Exercise walk-through

2.1 Vulnerability and resources: supported rehearsal

International Baccalaureate · IB Diploma · Geography · HL

Consequences and vulnerability

- Climate change affects the whole Earth system: hotter heatwaves, heavier rain, longer droughts, warmer and more acidic oceans, coral bleaching, and rising seas.
- It affects people through health (heat stress, the spread of diseases such as dengue), food (lower yields in hot regions) and **migration** , when people leave land that floods or dries.
- Not everyone is affected equally. **Vulnerability** depends on three things:
- **Resilience** is the ability to cope and recover.

Common errors

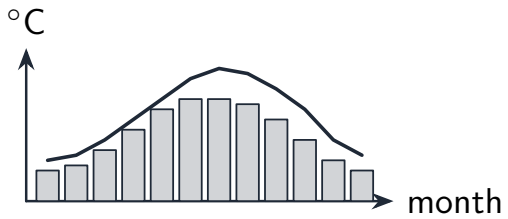
- Confusing the **greenhouse effect** (natural and necessary) with the **enhanced greenhouse effect** (caused by human emissions).
- Using one storm as proof of climate change; the evidence is the trend in many events.
- Confusing **mitigation** (reducing the causes) with adaptation (living with the effects).

Key terms (2)

- **Mitigation**: action to reduce the causes of climate change, such as cutting emissions.
- **Adaptation**: action to reduce the harm from climate change, such as sea walls or drought-resistant crops.
- **Ecological footprint**: the area of land and sea needed to supply what a person uses and absorb their waste.
- **Water–food–energy nexus**: the links that make water, food and **energy security** depend on each other.

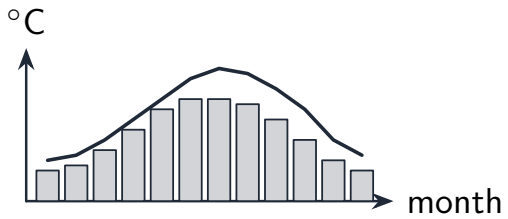
Exercise 2.1

2.1 Name one natural and one anthropogenic cause of climate change, with the mechanism of each. [2]



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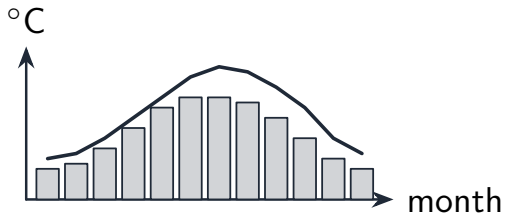
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2.1 Natural: volcanic eruptions inject aerosols that shade the surface and cool it for years (or Milankovitch orbital cycles altering solar input) (1). Anthropogenic: burning fossil fuels emits carbon dioxide that thickens the greenhouse blanket, trapping more outgoing radiation and warming the surface (1).

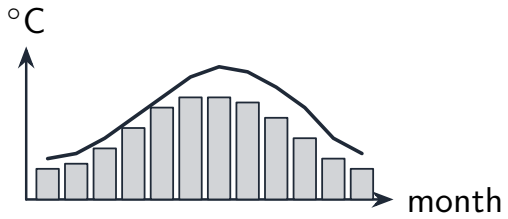
Exercise 2.2

2.2 World average ecological footprint is about 2.6 gha per person and biocapacity about 1.6 gha. Calculate the number of Earths being used, and name the term for using more than biocapacity provides. [3]



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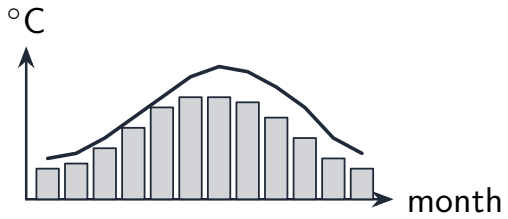


2.2 Number of Earths = $2.6/1.6 \approx 1.7$ (2). Using more than biocapacity provides is OVERSHOOT – drawing down natural capital, only possible temporarily (1).

Exercise 2.3

2.3 Classify each as mitigation or adaptation:

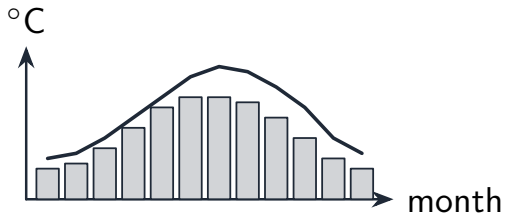
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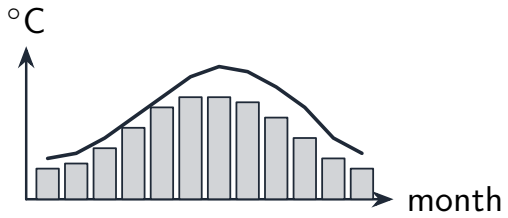
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2.3 (a) Adaptation – adjusts to the impact, sea level, without touching the cause (1); (b) mitigation – removes the cause by cutting emissions (1); (c) adaptation (1).

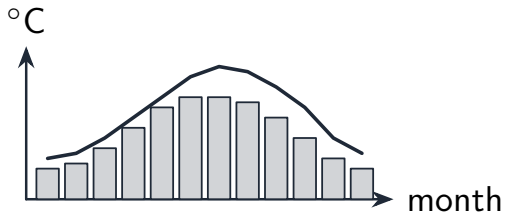
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2.4 Agriculture takes about 70% of global freshwater withdrawals. State one implication for water security as demand grows. [2]



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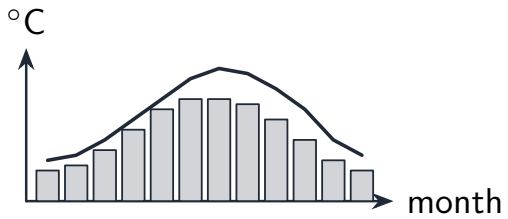
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2.4 Any one: as demand grows, the largest user (irrigation) is the first target of efficiency and reallocation, so food output becomes exposed to water policy; or aquifer depletion undermines future irrigation; or competition sharpens between farms and cities (2).

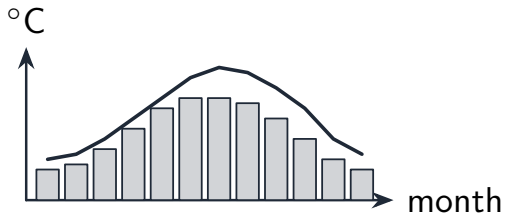
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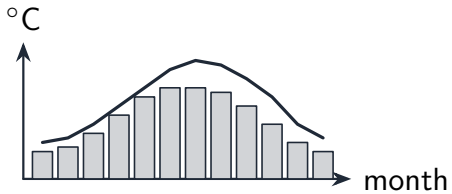
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2.5 A renewable resource regenerates within human timescales (solar, wind, biomass, fish); a non-renewable is a finite stock (coal, oil, minerals) (1). The renewable must be harvested at or below its rate of regeneration – its sustainable yield – or it becomes effectively non-renewable (overfished stocks, depleted aquifers) (1).

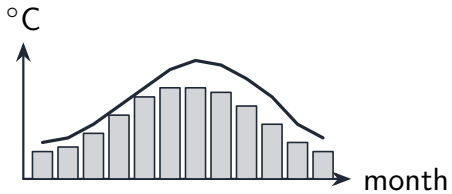
Exercise 3.1

3.1 *(Explain style.)* Explain why a low-lying, low-income delta country is more vulnerable to climate change than a wealthy inland state, using the vulnerability formula from the toolkit, and name one adaptation that builds its resilience. [6]



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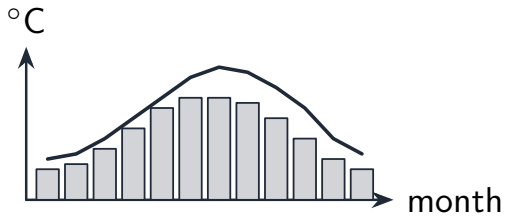
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3.1 Exposure: a delta country sits in the path of sea-level rise, storm surge and salinisation, while the inland state does not (2). Sensitivity: livelihoods are climate-dependent (farming, fishing) and infrastructure is fragile, raising losses from the same hazard (2). Capacity: low income and weak institutions mean weak defences, warning systems and insurance, subtracting little from vulnerability – the wealthy state's capacity lowers its vulnerability despite exposure (1). Adaptation building resilience: cyclone shelters and early-warning systems (the Bangladesh model) that cut death tolls from the same events (1).

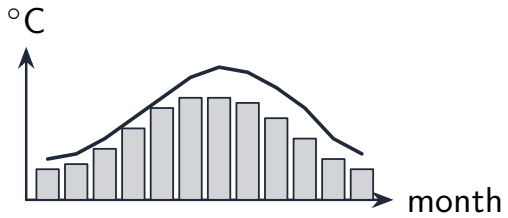
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3.2 *(Evaluate style.)* ”Renewable energy is the whole answer to mitigation.” Evaluate this claim with one strength and two limitations. [4]



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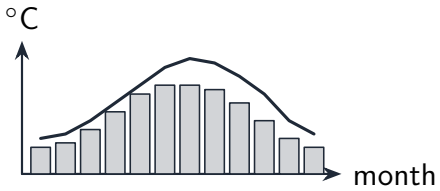
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3.2 Strength: renewables generate without CO_2 at the point of use, so displacing coal cuts emissions at scale – genuine mitigation (1). Limitation one: wind and solar are intermittent, so storage or backup is needed, and the transition itself mines lithium, cobalt and copper – new resource demands (1). Limitation two: mitigation is more than the electricity mix – transport, industry, land use and demand growth all matter, so a full answer adds efficiency, electrification, reforestation and demand management (2). Judgement: renewables are the centrepiece, not the whole answer.

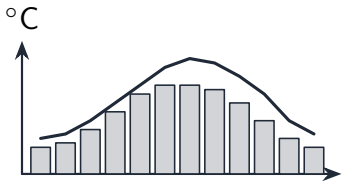
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3.3 The failing pillar is ACCESS (affordability and distribution): availability is met (enough grain) yet households cannot obtain it at spike prices (2). Policies: targeted food subsidies or cash transfers to poor households; grain reserves released to moderate prices; price monitoring and market information – any one, addressing purchasing power rather than production (2).

Local review guidance: the division shown before the Earths figure; structure the answer on the vulnerability formula, term by term; (R1 3.2/3.3) the evaluation reaches a judgement and the pillar named with its evidence. Authored classroom guidance.