# 4.2 Water access, use and security

Name: _____ Class: _____ Date: _____ **Total: 14 marks**

**KEY WORDS** freshwater • water security • water scarcity • virtual water • water footprint • desalination

## Objective

Build the skills to answer exam questions on **water access**, use and **water security**: freshwater supply, scarcity, water footprints, and strategies to meet demand.

**You must be able to:**

- describe how little of Earth's water is accessible freshwater, and how it is used
- tell physical from economic water scarcity
- calculate and compare water footprints, including virtual water
- evaluate strategies to improve water security, including transboundary issues

## 1 Key knowledge and worked examples

### ■ Water access and security

Only about 2.5% of Earth's water is fresh, and most of that is frozen or deep underground; less than 1% is easy to reach in rivers, lakes and shallow groundwater.

Worldwide, about 70% of freshwater withdrawal is for **agriculture** (irrigation), about 20% for **industry** and about 10% for **domestic** use.

**Water security** means reliable access to enough safe water for health, livelihoods and ecosystems.

| scarcity | cause | example |
|---|---|---|
| **physical** | not enough water in the region | arid regions, overused rivers |
| **economic** | water exists, but no money or infrastructure to supply it | many rural areas with rivers but no pipes or treatment |

**Water footprint:** the total volume of freshwater used to make a product or used by a person, including **virtual water** – the water "hidden" in goods (e.g. about 15 000 litres for 1 kg of beef, about 1 800 litres for 1 kg of wheat; global averages).

| strategy | for | against |
|---|---|---|
| dams and reservoirs | store water, hydro power | displace people, trap sediment, harm fish |
| desalination | unlimited sea water | energy-intensive, salty brine waste |
| drip irrigation | less waste | cost for farmers |
| rainwater harvesting, grey-water reuse | cheap, local | small scale |
| pricing and education | less waste | can hurt the poor |

Rivers that cross borders (e.g. the Nile, the Mekong) can cause conflict when an upstream country builds a dam; agreements share the water.

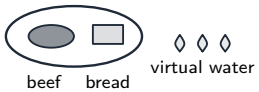
**Answer shapes:** name the strategy, say how it raises supply or cuts demand, then one cost.

## 2 Practice

**2.1** Distinguish between physical and economic water scarcity. [2]




**2.2** A person eats 0.2 kg of beef and 0.5 kg of wheat products a day. Using 15 000 L $kg^{-1}$ for beef and 1 800 L $kg^{-1}$ for wheat, calculate the daily virtual water in this food, and suggest **one** way to reduce it. [3]



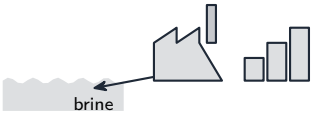



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## 3 Exam-style questions

**3.1** A coastal city in a dry region plans to build a desalination plant.

(a) Explain **one** advantage and **one** disadvantage of desalination. [2]

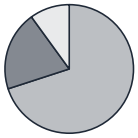



(b) Suggest **two** other strategies the city could use to improve its water security. [2]

**3.2** The pie chart shows water withdrawal by sector in a country.

(a) Identify the sector where saving water would have the largest effect. [1]

(b) Evaluate drip irrigation as a way to improve water security in this country. [4]






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