

Solutions

2.1 A resource that is replenished as it is used.

2.2 Renewable: wind, tides, bio-fuel. Non-renewable: coal, nuclear fuel, natural gas.

2.3 Weather-independent: nuclear / fossil-fuel / hydroelectric / geothermal / tidal (any one, B1). Weather-dependent: wind / solar.

3.1 Transport: use electric vehicles instead of petrol/diesel – charged from electricity generated without fossil fuels, so less CO₂ from engines. Electricity generation: replace coal/gas power stations with renewable generation or nuclear – those release no CO₂ while running, so the same demand is met with fewer fossil-fuel emissions. (Cycling/public transport/walking also credit in the first pair; reducing demand for appliances also credits in the second.)

3.2 (a) Hydro dips in the dry season while solar output peaks in the same sunny months; the two resources fail at different times, so a supply gap in one is covered by the other and the combined output varies less. (b) Any one: hydro generates at night and on dull days; solar panels need large roof/land area; hydro's cost per unit can be lower at village scale; hydro output is steadier minute-to-minute.

3.3 (a) The nuclear station is fully reliable – it runs continuously on demand and does not depend on weather; the barrage's output follows the tide's timetable – predictable but not constant, with no output at slack tide, so it cannot alone meet demand at every hour. (b) Nuclear: no CO₂ while running but produces radioactive waste that must be stored safely for many years. Barrage: no CO₂ and renewable, but permanently changes the estuary – flooding mudflats upstream and altering habitats for birds and fish. (Either order; a paired comparison scores.) (c) The science identifies the environmental effects and the engineering of each option; choosing between them weighs cost, jobs, local opposition, safety policy and ethics – political, social, ethical and economic decisions that scientists alone cannot settle.