

Exercise walk-through

5.11

# Ecological Footprints

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AP Environmental Science

# Urbanization and sustainability

**Urbanization** adds  
**impervious surfaces** :

- more runoff, less recharge;  
heat island; sprawl
- fix with permeable pavement,  
green roofs

An ecological footprint above  
biocapacity cannot last.



*Sprawl: impervious surfaces and heat islands*

# Ecological footprints

An **ecological footprint** is the land and water one person needs to supply their resources and absorb their wastes.

Wealthy, high-consumption nations have much larger footprints. Footprint **per person** is the yardstick.

## How many Earths?

Earth provides about 1.6 global hectares (gha) of **biocapacity** per person.

$$\frac{2.7}{1.6} \approx 1.7 \text{ Earths at the world average,}$$

$$\frac{8}{1.6} = 5 \text{ Earths if everyone lived at 8 gha.}$$

## Exam tips

- Explain the **tragedy of the commons** – shared, unowned resources get overused – and how rules/ownership prevent it.
- Weigh the trade-offs of the green revolution, irrigation (salinisation, aquifer depletion), and mining/urbanisation.
- Compute an **ecological footprint** in “number of Earths” (footprint  $\div$  biocapacity per person); it is measured **per person**.
- List the harms of **deforestation** (erosion, flooding, lost habitat, more CO<sub>2</sub>).
- Define **sustainability** (meeting needs without harming future generations) and give sustainable methods (IPM, crop rotation, quotas).

## Exercises 2.1-2.3

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**2.1** Define an ecological footprint.

[1]

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**2.2** State one factor that increases a person's footprint.

[1]

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**2.3** State one way to lower your footprint.

[1]

## Exercises 2.1-2.3

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**2.1** Define an ecological footprint.

[1]

**2.1**

- The area of land and water needed to supply a person's resources and absorb their waste

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**2.2** State one factor that increases a person's footprint.

[1]

**2.2**

- Any one: high energy use, meat-heavy diet, driving, buying many goods

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**2.3** State one way to lower your footprint.

[1]

**2.3**

- Any one: use less energy, eat lower on the food chain, recycle, use renewables

## Exercise 3.1

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**3.1** A person with a large ecological footprint most likely has

[1]

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**A** low resource consumption

**B** high resource consumption

**C** no impact

**D** a plant-based diet only

## Exercise 3.1

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**3.1** A person with a large ecological footprint most likely has

[1]

☐

**A** low resource consumption

**B** high resource consumption

**C** no impact

**D** a plant-based diet only

**3.1 B**

- high resource consumption

## Exercise 3.2 (a)

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**3.2** Two countries: one wealthy and high-consuming, one lower-income.

(a) Which likely has the larger per-person footprint?

[1]

## Exercise 3.2 (a)

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**3.2** Two countries: one wealthy and high-consuming, one lower-income.

(a) Which likely has the larger per-person footprint?

[1]

(a)

- The wealthy, high-consuming country

## Exercise 3.2 (b)

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**3.2** Two countries: one wealthy and high-consuming, one lower-income.

(b) Explain why.

[2]

## Exercise 3.2 (b)

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**3.2** Two countries: one wealthy and high-consuming, one lower-income.

(b) Explain why.

[2]

(b)

- Its people consume more energy, food, and goods and produce more waste, requiring more land and water per person

## Exercise 3.3

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**3.3** Explain what it means for humanity to be in ecological “overshoot”.

[2]

## Exercise 3.3

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**3.3** Explain what it means for humanity to be in ecological “overshoot”. [2]

### **3.3**

- Overshoot means humanity’s total footprint exceeds Earth’s biocapacity, so resources are being used faster than the planet can regenerate them