2.3 Resource consumption and stewardship

Name: _____ Class: _____ Date: _____ **Total: 30 marks**

KEY WORDS ecological footprint • middle class • renewable resource • non-renewable resource • Green Revolution • resource stewardship • circular economy

Objective

Build the skills to answer exam questions on **resource consumption** : population and the growing middle class, the **ecological footprint** , renewable and non-renewable resources, and views on resource futures: Malthus, Boserup, the Sustainable Development Goals and the **circular economy** .

You must be able to:

- explain why consumption grows faster than population
- calculate and interpret ecological footprint and overshoot data
- distinguish renewable and non-renewable resources
- compare the views of Malthus and Boserup and judge them with evidence
- evaluate resource stewardship strategies: the SDGs and the circular economy

1 Key knowledge and worked examples

Consumption

The world population passed 8 billion in November 2022. Consumption grows faster than population because more people join the **middle class** and buy more meat, cars and electronics.

The **ecological footprint** is the area of land and sea needed to supply what a person uses and absorb their waste, in global hectares (gha). World average about 2.6 gha per person; the Earth can supply about 1.6 gha per person, so humanity uses about $2.6 \div 1.6 \approx 1.6$ Earths. In 2024 **Earth Overshoot Day** was 1 August.

- **Renewable resources** (fish, forests, wind, sunlight) last if used no faster than they renew.
- **Non-renewable resources** (coal, oil, metals) exist in a fixed amount.

Views on resources

view	idea	evidence
Malthus (1798)	population grows faster than food, so famine, disease and war stop growth	local famines; soil and water limits
Boserup (1965)	"necessity is the mother of invention": people find new ways to grow more food	the **Green Revolution** (1960s–70s): new seeds, fertilizer and irrigation raised grain output faster than population

But the Green Revolution used much water and fertilizer, so a limit may come from the environment instead of from food.

Stewardship

Resource stewardship means using resources carefully so they last. The UN's 17 **Sustainable Development Goals** (2015) include clean water (6), clean energy (7) and responsible consumption (12). A **circular economy** keeps materials in use (repair, reuse, recycle) instead of "take, make, throw away". China passed a Circular Economy Promotion Law in 2008.

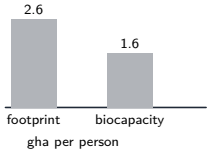
Worked example. A country's footprint is 4.0 gha per person and its biocapacity 1.0 gha per person. It uses $4.0 \div 1.0 = 4$ times what its own land can supply, so it depends on imports or on using up stocks.

2 Practice

2.1 Define **ecological footprint**. [2]

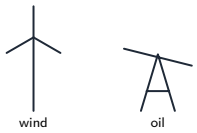


2.2 The world average ecological footprint is about 2.6 gha per person, and the Earth can supply about 1.6 gha per person. Calculate how many Earths humanity uses, and explain what this means. [3]

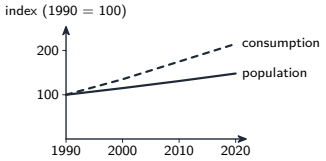


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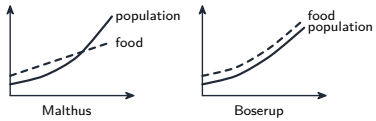
2.3 Distinguish between **renewable** and **non-renewable** resources, with an example of each. [2]



2.4 Explain why world resource consumption has grown faster than world population. [3]



2.5 Compare the views of **Malthus** and **Boserup** on population and resources. [4]



3 Exam-style questions

3.1 *(Paper 2 style.)* The table shows ecological footprint and biocapacity per person for four countries.

(a) Identify the country with the largest **ecological deficit** per person, and calculate its size. [2]

(b) Suggest **two** reasons why the footprint per person differs between Country W and Country Z. [4]

country	footprint	biocapacity
W	6.0	3.5
X	5.0	1.0
Y	2.5	2.2
Z	1.2	0.7

3.2 "Boserup's view of resources is more convincing than Malthus's." Discuss this statement. [10]

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Solutions

Marking: **M1** a correct method, **A1** the correct answer, **B1** an independent mark.

Each answer shows the steps, then the **result**.

2.1

the area of productive land and sea needed to supply the resources a person (or population) uses and to absorb their waste, measured in global hectares

2.2

$2.6 \div 1.6 \approx$ **1.6** Earths; humanity uses resources faster than nature renews them, by using up stocks (e.g. fish, forests) and letting waste such as CO_2 build up

2.3

renewable: can be used again if used no faster than it renews, e.g. forests, fish, wind; non-renewable: exists in a fixed amount and is used up, e.g. coal, oil, metals

2.4

more people join the middle class as incomes rise, especially in Asia; each person then uses more: more meat, cars, electronics and energy; so consumption per person rises as well as the number of people

2.5

Malthus: population grows faster than food supply, so famine, disease and war will stop growth; Boserup: population growth pushes people to invent new ways to grow more food, so food supply can keep up with population

3.1

(a) Country X; $5.0 - 1.0 =$ **4.0** gha per person

(b) any two, explained: Country W is richer, so people eat more meat and buy more goods; more energy use from cars, heating and air conditioning, often from fossil fuels; more waste and more imports of goods made elsewhere; Country Z is poorer and more rural, with lower energy use per person

3.2

Mark with the markbands: [9-10] focused on the command term, detailed and accurate knowledge, well-developed explanation, specific named examples (places, dates, numbers), balanced evaluation and a supported conclusion; [7-8] mostly focused, good knowledge and examples, some evaluation; [5-6] relevant knowledge and examples, explanation partly developed, little evaluation; [3-4] general knowledge, few examples, mostly description; [1-2] little that is relevant. Points that may be included: Boserup: the Green Revolution (new seeds, fertilizer, irrigation) raised world grain output faster than population; world population passed 8 billion in 2022 without a world famine; new technology keeps raising supply: drip irrigation, new varieties, solar and wind energy; Malthus: famines still happen, though usually because people cannot afford food, not because there is none (Sen); humanity uses about 1.6 Earths, so stocks such as fish and forests are being used up; the Green Revolution needed a lot of water and fertilizer, causing falling water tables

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and polluted rivers; climate change could cut yields in hot regions, a limit Malthus did not foresee; scale: at the global scale Boserup fits better; at a local scale, overuse of land and water fits Malthus; conclusion: Boserup has been more accurate so far, but a Malthusian limit may come from the environment instead of from food