Exercise walk-through

7.2 Energy sources: uses and management

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

Resource security: two water contexts

Singapore

Four National Taps: catchments, imports, NEWater and desalination.

Diversity improves resilience but needs energy, finance and quality management.

Jordan, 2023 strategy

About 61 m^3 **renewable** freshwater/person/year in the dated account.

Scarcity, demand, groundwater and unequal access; planned supply is not delivered capacity.

Compare treatment pathways

Landfill and incineration

Engineered **landfill** needs containment, gas and long-term monitoring.

Incineration may recover energy but needs emissions control and ash management.

Biological and material routes

Compost needs sorted organics, oxygen and quality control.

Digestion yields biogas/digestate; **recycling** needs collection, clean streams, energy and markets.

Check yourself

Your turn

A reusable item matches disposable energy at 20 uses and grows more slowly thereafter. At which whole-number use does it first use less?

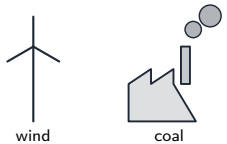
A. 21 uses.

B. 20 uses.

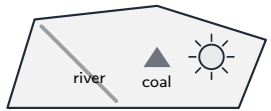
C. 19 uses.

Exercises 2.1·2.2

2.1 Distinguish between renewable and non-renewable energy sources, giving **one** example of each. [2]

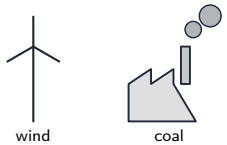


2.2 Explain **three** factors that affect the energy sources a country chooses. [3]



Exercises 2.1·2.2

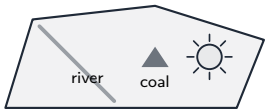
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2.1

renewable: replaced naturally as fast as it is used, e.g. wind, solar, HEP; non-renewable: a finite stock that is used up much faster than it forms, e.g. coal, oil, gas

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2.2

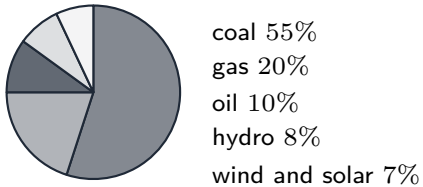
any three, explained: natural resources available (e.g. coal reserves, rivers for HEP, strong sun); cost and access to technology; politics and energy security, e.g. avoiding imports from unstable suppliers; climate targets and public opinion, e.g. opposition to nuclear

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Exercise 3.1 (a)

3.1 The pie chart shows the primary energy mix of a country that uses 2 000 PJ a year: coal 55%, natural gas 20%, oil 10%, hydroelectric 8%, wind and solar 7%.

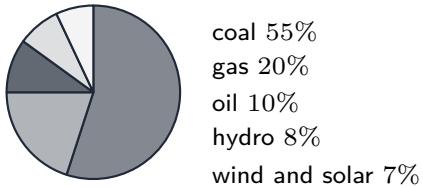
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(a) renewables $= 8\% + 7\% = 15\%$; $0.15 \times 2000 = \mathbf{300}$ PJ

Exercise 3.1 (b)

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(b) Suggest **two** reasons why the country depends on coal. [2]

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3.1 The pie chart shows the primary energy mix of a country that uses 2 000 PJ a year: coal 55%, natural gas 20%, oil 10%, hydroelectric 8%, wind and solar 7%.

(b) Suggest **two** reasons why the country depends on coal. [2]

(b) any two: large coal reserves of its own; coal power is cheap and steady; existing power stations and mining jobs; less money for new technology

Exercise 3.2 (a)

3.2 A country wants to cut emissions from electricity.

(a) Outline **one** advantage and **one** disadvantage of solar power. [2]

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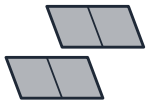
(a) Outline **one** advantage and **one** disadvantage of solar power. [2]

(a) advantage: no fuel cost / very low emissions / falling price; disadvantage: no output at night or in cloud, so storage is needed / uses land

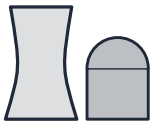
Exercise 3.2 (b)

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(b) Evaluate nuclear power as a way to reduce greenhouse gas emissions. [3]



solar

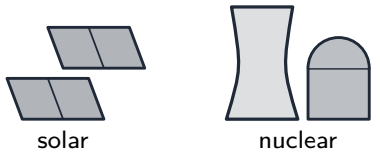


nuclear

Exercise 3.2 (b)

3.2 A country wants to cut emissions from electricity.

(b) Evaluate nuclear power as a way to reduce greenhouse gas emissions. [3]



(b) strength: very low CO_2 per unit, steady output day and night; limitation: high cost and 10+ years to build; radioactive waste and accident risk; public opposition; judgement: helpful where it is accepted, but slow, so renewables are faster for quick cuts

Exercise 3.3

3.3 A country imports 70% of its energy as oil and gas from two suppliers.

Discuss how the country could improve its energy security while also cutting emissions. [6]



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3.3

award up to [6]: low security: depends on few suppliers; supply and price can be cut by conflict or politics; build domestic renewables (wind, solar, HEP), which need no imported fuel; improve efficiency (insulation, transport), so less energy is needed; storage, grid links and a mix of sources to deal with variable output; limits: high early cost; land and materials; transition time; jobs in old industries; conclusion: diversification plus efficiency improves both goals, with justification