Exercise walk-through

4.2
Water access, use and security

International Baccalaureate · IB Diploma · Environmental Systems and Societies · HL

Withdrawal, consumption and sector shares

Definitions

Withdrawal: water removed from a source.

Consumption: water not returned within the relevant system and period.

FAO, 2023 withdrawals

72% agriculture + 15% industry + 13% services = 100%.

Services is not simply household drinking water.

Physical and economic scarcity

Physical water scarcity

Available water cannot meet demand and ecosystem needs.

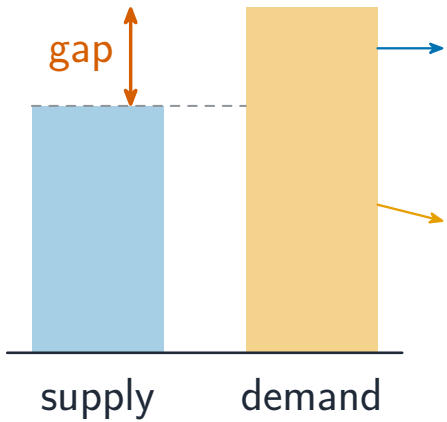
Quantity, timing and quality constrain use.

Economic water scarcity

Finance, infrastructure or institutions constrain access.

Nearby water does not guarantee affordable treatment and distribution.

Closing a water gap



raise supply: reservoirs, desalination, rainwater harvesting, recharged groundwater, inter-regional transfer

cut demand: drip irrigation, pricing and metering, greywater reuse, fixing leaks

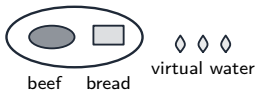
> Either side can close the gap

Exercises 2.1·2.2

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]



Exercises 2.1·2.2

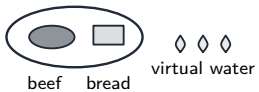
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2.1

physical: there is not enough water to meet demand, e.g. in dry regions; economic: water is available, but people lack money or infrastructure to access it

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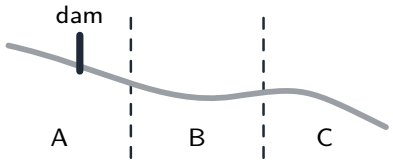
2.2

$0.2 \times 15\,000 = 3000$ L and $0.5 \times 1\,800 = 900$ L; total **3900** L a day; eat less beef / replace some beef with plant protein

exercises.lol exercises.com.cn

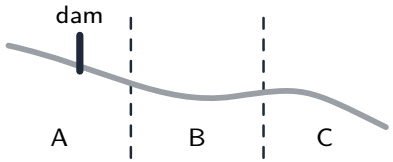
Exercise 2.3

2.3 An upstream country builds a large dam on a river that flows through two other countries. Explain **three** possible effects on the downstream countries. [3]



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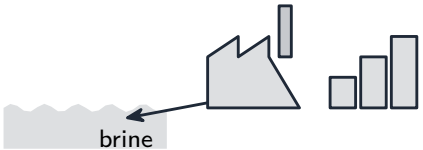
2.3

less water reaches them while the reservoir fills or in dry years; less sediment and nutrients reach farmland and deltas, which may shrink; possible tension or conflict over water rights, needing an agreement; but floods may be controlled

Exercise 3.1 (a)

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

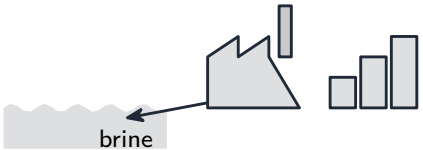
(a) Explain **one** advantage and **one** disadvantage of desalination. [2]



Exercise 3.1 (a)

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



(a) advantage: a reliable supply not depending on rain; disadvantage: uses much energy (often from fossil fuels) / salty brine harms marine life / expensive

Exercise 3.1 (b)

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

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

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

(b) any two: repair leaking pipes; recycle waste water; rainwater harvesting; water pricing and education; drip irrigation on nearby farms

Exercise 3.2 (a)

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]

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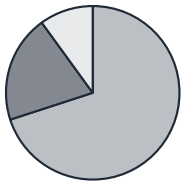
(a) Identify the sector where saving water would have the largest effect. [1]

(a) agriculture

Exercise 3.2 (b)

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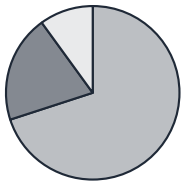
(b) Evaluate drip irrigation as a way to improve water security in this country. [4]



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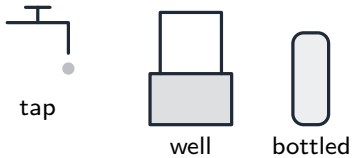


(b) award up to [4]: delivers water to the roots, so much less is lost by evaporation and runoff; in the largest sector, so the national saving can be large; but costly to install and maintain for poor farmers; farmers may use the saved water to irrigate more land, so total use may not fall; conclusion: effective with support (subsidies) and limits on total withdrawal

Exercise 3.3

3.3 Water security can be measured in different ways.

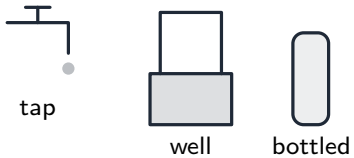
Discuss whether water security is more a problem of supply or of management. [4]



Exercise 3.3

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Discuss whether water security is more a problem of supply or of management. [4]



3.3

award up to [4]: supply: some regions are physically dry, and climate change makes rainfall less reliable; management: many shortages are economic, caused by lack of pipes, treatment and investment, or by waste and pollution; unfair access and pricing, and upstream use, decide who gets water; conclusion: in most places management and fairness matter more than total supply