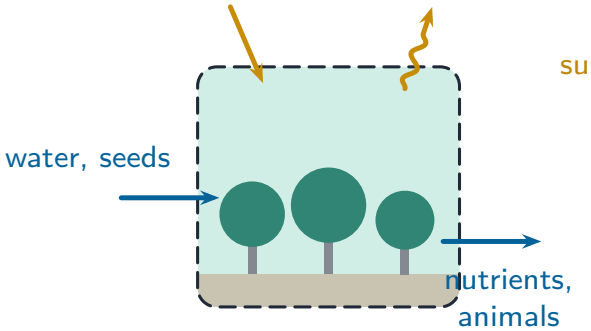
Exercise walk-through

1.3
Sustainability: natural capital and footprints

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

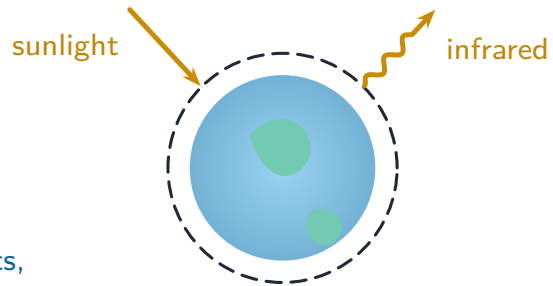
Types of system

open



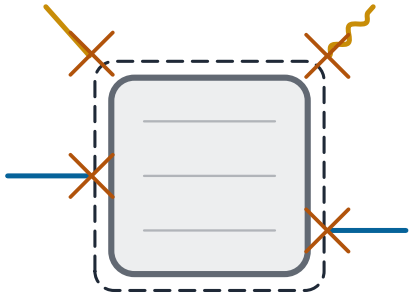
a forest
energy and matter
cross the boundary

closed



Earth (almost)
energy crosses;
matter does not

isolated

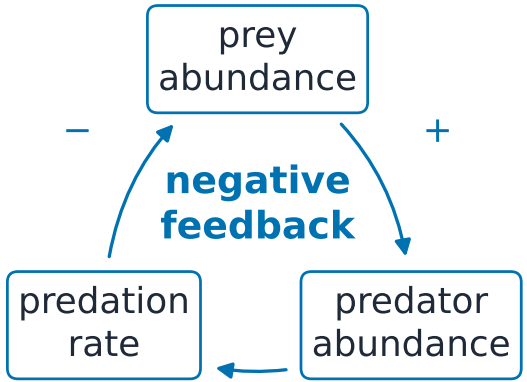


an ideal model
neither energy
nor matter crosses

energy matter system boundary

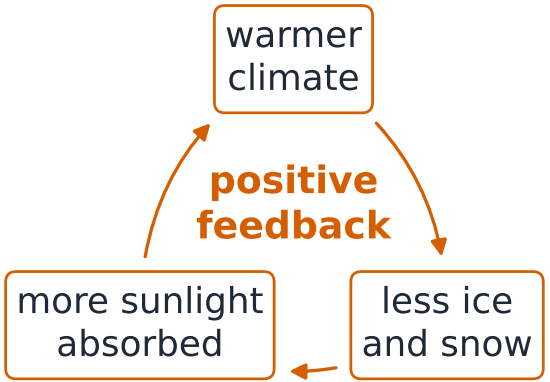
Energy and matter crossing the **boundary** determine the **system** type.

Feedback



\+

opposes the change;
delays can cause cycles



reinforces the change;
not a value judgement

> Trace the complete loop; its sign does not judge whether the outcome is good.

Sustainability and justice

Ecological limits

Economy depends on society and environment.

Critical natural functions may not be replaceable by money.

Distribution

GDP is not a full environmental account.

Ask who benefits and who bears costs, locally and across borders.

Exercise 2.1

2.1 Distinguish between natural capital and natural income, using a fish stock as the example. [2]



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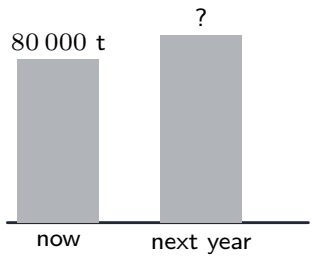


2.1

natural capital: the stock of fish in the sea; natural income: the new fish added each year by growth and reproduction, which can be caught sustainably

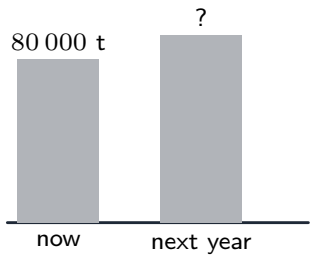
Exercise 2.2

2.2 A fish stock is 80 000 t. With no fishing it would be 92 000 t a year later. (i) Calculate the sustainable yield. (ii) The fleet catches 15 000 t a year. Describe what happens to the stock. [3]



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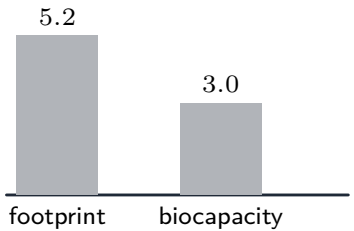


2.2

(i) $92\,000 - 80\,000 = \mathbf{12\,000}$ t a year; (ii) the catch is larger than the yield, so the stock falls by about 3 000 t a year: the natural capital is being used up

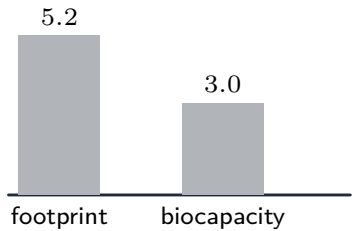
Exercise 2.3

2.3 Country X has an ecological footprint of 5.2 gha per person and a biocapacity of 3.0 gha per person. Calculate the ecological deficit per person, and state **two** ways the country could reduce it. [3]



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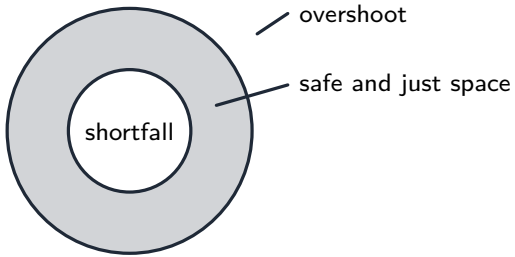
2.3

5.2 − 3.0 = **2.2** gha per person; any two: renewable energy instead of fossil fuels; less meat in diets; less waste and more recycling; public transport

Exercise 3.1 (a)

3.1 The doughnut model shows a safe and just space for humanity.

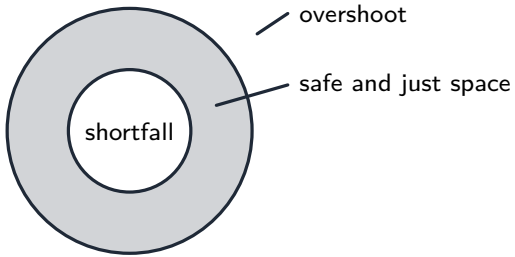
(a) Describe what the inner and outer rings of the doughnut represent. [2]



Exercise 3.1 (a)

3.1 The doughnut model shows a safe and just space for humanity.

(a) Describe what the inner and outer rings of the doughnut represent. [2]



(a) inner ring: the social foundation, the minimum everyone needs (food, water, health, education); outer ring: the ecological ceiling, the planetary limits that must not be crossed

Exercise 3.1 (b)

3.1 The doughnut model shows a safe and just space for humanity.

(b) Suggest why a rich country and a poor country might be in different parts of the model. [2]

Exercise 3.1 (b)

3.1 The doughnut model shows a safe and just space for humanity.

(b) Suggest why a rich country and a poor country might be in different parts of the model. [2]

(b) a rich country often meets the social foundation but overshoots the ceiling through high consumption; a poor country may stay inside the ceiling but fall short of the social foundation

Exercise 3.2 (a)

3.2 The table shows the ecological footprint (EF) and biocapacity of three countries, in gha per person.

country	EF	biocapacity
P	7.5	8.0
Q	4.0	1.2
R	1.1	0.6

(a) Identify the country with an ecological reserve, and the country with the largest deficit per person. [2]

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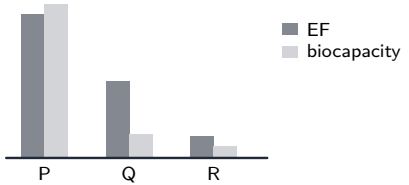
(a) reserve: P (EF below biocapacity); largest deficit: Q, 2.8 gha per person

Exercise 3.2 (b)

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(b) Evaluate the ecological footprint as a measure of sustainability. [4]

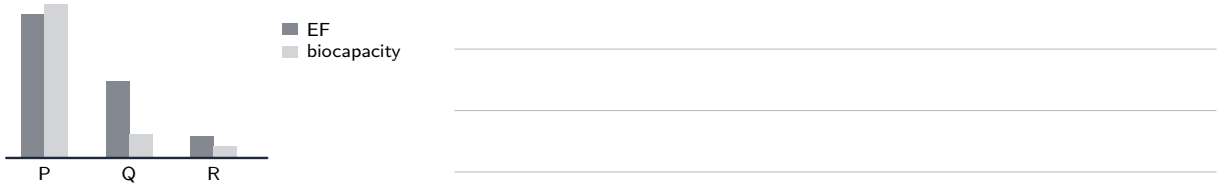


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(b) award up to [4]: strengths: one simple number, easy to compare countries and over time; links consumption to land and sea area; limitations: leaves out some impacts (e.g. pollution, water use, biodiversity loss); depends on assumptions in converting to global hectares; a country can import goods and "move" its footprint elsewhere; conclusion: useful for awareness and comparison, best used with other indicators