Exercise walk-through

8.3
Urban air pollution

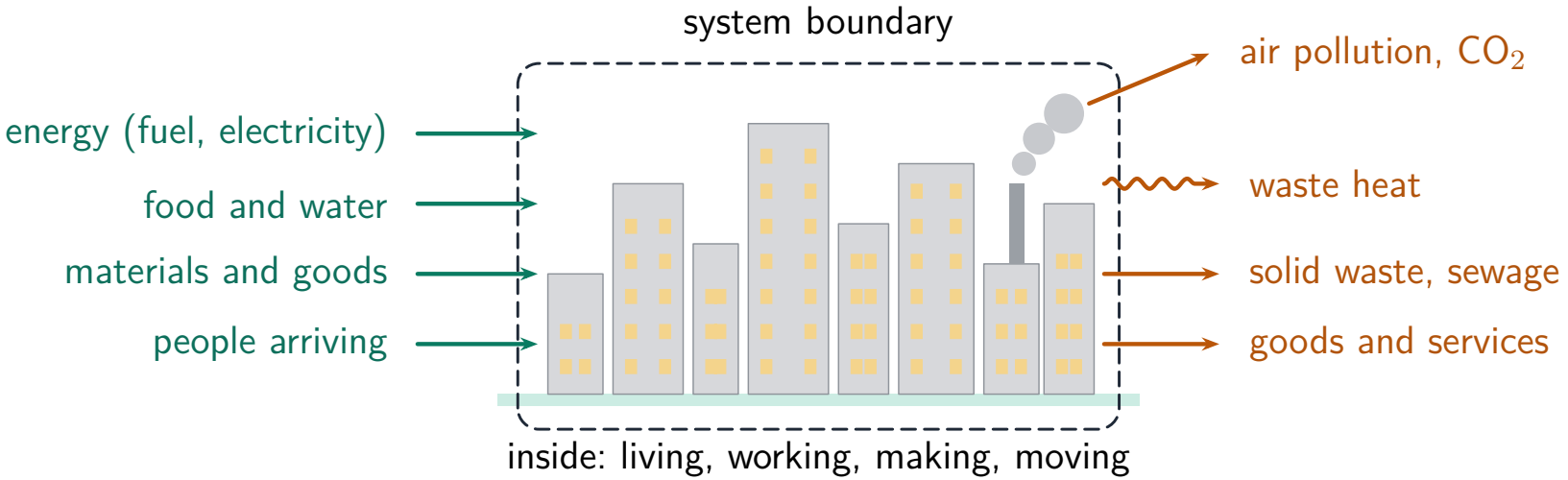
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A country that started to shrink

> Birth totals can rise in a year when the population still falls.

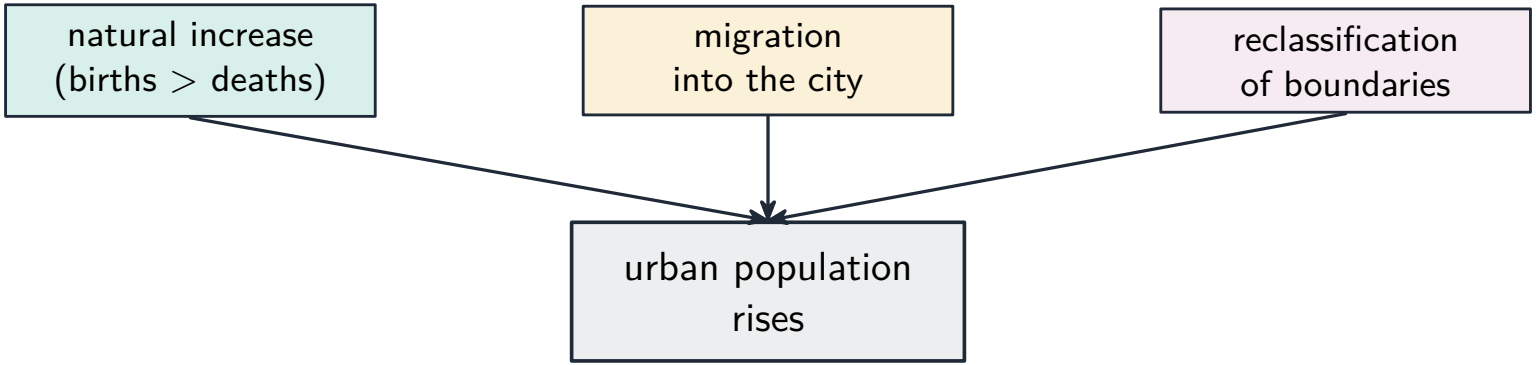
- China's population fell in 2022, 2023 and 2024.
- NBS 2024: 9.54 million births, 10.93 million deaths; births rose from 2023 while population fell.
- This unit: populations $\rightarrow$ cities $\rightarrow$ urban air.

A city as a system



Track matter, energy and people across the stated city boundary.

Why the urban population grows

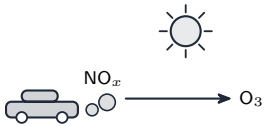


compare maps at the same scale and boundary before blaming migration alone

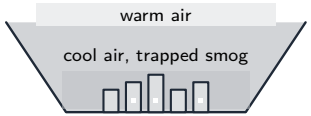
> Three routes raise the urban count

Exercises 2.1·2.2

2.1 Distinguish between primary and secondary pollutants, giving **one** example of each. [2]

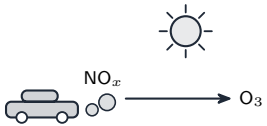


2.2 Explain how a temperature inversion traps air pollution in a city. [3]



Exercises 2.1·2.2

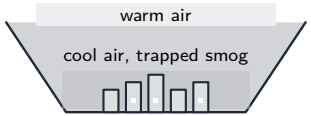
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2.1

primary: released directly from a source, e.g. NO_x, CO, SO_2, particulates from vehicles; secondary: formed in the air by reactions of primary pollutants, e.g. tropospheric ozone

2.2 Explain how a temperature inversion traps air pollution in a city. [3]



2.2

normally air cools with height, so warm polluted air rises and disperses; in an inversion a layer of warm air lies above cooler air near the ground; the cool, dense air cannot rise through it, so pollutants build up near the ground

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Exercise 3.1 (a)

3.1 The graph shows the monthly mean $PM_{2.5}$ concentration in a northern city.

(a) Describe the pattern shown. [2]



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(a) highest in winter (December–February), lowest in summer (June–August); winter values are about three times the summer values

Exercise 3.1 (b)

3.1 The graph shows the monthly mean $PM_{2.5}$ concentration in a northern city.

(b) Suggest **two** reasons for the pattern. [2]

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(b) Suggest **two** reasons for the pattern. [2]

(b) more burning of coal and wood for heating in winter; more temperature inversions and calm air in winter trap pollution / more summer rain washes particles out

Exercise 3.2 (a)

3.2 A city plans a **low-emission zone**: older, more polluting vehicles must pay a daily charge to enter the centre.

(a) Outline **two** health effects of urban air pollution. [2]

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(a) any two: asthma and other breathing problems; heart disease and stroke; lung cancer; early death; eye irritation

Exercise 3.2 (b)

3.2 A city plans a **low-emission zone**: older, more polluting vehicles must pay a daily charge to enter the centre.

(b) Evaluate the low-emission zone. [3]



Exercise 3.2 (b)

3.2 A city plans a **low-emission zone**: older, more polluting vehicles must pay a daily charge to enter the centre.

(b) Evaluate the low-emission zone. [3]



(b) strength: fewer old polluting vehicles in the centre, so less NO_x and particulates where most people are; limitation: poorer drivers and small businesses may pay most; traffic and pollution may move to roads outside the zone; judgement: effective when combined with better public transport and help to replace old vehicles