

Exercise walk-through

Impacts of Urbanization ■ 5.10

eXercise

You must be able to

- describe **urban sprawl** 城市扩张 and **impervious surfaces** 不透水面
- link paving to runoff, flooding, and the **urban heat island** 城市热岛
- suggest smart-growth solutions

Method — Urbanization impacts

As cities grow (**urban sprawl**), natural land is replaced with **impervious surfaces** (roads, roofs) that water cannot soak into.

Method — Runoff and flooding

Impervious surfaces increase **runoff** and reduce **infiltration**, causing more **flooding** and carrying pollutants (oil, litter) into waterways.

Method — Urban heat island

Cities are warmer than surrounding areas (the **urban heat island effect**) because dark surfaces absorb heat and there is little vegetation to cool the air.

Method — Smart growth

Solutions include **mixed-use, dense development**, public transit, green roofs, and preserving green space — reducing sprawl and its impacts.

Practice 2.1 ■ 1 mark

What is an impervious surface?

Solution 2.1

Worked steps

A surface (road, roof) that water cannot soak into **B1**.

Practice 2.2 ■ 1 mark

How does paving affect runoff and infiltration?

Solution 2.2

Method: Runoff and flooding

Worked steps

It increases runoff and reduces infiltration **B1**.

Practice 2.3 ■ 1 mark

What is the urban heat island effect?

Solution 2.3

Method: Urban heat island

Worked steps

Cities being warmer than surrounding rural areas **B1**.

Exam-style 3.1 ■ 1 mark

Cities are often warmer than surrounding rural areas because of the

- A** rain shadow effect
- B** urban heat island effect
- C** Coriolis effect
- D** greenhouse effect only

Solution 3.1

Method: Urban heat island

- A rain shadow effect
- B urban heat island effect 
- C Coriolis effect
- D greenhouse effect only

Worked steps

B — the urban heat island effect.

Exam-style 3.2 ■ 2 marks

A city expands, paving over fields.

- (a) Explain how this increases flooding.
- (b) Suggest one smart-growth solution.

Solution 3.2

Method: Smart growth

Worked steps

(a) Paving stops water soaking in, so more runs off quickly over the hard surfaces, overwhelming drainage and causing floods **M1 A1**. (b) Any one: green roofs, permeable pavement, preserving green space, denser development **B1**.

Exam-style 3.3 ■ 2 marks

Explain why the urban heat island effect occurs.

Solution 3.3

Method: Urban heat island

Worked steps

Dark paved surfaces and buildings absorb and re-radiate heat, and there is little vegetation to cool the air by shade and transpiration, so cities stay hotter **M1** **A1**.