ask what evidence, and what organisation, stands behind the message.

3. Community policy: bins, warnings and campaigns

Kerbside bins — separating waste is a policy (VC2S8H04.E03). Science communication about the impact of waste materials on the environment is the reason councils run colour-coded kerbside systems. EPA Victoria reports that single-use plastics make up a third of the litter seen in Victoria [S4], and its waste hierarchy ranks landfill as the *least* preferred option for waste [S6]. Figure 4 shows one worked example of the policy that follows: the City of Melbourne's three-bin system [S20].

Kerbside bins in the City of Melbourne — sorting waste is a community policy



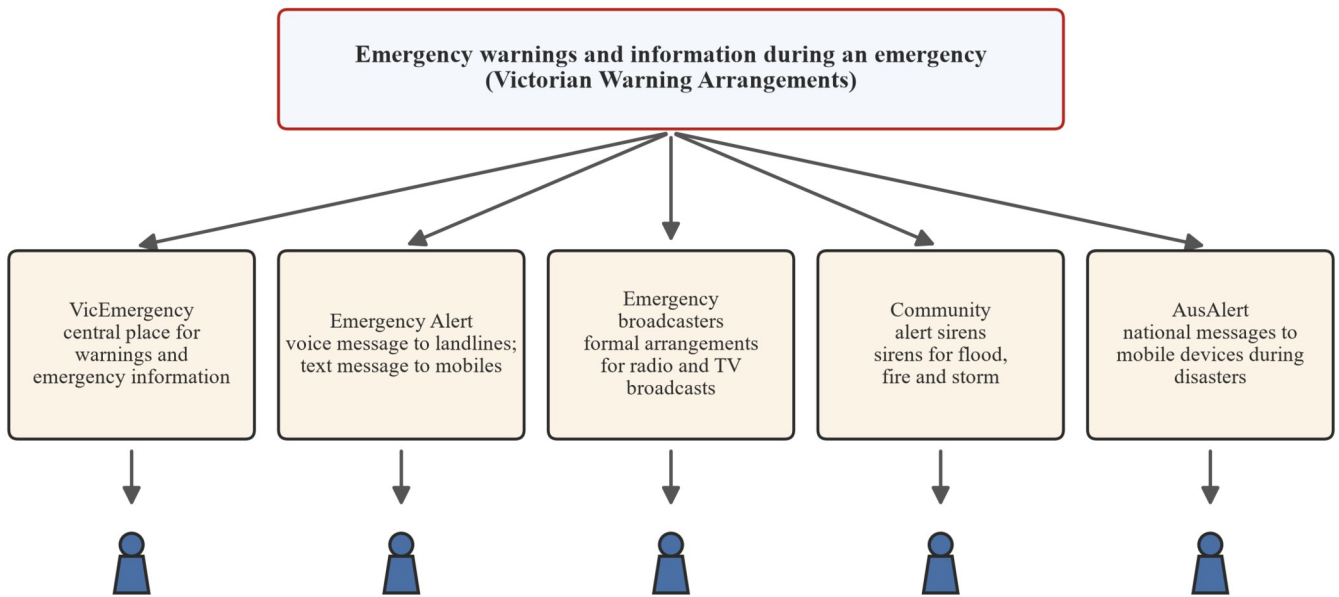
Bin colours, sizes, collection frequency and accepted items: City of Melbourne, 'Bins and collections'.
Other Victorian councils run similar colour-coded systems; local rules vary by council.

Kerbside bins in the City of Melbourne: lid colours, collection frequency, what goes in and stays out

Trace the chain: research on waste impacts (evidence) is reported by EPA and councils (message and channel), households sort their waste (audience acts), and the community policy works because both sides keep their half of the agreement — households sort, councils collect. Notice the “kept out” list: soft plastics, bagged waste, polystyrene, batteries and food waste do not belong in the recycling bin [S20]. A policy like this only works as a *community* policy; one person sorting perfectly while the neighbour bags everything achieves little. Other Victorian councils run similar colour-coded systems, with local differences, so the local council guide is always the final say.

Warnings — communicated science that tells a community when to act (VC2S8H04.E02). Reporting on high-impact weather and fire danger has led, over many years, to warning systems and evacuation policies. Victoria’s integrated warning system sends one message through many channels (Figure 5): the VicEmergency website and app, Emergency Alert (voice messages to landlines, text messages to mobiles), emergency broadcasters on radio and TV, community alert sirens for flood, fire and storm, and AusAlert for national messages to mobile devices [S13].

Victoria's integrated warning system — one message, many channels

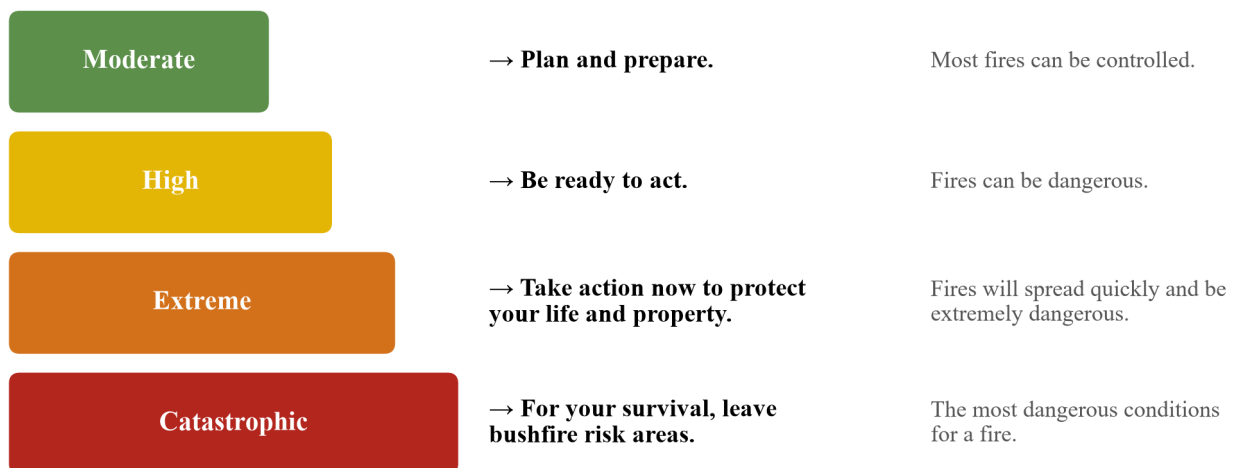


Channels listed by Emergency Management Victoria, 'Victoria's warning system'.

Victoria's integrated warning system: one message through five channels to the community

The fire danger rating is the clearest single message in the system. Australia uses one shared system, the Australian Fire Danger Rating System (AFDRS), with the same four levels nationwide (Figure 6). Ratings are forecast from Bureau of Meteorology data up to four days ahead, using weather and vegetation conditions [S14]; some days carry no rating at all, when fire is possible but not likely to threaten the community [S14].

The Australian Fire Danger Rating System — the same four levels across Australia



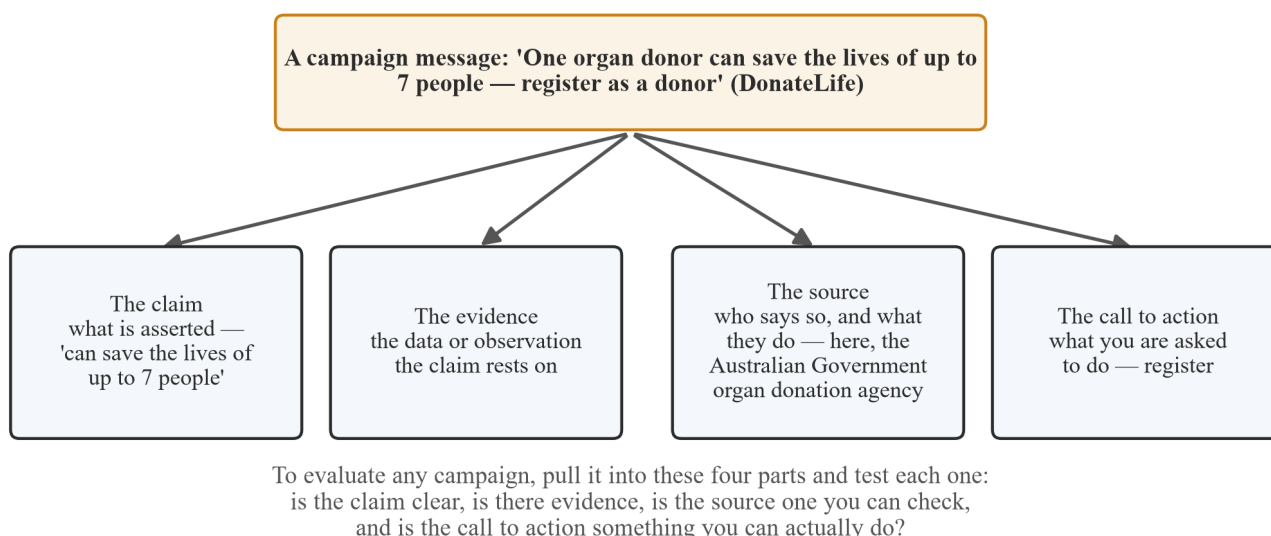
Some days carry no rating: fire is possible but not likely to threaten the community. Ratings are forecast from Bureau of Meteorology data up to four days ahead (CFA).

The Australian Fire Danger Rating System: four levels, the action each asks for, and what each means

Trace the chain: BOM data (evidence) becomes a rating (message), carried by broadcasts, apps and signs (channels), and the audience is asked to act on it — on an **Extreme** day, “take action now to protect your life and property”; on a **Catastrophic** day, “for your survival, leave bushfire risk areas” [S14]. Evacuation policies rest on exactly this communicated science: the decision to leave early is made *because* the rating was communicated, not because anyone can see a fire.

Campaigns — organised communication trying to move a viewpoint or a policy (VC2S8H04 .E04). A campaign is a chain built on purpose. DonateLife, the Australian Government organ donation organisation, runs the message “one organ donor can save the lives of up to 7 people — register as a donor”. Its published facts give the evidence link: one donor can save the lives of up to 7 people; families agree to donation in 8 out of 10 cases when the deceased person was a registered donor, but in only 4 out of 10 when they are unsure of the person’s decision; and donation rates in Australia have more than doubled in recent years [S16]. DonateLife Week (in 2026, Sunday 26 July to Sunday 2 August) is the channel that puts the message in front of an audience [S17], and the call to action is small and doable: register. Figure 7 pulls that message into the four parts every campaign claim has — the parts any campaign can be tested on.

Anatomy of a campaign claim



Anatomy of a campaign claim: the DonateLife message split into claim, evidence, source and call to action

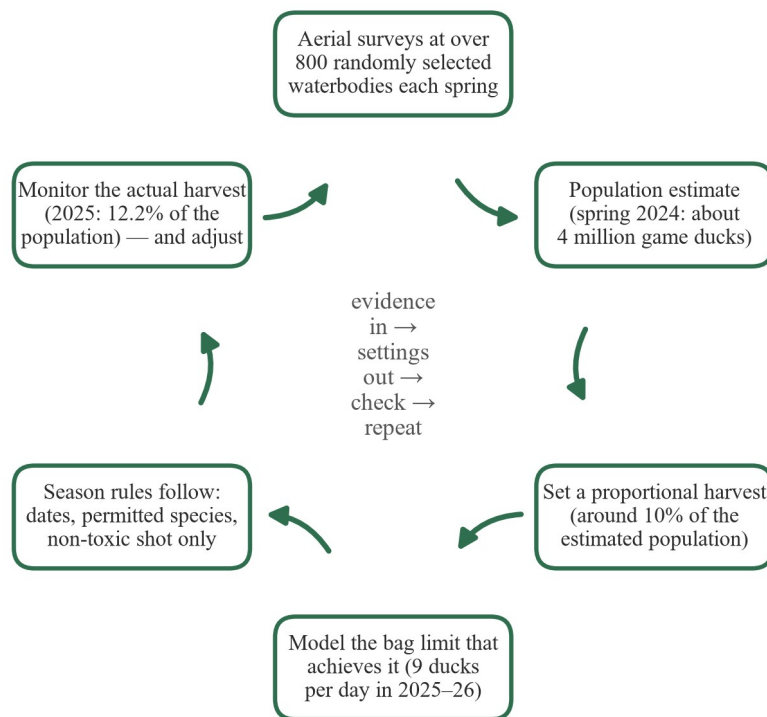
VC2S8H04 .E04 points to other campaigns of the same shape — recycling-rate campaigns, and long-running public debates such as nuclear power as an energy option, where communication pushes at policy rather than at a single purchase.

4. Regulation: when communicated science becomes a rule with legal force

A regulation differs from a policy: it has legal force. Two Victorian wildlife cases show how communication about species leads to fishing and hunting limits (VC2S8H04 .E01), and the plastics ban closes the loop from section 2.

Game ducks — adaptive harvest management. The Game Management Authority (GMA) sets Victoria’s game duck season through what it calls an evidence-based process of **adaptive harvest management**, or “learning by doing” [S8]. The loop is Figure 8.

Adaptive harvest management — 'learning by doing' (Game Management Authority)



The adaptive harvest management loop for Victorian game ducks: survey, estimate, set the share, model the bag limit, set season rules, monitor, adjust

The numbers for the 2025 season show the loop working [S8, S10]. Aerial surveys of over 800 randomly selected waterbodies each spring produced a population estimate of about 4 million game ducks in spring 2024. The GMA's target was a set share of that population — about 10 per cent — giving a quota of 400,500 birds, and modelling said a bag limit of 9 ducks per person per day would take about 10.4 per cent. The season rules then followed: the 2026 season opens at 8:00 am on Wednesday 18 March 2026 and closes 30 minutes after sunset on Monday 8 June 2026, with a daily bag limit of 9, seven permitted species (including Pacific Black Duck, Chestnut Teal and Wood Duck), Blue-winged Shoveler prohibited, and non-toxic shot only [S9]. The rules sit in regulations under Victoria's wildlife (game) law, remade in September 2024 [S9]. Finally the loop closes: the actual 2025 harvest came in at 12.2 per cent of the population, above the 10 per cent target, so the evidence goes back around the loop and the settings are reviewed — an independent expert panel's advice runs from 10 to 20 per cent [S8]. At every link, what matters is that the science is *communicated*: the GMA publishes the estimate, the quota and the reasoning, and hunters, and the public, can check the chain.

Kingfish — evidence and public feedback move a fishing rule. Victoria's recreational kingfish rules changed through the same shape of chain (Figure 9). A bag limit of 5 per person per day had run since 2001 and a minimum size limit of 60 cm since 2009. In 2024–25, tagging research on kingfish movement and growth, led by Deakin University with the Victorian Fisheries Authority (VFA) and partners, supplied new evidence. The VFA then asked the public for its views: 193 written submissions, 79 per cent supportive of the change, and a survey of 1023 people, 72 per cent supportive; four social media posts about the proposal reached more than 262,000 views [S11]. The proposed regulation follows: the bag limit reduced from 5 to 2 per person per day [S11]. (For comparison, species with no listed limit carry a default bag and possession limit of 5 [S12] — the rules are a published list, and the list moves when the evidence and the community's response move.)

How evidence and consultation moved a fishing rule — the kingfish bag limit



Victorian Fisheries Authority, 'Angler support confirms kingfish bag limit change'.

Timeline of the Victorian kingfish bag limit: 2001 rule, 2009 size limit, 2024-25 tagging research, 2025 consultation, proposed change

The plastics ban — section 2's viewpoint, scaled up to a regulation. On 1 February 2023 Victoria banned the supply of single-use plastics including straws, stirrers, cotton bud sticks, plates, cutlery and expanded polystyrene food and drink items; some further items joined the ban from 1 January 2026 [S4]. Handled plastic bags 35 μm (micrometres — millionths of a metre) thick or less were banned under the same law [S5]. Penalties show the legal force: over \$11,800 for a person operating a business and over \$59,000 for a body corporate [S4]. And notice the detail that ties the ban back to the Word watch in section 2: **the ban also applies to biodegradable, degradable and compostable plastics** [S4]. The regulator's reasoning is exactly the conditions argument — a product that only breaks down under managed conditions behaves like ordinary plastic when it is littered or landfilled, and single-use plastics make up a third of the litter seen [S4]. The chain is complete: evidence about waste impacts → communication → individual viewpoints (section 2) and community bin policies (section 3) → a regulation.

5. Enriching policy and regulation: cultural burning in Victoria

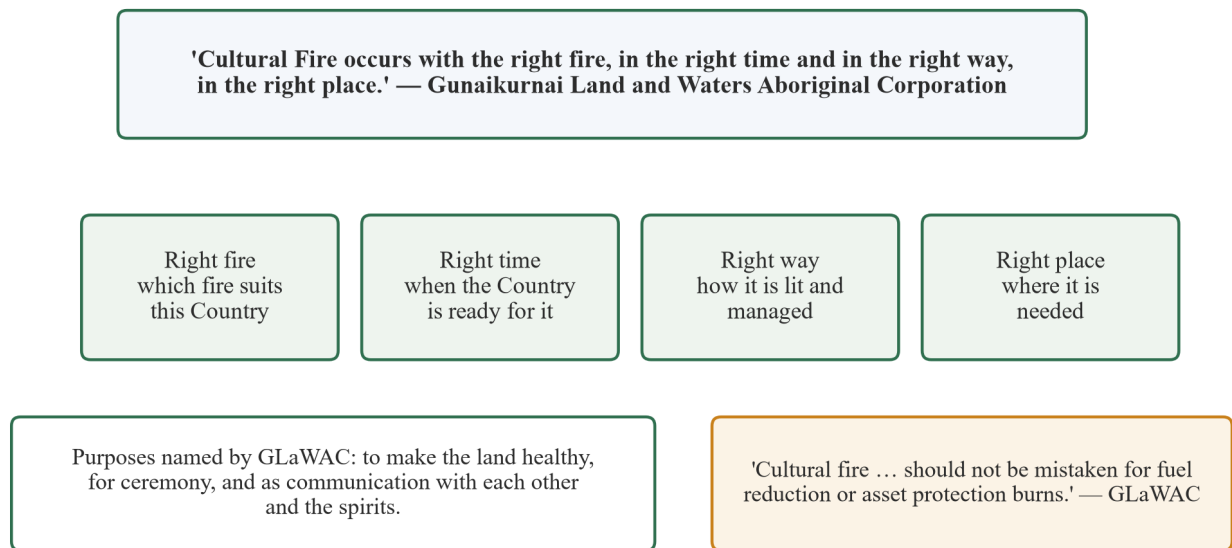
VC2S8H04.E06 asks how including Aboriginal and/or Torres Strait Islander Peoples' scientific knowledges can enrich policies and regulations, naming cultural burning practices informing planned burning in Victoria. This section quotes two named published sources: the Gunaikurnai Land and Waters Aboriginal Corporation (GLaWAC) and the *Victorian Traditional Owner Cultural Fire Strategy* [S1, S2]. The words below are quoted as published, with attribution; the cultural knowledge itself remains the cultural property of its Traditional Owner communities.

The Gunaikurnai are Traditional Owners of Country in eastern Victoria. Their connection was recognised in law in October 2010 through a Traditional Owner Recognition and Settlement Agreement, which granted Aboriginal Title over 14 national parks and reserves and established joint management of them with Parks Victoria [S3]. GLaWAC publishes its own account of **Cultural Fire**:

“Cultural Fire occurs with the right fire, in the right time and in the right way, in the right place. We use fire to make the land healthy, for ceremony and as a means for communication with each other and the spirits.” — GLaWAC [S1]

Figure 10 unpacks the four “rights” as GLaWAC frames them, together with two things GLaWAC says Cultural Fire is *for* (healthy Country, ceremony, communication) and *not to be mistaken for* (fuel reduction or asset protection burns) [S1].

Cultural burning on Gunaikurnai Country — the right fire



The Victorian Traditional Owner Cultural Fire Strategy adds: risk reduction can follow as a complementary outcome when culturally meaningful objectives are realised (Traditional Owner-led burning).

Cultural burning on Gunaikurnai Country: the right fire, time, way and place, quoted from GLaWAC

The *Victorian Traditional Owner Cultural Fire Strategy*, hosted by GLaWAC, defines Cultural Fire as fire put into the landscape on purpose, authorised and led by the Traditional Owners of that Country — for purposes including ceremony, protection of cultural and natural assets, fuel reduction, regeneration of food, fibre and medicine plants, fauna habitat protection and healing Country's spirit [S2]. Its first principle is "Right Fire, Right Time, Right Way and for the right (cultural) reasons according to Lore", and it states that reduced fire risk can follow as a *complementary outcome* when culturally meaningful objectives are realised [S2]. Elders and a Fire Knowledge Holder Group lead the work [S1].

Trace the consequence for policy (the elaboration's own example). Planned burning in Victoria has long been communicated and run mainly as fuel reduction. Taking Cultural Fire knowledge into the policy — as the Strategy describes, with Traditional Owner-led burning on Country — enriches it: the burns gain purposes beyond fuel (healthy Country, habitat, culture), risk reduction arrives as a complementary outcome, and the communication changes too, because the Strategy frames the fire as a means of communication "with each other and the spirits" [S1, S2]. The chain's decision link moves from a single-purpose rule to a richer policy — which is exactly what VC2S8H04.E06 means by *enrich*.

6. Evaluating any campaign: six questions

The skill of the subtopic, applied to any message, is Figure 11. In an exam you will not be marked for agreeing or disagreeing with a campaign; you will be marked for the reasoning steps — naming the claim, the evidence, the source, the channel, the audience and the decision scale, and saying whether each link is strong enough to carry the decision.

Evaluating a science communication campaign — six questions

1. What is the claim? State it in one sentence of your own.
2. What evidence is offered for it — and is it enough to carry the claim?
3. Who is the source, and what do they do? Could they check what they report?
4. Which channel carries the message (post, broadcast, sign, social media)?
5. Who is the audience, and what are they being asked to think, feel or do?
6. What changed, or could change, as a result: a viewpoint, a policy, or a regulation?

Marks in this book are awarded for the reasoning steps shown, not for agreeing with the campaign.

Six questions for evaluating a science communication campaign

Worked examples

Example 1 (scaffolded) — the duck quota, step by step (3 marks)

The GMA's 2025 target was a harvest of about 10 per cent of the estimated game duck population.

1. Write the spring 2024 population estimate [S8]. (1 mark)
2. Calculate 10 per cent of it. (1 mark)
3. The published quota was 400,500 birds. Compare it with your answer to step 2, and name the scale of decision a quota belongs to. (1 mark)

Model answer. 1. About 4,000,000 game ducks. 2. 10% of 4,000,000 = 400,000 birds. 3. The published quota is 400,500 — 500 above the clean 10 per cent calculation, because the published number comes from the GMA's harvest model (the modelled 9-per-day bag limit, about 10.4 per cent) rather than from simple rounding; a quota is a **regulation** — a rule with legal force, made by government.

Example 2 (scaffolded) — anatomy of the EPA litter claim (3 marks)

EPA Victoria reports that single-use plastics make up a third of the litter seen in Victoria [S4]. Pull the message into chain parts.

1. State the claim in one sentence of your own. (1 mark)
2. Name the source and say why that source can check what it reports. (1 mark)
3. Name one decision at each of two different scales that this message can inform. (1 mark)

Model answer. 1. About one in three pieces of litter seen in Victoria is a single-use plastic item. 2. The source is EPA Victoria, the state environment protection regulator — it runs the monitoring and enforces the law, so it can check its own claim. 3. Individual viewpoint: I choose reusables over single-use items; community policy: my council runs waste-avoidance programs; regulation: the single-use plastics ban (any two scales with a sensible decision).

Example 3 (unscaffolded) — an Extreme Saturday (3 marks)

The forecast rating for your district this Saturday is **Extreme**. Your family had planned a camping trip in a bushfire risk area that day. Using Figure 6, state the action the rating asks for, the decision you would argue for at the kitchen table, and the organisation whose data the ratings are forecast from.

Model answer. The Extreme action is “take action now to protect your life and property” — fires will spread quickly and be extremely dangerous (1). A sensible decision is to cancel or move the camp rather than travel into a bushfire risk area on that day, because the rating means any fire that starts will be very hard to control (1). Ratings are forecast from Bureau of Meteorology data, up to four days ahead (1).

Example 4 (unscaffolded) — why DonateLife wants registration, not just goodwill (3 marks)

DonateLife reports that families agree to donation in 8 out of 10 cases when the deceased person was a registered donor, but in only 4 out of 10 when they are unsure of the person’s decision [S16].

- Write each figure as a percentage.
- In two or three sentences, explain why registration changes the family’s decision at a very hard moment.
- Name the scale of decision the family is making, and the scale the register itself belongs to.

Model answer. a) 8 in 10 = 80%; 4 in 10 = 40% (1). b) At the moment of loss, an unsure family must guess what the person wanted, and guesswork fails half-again as often; a registration is the person’s own communicated decision, so the family can honour it instead of guessing (1). c) The family’s consent is an individual viewpoint/decision; the register and the donation system it feeds are a community policy (a national program) (1).

Practice questions

Scaffolded

Q1 (2 marks). List the five links of the communication chain in order, from evidence to decision.

Q2 (2 marks). In your own words, define (a) community policy and (b) regulation.

Q3 (2 marks). Using Figure 4: which kerbside bin takes (a) a glass jar, and (b) food scraps?

Q4 (2 marks). Figure 6 gives four ratings. Match each action to its rating: (i) “be ready to act”; (ii) “for your survival, leave bushfire risk areas”; (iii) “plan and prepare”; (iv) “take action now to protect your life and property”.

Q5 (2 marks). From Figure 3, name two conditions an industrial composting facility supplies that the open environment does not reliably supply.

Q6 (2 marks). Calculate 10 per cent of 4,000,000 and state the published 2025 game duck quota [S8].

Unscaffolded

Q7 (3 marks). A product label says “compostable”. Using the idea of a term with a set meaning, explain the extra question you would ask before trusting the claim, and why the open environment is not a good test of it.

Q8 (3 marks). Figure 9: identify two pieces of *evidence or public feedback* the VFA used before proposing the new kingfish bag limit, and state precisely what would change in the regulation.

Q9 (3 marks). Victoria’s warning system sends one message through many channels. Name two channels from Figure 5 and, for each, say what kind of audience it reaches in an emergency.

Q10 (3 marks). Explain the difference between an **Extreme** and a **Catastrophic** rating, in terms of (a) what the rating means and (b) the action it asks for — and say why evacuation policies depend on the rating being communicated *before* anyone sees a fire.

Q11 (3 marks). Using the 80 per cent and 40 per cent family-consent figures [S16], explain why DonateLife Week urges people to register now rather than leaving the decision to families later.

Q12 (3 marks). GLaWAC says Cultural Fire “should not be mistaken for fuel reduction or asset protection burns” [S1]. Name one purpose of Cultural Fire that GLaWAC gives, and name the outcome the Strategy calls a *complementary outcome* [S2].

Q13 (3 marks). The 2025 game duck harvest was 12.2 per cent of the population against a 10 per cent target [S8]. Describe what the adaptive harvest management loop does with that number next, and explain why the GMA’s phrase “learning by doing” fits.

Q14 (3 marks). Choose one communicated message from this subtopic (any figure or case). Run it through two of the six questions in Figure 11 and give a reasoned judgement of those two links.

Answers

Q1. Evidence → message → channel → audience → decision. **Q2.** (a) What a community agrees to do together (a council service, a warning system, a program). (b) A rule with legal force, made by government. **Q3.** (a) The yellow-lid recycling bin (glass bottles and jars, loose). (b) The lime-green FOGO bin. **Q4.** (i) High. (ii) Catastrophic. (iii) Moderate. (iv) Extreme. **Q5.** Any two of: micro-organisms managed in, warmth (a hot phase), air (oxygen), moisture — managed, controlled conditions. **Q6.** 400,000; the published quota was 400,500 birds. **Q7.** Ask *under what conditions* it breaks down (which facility, what heat, what time) — a set-meaning term is only as good as its conditions; the open environment varies in heat, air and moisture, so a product that breaks down in a facility may persist as litter. **Q8.** Evidence: the 2024–25 tagging research on movement and growth (Deakin University, VFA and partners); public feedback: 193 submissions (79% supportive) and the survey of 1023 people (72% supportive). Change: bag limit reduced from 5 to 2 kingfish per person per day. **Q9.** Any two with a sensible audience, e.g. Emergency Alert — voice to landlines, text to mobiles, reaching people in a named area even at night; emergency broadcasters — radio/TV listeners and viewers during an event; community sirens — people nearby outdoors; VicEmergency — anyone checking online; AusAlert — mobile devices nationally. **Q10.** (a) Extreme: fires will spread quickly and be extremely dangerous; Catastrophic: the most dangerous conditions for a fire. (b) Extreme: take action now to protect your life and property; Catastrophic: for your survival, leave bushfire risk areas. Evacuation policies depend on the communicated rating because the decision to leave early must be made before fire is visible. **Q11.** Registration is the person's own communicated decision; unsure families must guess, and consent drops from 80% to 40% — registering now roughly doubles the chance the person's wish is honoured. **Q12.** Purpose (any one from GLaWAC): to make the land healthy; for ceremony; as communication with each other and the spirits. Complementary outcome: reduced fire risk (risk reduction). **Q13.** The 12.2% figure is fed back into the loop: the estimate, target and bag limit are reviewed and adjusted before the next season (with the expert panel's 10–20% range in view). “Learning by doing” fits because each season's monitored result becomes the next season's evidence. **Q14.** Any two checklist questions applied to a real message from the subtopic, with a reasoned judgement (e.g. the EPA litter claim: claim clear — one in three litter items is single-use plastic; source checkable — EPA runs the monitoring).

Fully-worked solutions

Q1 (2 marks). Scientists gather **evidence** (1); someone communicates a **message**, a **channel** carries it to an **audience**, and a **decision** is informed — the remaining four links in order (1).

Q2 (2 marks). (a) A community policy is what a community agrees to do together — a shared service or program such as kerbside bins (1). (b) A regulation is a rule with legal force made by government; breaking it can carry a penalty (1).

Q3 (2 marks). (a) Glass bottles and jars go in the **yellow-lid recycling bin**, loose (1). (b) Food scraps go in the **lime-green FOGO bin** (food and garden waste) (1).

Q4 (2 marks). (i) High; (ii) Catastrophic (1 for both). (iii) Moderate; (iv) Extreme (1 for both).

Q5 (2 marks). One mark per named condition, e.g. a managed **hot phase** (**warmth**) and supplied **air** (**oxygen**) — the facility controls conditions the open environment only sometimes has (1+1).

Q6 (2 marks). $10\% \times 4,000,000 = 400,000$ (1). Published 2025 quota: **400,500 birds** (1).

Q7 (3 marks). The extra question: *under what conditions* does it break down — which facility, what heat, air, moisture and time (1). Reason: ‘compostable’/‘biodegradable’ are set-meaning terms, so the claim is only true under the named conditions (1). The open environment varies in those conditions, so the item may persist as litter instead of breaking down (1).

Q8 (3 marks). Evidence link: tagging research on kingfish movement and growth, led by Deakin University with the VFA (1). Feedback link: consultation — 193 submissions, 79% supportive, and a survey of 1023 people, 72% supportive (1). Regulation change: the bag limit would drop from 5 to 2 per person per day (1).

Q9 (3 marks). One mark per channel with a matching audience, e.g. **Emergency Alert**: voice messages to landlines and texts to mobiles — reaches households in a defined area, including people not watching news (1+1). **Emergency**

broadcasters: radio and TV under formal arrangements — reaches people already tuned in during an emergency (1). (VicEmergency, sirens and AusAlert also acceptable with a sensible audience.)

Q10 (3 marks). (a) Meaning: Extreme — fires will spread quickly and be extremely dangerous; Catastrophic — the most dangerous conditions for a fire (1). (b) Action: Extreme — take action now to protect your life and property; Catastrophic — for your survival, leave bushfire risk areas (1). Evacuation point: the rating is forecast (from BOM data, up to four days ahead) so people can leave *before* a fire starts or is visible; waiting for visible fire removes the early-leaving window (1).

Q11 (3 marks). Registered donor: families consent in 80% of cases; unsure: 40% (1). At a very hard moment, an unsure family must guess the person's wish, and the figures show that guess fails far more often (1). So registering communicates your decision in advance and roughly doubles the chance it is honoured — that is the campaign's evidence link and its call to action (1).

Q12 (3 marks). One GLaWAC purpose: to make the land healthy / for ceremony / as communication with each other and the spirits (1). Not to be mistaken for fuel reduction or asset protection burns — the purposes are cultural first (1). The Strategy's complementary outcome: reduced fire risk when culturally meaningful objectives are realised (1).

Q13 (3 marks). The monitored 12.2% result is fed back around the loop — the estimate, the 10% target share and the modelled bag limit are reviewed and adjusted before the next season, with the expert panel's 10–20% advice in view (2). “Learning by doing” fits because the regulation is not fixed once: each season's monitored outcome becomes the next season's evidence (1).

Q14 (3 marks). One mark per checklist question genuinely applied to a named message, plus one for a reasoned judgement. Model: message — the CFA's Extreme rating. Q1 (claim): “conditions this day make fires extremely dangerous; act now” — clear and one-sentence-able (1). Q3 (source): the CFA, forecasting from BOM data — a source that can check what it reports (1). Judgement: both links are strong, so the message can carry a life-sized decision like leaving early (1).

Sources

All retrieved 2026-08-21. Where a page shows its own update or review date, that date is noted in the line.

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- [S4] EPA Victoria, “Single-use plastics”, 2025. epa.vic.gov.au — retrieved 2026-08-21.
- [S5] EPA Victoria, “Plastic bags”, 2025. epa.vic.gov.au — retrieved 2026-08-21.
- [S6] EPA Victoria, “Waste”, 2025. epa.vic.gov.au — retrieved 2026-08-21.
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- [S12] Victorian Fisheries Authority, “Catch limits and closed seasons”, 2026. vfa.vic.gov.au — retrieved 2026-08-21.
- [S13] Emergency Management Victoria, “Victoria's warning system”, 2026. emv.vic.gov.au — retrieved 2026-08-21.

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- [S18] CSIRO, “Education”, n.d. csiro.au — retrieved 2026-08-21.
- [S19] Museums Victoria, “Education”, n.d. museumsvictoria.com.au — retrieved 2026-08-21.
- [S20] City of Melbourne, “Bins and collections”, n.d. melbourne.vic.gov.au — retrieved 2026-08-21.
- [S21] CSIRO, “Indigenous Cultural and Intellectual Property Principles”, n.d. csiro.au — retrieved 2026-08-21.
- **Elaboration uses:** VCAA, Victorian Curriculum F–10 Version 2.0, Science Levels 7 and 8, elaborations VC2S8H04.E01–VC2S8H04.E07, as recorded in S:\Files\projects\mcq-system\data\vc2_books\science_7-8.json (the operative authority file, D15).

Teacher-facing note — E06 delivery under D10/ICIP (not student text). The student text of section 5 quotes only what two named published sources publish for general readers: GLaWAC’s own “Cultural Fire” and “Joint Management” pages, and the *Victorian Traditional Owner Cultural Fire Strategy* PDF that GLaWAC hosts. The four “rights”, the named purposes and the “complementary outcome” phrasing are all quoted as published, with attribution; no ceremony, lore, ecological technique or seasonal knowledge is reproduced, described or generalised beyond those published words, and no other Peoples or Countries are named or invented. Per CSIRO’s Indigenous Cultural and Intellectual Property principles [S21], cultural fire knowledge remains the cultural property of its Traditional Owner communities; the quoted material carries the sources’ own authority and conditions of use. Teachers seeking to go deeper should contact the relevant Traditional Owner corporations directly rather than extending this text.

Test A

Topic test T8 — Science in society Science 7–8 · Victorian Curriculum 2.0 · Levels 7 and 8

This is a school-designed paper. It is not a VCAA instrument and it is not a VCAA examination. Levels 7 and 8 carry no VCAA examination and no external assessment; achievement at Levels 7 and 8 is reported against the Victorian Curriculum 2.0 achievement standard on teacher judgement, and the marks here are one source of evidence towards that judgement.

About this test

- **Total: 25 marks** — Test A (5 multiple-choice marks) and Test B (20 marks of short and structured response, including one 8-mark issue analysis). Answer all questions.
- **Suggested time: 35 minutes.** This test is untimed: students may take as long as they need to finish it.
- **No calculator is required.** Nothing on this paper needs one. No formula sheet. No reading time.
- **Reading support is available.** The plan specifies no special reading support for this task, so students may use the reading support their classroom normally provides — for example, a teacher reading a question aloud. Reading is not being tested.
- The paper covers Topic 8 — Science in society: Chapter 18, subtopic 18A (Socio-scientific issues: taking a proposed scientific response and weighing its ethical, environmental, social and economic considerations) and subtopic 18B (Science communication and its consequences: how it shapes an individual viewpoint, a community policy and a regulation).
- **8 of the 25 marks on this paper are inquiry-strand marks** — Question 8 (VC2S8I07) and Question 9 (VC2S8I08) — above the required minimum of 5 inquiry-strand marks per topic test (D7). Chapter 18 carries no practical work, so the inquiry marks attach to the evaluating and communicating skills the chapter's cases revisit from Chapters 5 and 6.

What this paper assesses

proposed scientific responses to socio-scientific issues impact on society and may involve ethical, environmental, social and economic considerations — VC2S8H03

communication of scientific knowledge has a role in informing individual viewpoints, and community policies and regulations — VC2S8H04

Answer all five questions. Choose A, B, C or D. Each question is worth 1 mark.

Q1. Lab-grown meat could reduce which environmental impact? (1 mark)

A. Use of fertilisers in crop production B. Land and water use for livestock C. Plastic packaging in supermarkets D. Demand for fresh vegetables

Q2. Which is a potential ECONOMIC implication of lab-grown meat? (1 mark)

A. Reduced demand for veterinary services in rural areas B. Increased need for specialised refrigerated transport C. Lower prices for animal feed grains D. Disruption to traditional livestock industries and rural jobs

Q3. Scientific data on declining fish stocks has commonly led to: (1 mark)

A. Catch limits and fishing quotas B. Removal of all fishing restrictions C. Bans on all forms of aquaculture D. Government subsidies for larger fishing fleets

Q4. A government issues a ban on hunting a species. The most likely scientific input was: (1 mark)

A. Tourism reports B. Sport-shooting numbers C. Population data showing the species is endangered D. Random sampling

Q5. Why is clear science communication essential before introducing wildlife regulations? (1 mark)

A. It allows regulators to skip the scientific review process B. Public support and compliance depend on understanding the rationale C. It guarantees every citizen will agree with the regulation D. It removes the need to enforce the new rules

Test B

This paper is a school instrument of this book's own design, not a VCAA examination, and its completion is untimed.

Answer all four questions. Write your answers in full sentences where a question asks you to explain or discuss. There is no calculation on this paper.

The questions are worth 20 marks in total:

Question	Assesses	Marks
6	Issue analysis: cultured meat weighed through the four lenses (VC2S8H03)	8
7	The kingfish rule change traced along the communication chain (VC2S8H04)	4
8	Inquiry: evaluating a claim about 'compostable' cups (VC2S8I07)	4
9	Inquiry: choosing a format to communicate fire danger ratings to two audiences (VC2S8I08)	4
	Total	20

Q6. Meat grown from animal cells is now real. The first burger made this way was shown in London in 2013 and cost more than US\$325 000 to produce. In 2020 the first cultured-meat product was approved for sale, in Singapore. By comparison, producing one kilogram of beef takes about 15 415 L of water on the global average, and raising livestock takes up vast areas of land for grazing and feed crops. A food company proposes that some of the meat sold in Australia be replaced with **cultured meat** — meat grown from animal cells in a **bioreactor**, a warm, controlled tank where the cells multiply into tissue. (8 marks)

Source: Wikipedia, "Cultured meat", 2026, en.wikipedia.org — retrieved 2026-08-21.

Source: Wikipedia, "Water footprint", 2026, en.wikipedia.org — retrieved 2026-08-21.

Weigh the proposal through the four lenses of subtopic 18A.

- State what makes this a socio-scientific issue rather than a purely scientific question. (1 mark)
- Identify two stakeholders — people, groups or living things with a stake in how this is decided. (1 mark)
- Give one consideration under each of the four lenses — ethical, environmental, social and economic. Each consideration may be *for* or *against* the proposal, and must be stated at its strongest. (4 marks)
- Name one tension — a place where two of your lenses pull in different directions. (1 mark)
- Take a position on the proposal. Your position must carry an *if* or an *unless*. (1 mark)

Q7. Victoria's recreational fishing rules for kingfish are changing through the communication chain taught in subtopic 18B. A bag limit of 5 kingfish per person per day had run since 2001. In 2024–25, tagging research on kingfish movement and growth, led by Deakin University with the Victorian Fisheries Authority (VFA) and partners, supplied new evidence. The VFA then asked the public for its views: it received 193 written submissions, 79 per cent supportive of the change, and surveyed 1 023 people, 72 per cent supportive; four social media posts about the proposal reached more than 262 000 views. The proposed regulation reduces the bag limit from 5 to 2 kingfish per person per day. (4 marks)

Source: Victorian Fisheries Authority, "Proposed changes to kingfish regulations", 2025, vfa.vic.gov.au — retrieved 2026-08-21.

- (a) State (i) the evidence link and (ii) the decision link of this chain. (1 mark)
- (b) The bag limit is a regulation, not a community policy. State what makes a regulation different from a community policy. (1 mark)
- (c) State one channel the VFA used to reach its audience during the consultation. (1 mark)
- (d) A scientific finding kept in a lab notebook changes nothing. Explain why communicating the evidence and the reasoning mattered for this rule change — what did the communication make possible? (1 mark)

Q8. SCENARIO — *invented for skills practice*. An online advertisement for a brand of disposable cup reads: “Our cups are 100% compostable — kind to the planet. No guilt — just throw them away. They will break down on their own and do no harm.” The ad has no author named and no date. (4 marks)

In this book, **compostable** and **biodegradable** are terms with a set meaning: the material breaks down only under the right conditions — warmth, moisture, air and time — such as the conditions managed in an industrial composting facility.

Source: EPA Victoria, “Industrial composting”, 2025, epa.vic.gov.au — retrieved 2026-08-21.

- (a) State the claim the advertisement makes, in one sentence of your own. (1 mark)
- (b) Identify what the advertisement leaves out about the term *compostable*, and explain why that matters for a cup thrown away in the open environment. (2 marks)
- (c) The advertisement is the message of a seller with a product to move; EPA Victoria is the environment protection regulator. State which of the two you would trust more for information about where compostable cups actually break down, and give one reason. (1 mark)

Q9. Victoria’s fire danger ratings are forecast from Bureau of Meteorology data and communicated through many channels. On a **Catastrophic** day, the action is: “*for your survival, leave bushfire risk areas.*” The Country Fire Authority (CFA) wants two audiences to know what to do on a Catastrophic day: (4 marks)

- **Audience 1:** households living in bushfire-prone areas of Victoria.
- **Audience 2:** overseas tourists visiting Victoria for the first time, who have never seen a fire danger rating before.

Source: Country Fire Authority, “About fire danger ratings”, 2025, cfa.vic.gov.au — retrieved 2026-08-21.

- (a) Choose a presentation format or channel for Audience 1 and explain why it fits that audience. (2 marks)
- (b) Choose a presentation format or channel for Audience 2 and explain why it fits that audience. (2 marks)

Marking guide

For the classroom teacher. This paper is a school instrument of this book's own design, not a VCAA examination; the marks are one source of evidence towards the on-balance judgement against the Levels 7 and 8 achievement standard. Mark every part as set out below. Accept any response that carries the same idea in different words; spelling and handwriting do not lose marks. There are no half-marks: each mark point is either earned or not earned. For Question 6, marks are awarded for the quality of the reasoning, not for the conclusion reached — that is subtopic 18A's own rule, and it binds the marking.

Where the multiple-choice items come from. The band's question bank

(mcq-system/data/output/questions/L7-8_Science.csv) holds six items keyed to each of VC2S8H03 and VC2S8H04, at those codes' E01 and E02 elaborations. Test A draws five items from that bank — two from VC2S8H03 (Q1 and Q2, both at VC2S8H03.E01) and three from VC2S8H04 (Q3, Q4 and Q5, all at VC2S8H04.E01). The bank supplied an item at the right difficulty for every slot, so no new item was authored against either code for this paper. The bank stores every item with its correct option in position A; the option texts are printed unchanged but redistributed across the letters so that the key is not uniform, and the answer letters below are the letters as printed on the paper. No vocabulary repair was needed — all five items pass the band's word-level gate at the Year 8 ceiling as printed. Difficulty mix: two easy (D1), two medium (D2), one hard (D3). No item draws on a code from any other band or topic; the only codes used are the two above. The bank's items at VC2S8H03.E02 sit on a First Nations elaboration reserved under CONTENT_POLICY Rule 1 and are not drawn on; the bank's three VC2S8H04.E02 items (warning systems) are also not drawn on for Test A, because that context is assessed as the inquiry item Q9 in Test B instead.

Multiple-choice answers (5 marks)

Q	Answer	As printed	Source
1	B	Land and water use for livestock	Bank item VC2S8H03.E01.S01.D 1.V01 (options reordered)
2	D	Disruption to traditional livestock industries and rural jobs	Bank item VC2S8H03.E01.S01.D 2.V01 (options reordered)
3	A	Catch limits and fishing quotas	Bank item VC2S8H04.E01.S01.D 1.V01 (options reordered)
4	C	Population data showing the species is endangered	Bank item VC2S8H04.E01.S01.D 2.V01 (options reordered)
5	B	Public support and compliance depend on understanding the rationale	Bank item VC2S8H04.E01.S01.D 3.V01 (options reordered)

Each correct answer earns 1 mark. There is no working required for Test A and no part-credit.

Short and structured response — marking (20 marks)

Q6 (8 marks · 18A · VC2S8H03)

- (a) (1 mark) Science can inform the question but cannot, on its own, answer it: the testable parts (do the cells multiply, is the product safe?) are science, but whether a society replaces livestock meat reaches into people's

jobs, values and choices, which no laboratory can measure. Accept any version that separates the evidence part from the values/people part.

- (b) (1 mark) Any two of: farmers and livestock producers; farming towns; shoppers and consumers; animals; the environment; abattoir workers; food companies; regulators. One mark for two named stakeholders; do not award the mark for one.
- (c) (4 marks) One consideration under each lens, one mark each, stated at full strength and sitting under the right lens — a consideration filed under the wrong lens earns no mark. Accept, from 18A's Case 1:
- ethical — no animals need to be slaughtered (for); people disagree about whether it is right to eat meat grown in a tank, and both views must be heard (against);
 - environmental — could use far less land and water than raising cattle, lightening the load on ecosystems (for); bioreactors need large amounts of energy, so the gain depends on where that energy comes from (against);
 - social — could help feed growing cities (for); jobs and towns that depend on livestock could lose their main income, and shoppers may simply reject the product (against);
 - economic — the cost is falling (for); scaling up is still costly, and livestock incomes could fall (against).

A consideration may run in either direction; what is marked is the fit to the lens and the strength of the statement.

- (d) (1 mark) Any named tension between two of the student's own lenses, for example: the environmental gain (less land and water) against the social harm (farming towns lose income); the ethical gain (no slaughter) against the economic harm (livestock incomes fall). The tension must connect two lenses; a single-lens drawback is not a tension.
- (e) (1 mark) Any position carrying an *if* or an *unless*, for example: support, if the product is shown to be safe and is labelled honestly; oppose the replacement, unless farming towns get support to change. A bare "yes" or "no" without a condition earns no mark. A position opposite to the marker's own view loses no marks if the condition is there.

Q7 (4 marks · 18B · VC2S8H04)

- (a) (1 mark) (i) The evidence link is the 2024–25 tagging research on kingfish movement and growth, led by Deakin University with the VFA and partners. (ii) The decision link is the proposed rule change — the bag limit drops from 5 to 2 kingfish per person per day. Both halves are needed for the mark.
- (b) (1 mark) A regulation is a rule with legal force, made by government — breaking it can carry a penalty; a community policy is what a community agrees to do together. Accept any version that names legal force, government or penalty as the difference.
- (c) (1 mark) Any one channel named in the stimulus: social media posts; the written-submission process; the public survey. Accept "the VFA's public consultation" only if the student ties it to one of these channels.
- (d) (1 mark) Publishing the evidence and the reasoning let the audience see the chain and respond to it — 193 submissions and a survey of 1 023 people came back because the proposal was communicated, and the regulation is being shaped by the science and the community's response together; a finding kept private would have changed nothing. Accept any response that says the communication made the evidence checkable and let it inform the decision.

Q8 (4 marks · inquiry · VC2S8I07)

- (a) (1 mark) The claim, in the student's own words: the cups are compostable and kind to the planet, so throwing them away does no harm — they will break down on their own. The sentence must carry the "break down on their own after being thrown away" part, not just "the cups are compostable".
- (b) (2 marks) What is left out: the conditions the term needs — warmth, moisture, air and time, such as those managed in an industrial composting facility (1 mark). Why it matters: the open environment does not reliably supply those conditions, so a cup thrown away there may persist as litter instead of breaking down (1 mark). Accept "landfill" as the named destination where the cup persists, provided the conditions point is made.
- (c) (1 mark) EPA Victoria — because it is the environment protection regulator whose job is checking such claims (expert, independent, checkable), while the seller has a product to move and gains from the claim.

Accept any reason tied to credibility: expertise, independence, dated and checkable information, no gain from one answer.

Q9 (4 marks · inquiry · VC2S8I08)

- (a) (2 marks) 1 mark for a format or channel that fits households in bushfire-prone areas — accept: Emergency Alert text messages to mobiles in the affected area; the VicEmergency app or website; local radio and TV broadcasts; a letter or brochure with a household fire plan; a poster at the local CFA brigade. 1 mark for a reason tied to that audience — accept: they live there, so a message that reaches the whole household before a fire starts fits; they can make a plan in advance and act on it; they are reachable through local channels they already use. The reason must be about the audience, not just “it is clear”.
- (b) (2 marks) 1 mark for a format or channel that fits first-time overseas tourists — accept: simple picture-based signs at airports and visitor information centres; a short video with subtitles in several languages; a simple one-page card with pictures at hotel receptions; the VicEmergency app promoted at tourist points. 1 mark for a reason tied to that audience — accept: first-time visitors have never seen a rating, so pictures and simple words carry the meaning; language may be a barrier, so visuals and translation fit; tourists are not on local networks, so the message must meet them where they arrive. The reason must be about the audience, not just “it looks professional”.

Section B subtotal: 20 marks.

Data provenance and sources. Every multiple-choice item is drawn from the MCQ bank keyed to VC2S8H03 and VC2S8H04 and printed with stem and option texts unchanged (option order redistributed — see the Section A note); the bank item ids above keep the §4 join. The real data on this paper are Q6’s cultured-meat figures (first burger shown in London in 2013, more than US\$325 000 to produce; first approval for sale in Singapore in 2020; about 15 415 L of water per kilogram of beef on the global average), Q7’s kingfish consultation figures (193 submissions at 79 per cent supportive; a survey of 1 023 people at 72 per cent supportive; more than 262 000 views; bag limit from 5 to 2), Q8’s set-meaning conditions for compostable materials and Q9’s Catastographic rating action, each with its source line printed in the paper (retrieved 2026-08-21). The advertisement in Q8 is **simulated data for practice**, labelled as such wherever it appears. Elaboration contexts drawn on: VC2S8H03 . E01 (cultured meat), VC2S8H04 . E01 (fishing and hunting limits), VC2S8H04 . E02 (warning systems and evacuation) and VC2S8H04 . E05 (the set meaning of ‘biodegradable’).

Mark summary and curriculum map

Section	Marks	Inquiry-strand marks
Test A — Multiple choice	5	0
Test B — Short and structured response	20	8
Total	25	8 (required minimum: 5)

Evidence towards the achievement-standard extracts (§4.1 of the plan of record), quoted verbatim from the authority file:

Items	Code	Achievement-standard extract	Inquiry
Q1, Q2, Q6	VC2S8H03	“They discuss the relevant ethical, environmental, social and economic considerations associated with a proposed scientific response to a selected socio-scientific issue.”	0
Q3, Q4, Q5, Q7	VC2S8H04	“They analyse the	0

Items	Code	Achievement-standard extract	Inquiry
		importance of science communication in shaping viewpoints, policies and regulations.”	
Q8	VC2S8I07	“They provide science-based explanations for findings, and use evidence to support conclusions and evaluate claims.”	4
Q9	VC2S8I08	“They select and use appropriate presentation formats, scientific vocabulary, models and other representations when communicating their ideas, findings and arguments for specific purposes to specific audiences.”	4

The inquiry marks attach to the evaluating and communicating skills that Chapter 18’s cases revisit from Chapters 5 and 6 (claim evaluation from 5B; format choice for an audience from 6B), as D7’s revisited-inquiry design intends — Chapter 18 carries no practical work of its own.

Sources

- Victorian Curriculum and Assessment Authority, *Victorian Curriculum F–10 Version 2.0, Science, Levels 7 and 8*, content descriptions VC2S8H03 and VC2S8H04, the inquiry extracts of VC2S8I07 and VC2S8I08, their elaborations and the achievement standard, 2026. vcaa.vic.edu.au — retrieved 2026-08-21.
- Wikipedia, “Cultured meat”, 2026. en.wikipedia.org — retrieved 2026-08-21.
- Wikipedia, “Water footprint”, 2026. en.wikipedia.org — retrieved 2026-08-21.
- Victorian Fisheries Authority, “Proposed changes to kingfish regulations”, 2025. vfa.vic.gov.au — retrieved 2026-08-21.
- EPA Victoria, “Industrial composting”, 2025. epa.vic.gov.au — retrieved 2026-08-21.
- Country Fire Authority, “About fire danger ratings”, 2025. cfa.vic.gov.au — retrieved 2026-08-21.
- Multiple-choice items: the band’s question bank, mcq-system/data/output/questions/L7-8_Science.csv, items VC2S8H03.E01.S01.D1.V01, VC2S8H03.E01.S01.D2.V01, VC2S8H04.E01.S01.D1.V01, VC2S8H04.E01.S01.D2.V01 and VC2S8H04.E01.S01.D3.V01.

The real data on this paper are the figures listed under “Data provenance and sources” above, each used with the source line printed beside it. Every other scenario on this paper — the advertisement in Question 8 — is an original teaching scenario of this book’s own design, labelled as simulated data for practice.

Teacher-facing note

This note is written for an adult professional and is not student-facing text.

- **A school instrument, not a VCAA exam (D14).** Levels 7 and 8 carry no VCAA examination and no external assessment. This paper is a school-based assessment instrument of this book’s own design, graded against the achievement-standard extracts above, and its marks are one source of evidence towards the on-balance teacher judgement.

- **Administration.** Completion is untimed despite the 35-minute suggested time; no calculator is required; reading support is whatever the classroom normally provides. Award the marks exactly as set out in the guide — point-based, no holistic rubric, no half-marks, spelling and handwriting do not lose marks. In Question 6, marks are for the quality of the reasoning, not for the conclusion reached.
- **Inquiry coverage (D7).** 8 of the 25 marks are inquiry-strand marks — Q8 on VC2S8I07 (evaluating a claim and its source) and Q9 on VC2S8I08 (choosing a format for an audience) — above the required minimum of 5. Chapter 18 has no practical work, so the inquiry marks attach to the evaluating and communicating skills its cases revisit from Chapters 5 and 6, rather than to a practical scenario.
- **First Nations content (CONTENT_POLICY Rule 1).** This paper draws no Aboriginal or Torres Strait Islander content. The bank items at VC2S8H03.E02 (and the reserved elaborations VC2S8H03.E02 – .E03) are not drawn on, and VC2S8H04.E06 (cultural burning), though delivered in subtopic 18B, is not assessed here; the elaborations are contexts, not scope (D12), so VC2S8H03 and VC2S8H04 are fully assessed through their remaining elaborations.
- **Scope ceiling (D9).** There is no calculation on this paper — the cases stay qualitative, as 18A teaches them. No equations, no genetics and no greenhouse mechanism are taught or assessed.