



PART 2

Read the text below and answer questions 14–26.

DESIGNING FOR RESILIENCE: GREEN, GREY, AND BLUE INFRASTRUCTURE

A

Modern cities have long relied on what engineers call grey infrastructure: sea walls, drainage tunnels, levees, pumping stations, and other hard systems designed to impose order on hazards. Its appeal lies in measurability. A tunnel can be specified to convey a given discharge; a barrier can be modelled against a defined storm surge. This tradition has produced impressive reliability where risks are stable and assumptions hold. Yet contemporary climate pressures increasingly violate those assumptions. Rainfall arrives in shorter, more intense bursts; coastal surges compound with river floods; and “design storms” are recalibrated as the statistical past becomes a weaker guide to the hydrological future. In this setting, planners argue not that grey assets are obsolete, but that exclusive dependence on them can be brittle when stressors are frequent, compound, and uncertain.

B

The proposed alternative is therefore additive rather than revolutionary: broaden the repertoire of urban protection by recognising that landscapes and waterways already perform services that concrete alone cannot replicate. Green infrastructure employs vegetation and soil to absorb, store, and slow runoff—street trees, parks, green roofs, and rain gardens that function as distributed sponges. Blue infrastructure refers to the water systems themselves: rivers, canals, wetlands, floodplains, and coastal zones. When these are treated as networks rather than obstacles to be straightened, buried, or walled off, they can support hydrological resilience while also generating everyday benefits, including cooling, recreation, and habitat. The discursive shift is significant: resilience is framed not only as surviving extremes but as improving daily urban performance.

C

A pivotal mechanism within this expanded toolkit is infiltration. Conventional drainage in highly impervious districts assumes that every drop should be collected and channelled rapidly into pipes. Infiltration-based design reverses the logic by allowing water to soak into the ground, attenuating peak flows that would otherwise overwhelm drains. Permeable pavements and bioswales can be effective forms of attenuation, but their performance is conditional rather than universal. They work best where soil conditions can accept water at meaningful rates and where contamination risks to groundwater are low. In dense neighbourhoods with limited space, designers often combine many small



measures—tree pits, curb cuts, and micro-basins—so each block contributes incremental storage. The cumulative effect is modest per site but consequential across an urban catchment.

D

Even with extensive green and blue networks, grey infrastructure remains essential, particularly for conveying water safely during extremes and protecting critical facilities. The emerging emphasis is on hybrid design that anticipates predictable failure modes and builds redundancy accordingly. A drainage tunnel calibrated for a “once-in-fifty-year” storm can be exceeded if rainfall regimes shift; pumps can lose power during severe weather; and culverts and grates can clog with debris at the very moment capacity is most needed. Redundancy protocols—multiple conveyance pathways, backup power, and safe overflow routes—aim to ensure that when one component fails, the system degrades gracefully rather than catastrophically. In practice, this may mean protected routes for hospitals and transit hubs, sacrificial floodable spaces, and layered defences that reduce dependence on any single asset.

E

Green measures, however, are not automatically resilient simply because they look natural. They are living systems embedded in budgets, maintenance regimes, and institutional attention. Trees require care and can die in heatwaves; green roofs need structural support and irrigation strategies; wetlands can be damaged if they become polluted sinks for urban runoff. Where installation is celebrated but upkeep is neglected, projects can degenerate into ornamental landscapes that photograph well yet perform poorly during storms. Well-run programmes therefore treat maintenance as a core urban service, not an optional afterthought: performance is monitored over time, designs are adjusted when they under-deliver, and long-term budgets are secured so that function persists beyond political cycles.

F

Hybrid approaches also intensify a socio-economic dilemma that engineering metrics can miss. Restored river corridors and expanded parklands may lower flood risk while improving thermal comfort and public amenity, but these co-benefits can trigger gentrification. If rents rise near newly protected, greener areas, the communities most exposed to risk may be priced out of the safer environments created in their name. Resilience, in this sense, can become spatially regressive unless equity is explicitly planned. Some cities therefore pair infrastructure investment with housing protections—rent stabilisation, inclusionary zoning, or community land trusts—so that adaptation does



not function as a displacement mechanism. The moral test of resilience is not only whether water is managed, but who is permitted to remain.

G

Finally, durable resilience depends on measurement and governance that can learn. Grey projects align neatly with engineering standards, whereas green and blue networks perform differently across seasons, storms, and maintenance conditions. Increasingly, cities adopt “service” metrics: how much water is delayed, how many degrees of cooling are achieved, how many people gain access to shade, and how reliably benefits are delivered across districts. These metrics also reveal trade-offs: a design that maximises infiltration may reduce surface runoff effectively yet offer less cooling if tree canopy is sparse. Because the future is uncertain, planners often stage projects through adaptive management, starting with a pilot district and expanding as monitoring improves models and standards. In this view, infrastructure is not a single completed object but an evolving system—one whose success depends as much on institutions, coordination, and equity goals as on concrete and soil.

Questions 14–18

Select the correct answer.

14 What does the passage say about the purpose of grey infrastructure?

- A** It is mainly intended to provide everyday benefits such as cooling and habitat.
- B** It is designed around reliability and clear performance targets, including measurable capacity.
- C** It is increasingly being replaced because it cannot be evaluated by engineering standards.
- D** It is effective only when combined with infiltration-based designs.

15 Why do planners argue that hard structures alone may be insufficient?

- A** They prevent cities from investing in parks, green roofs and wetlands.
- B** They are too flexible to cope with predictable storm patterns.
- C** They cannot address climate stresses that are frequent, compound and uncertain by themselves.
- D** They are unable to reduce the risk of groundwater contamination.

16 Which benefit of treating green and blue systems as networks is mentioned in the passage?

- A** Cooling and recreation in addition to protection
- B** Guaranteed elimination of flood risk in coastal zones



- C** Lower rents for residents living close to restored corridors
- D** Reduced need for monitoring once systems are installed

17 What does the passage suggest about infiltration-based designs?

- A** They are most effective when each drop is channelled rapidly into pipes.
- B** They work best in dense districts because they require large continuous areas of land.
- C** They should be avoided whenever rainfall intensity increases.
- D** Their effectiveness depends on soil conditions and low risks of groundwater contamination.

18 What governance problem associated with resilience projects is highlighted?

- A** Grey infrastructure tends to fail because agencies refuse to update engineering standards.
- B** Co-benefits may raise rents and displace the people most exposed to risk unless protections are used.
- C** Service metrics are rejected because they focus on more than a single headline number.
- D** Pilot districts are ineffective because they delay the construction of large barriers.

Questions 19–22

Choose **YES** if the statement agrees with the claims of the writer, choose **NO** if the statement contradicts the claims of the writer, or choose **NOT GIVEN** if it is impossible to say what the writer thinks about this.

- 19** The passage suggests cities should stop building new grey infrastructure.
- 20** The passage suggests permeable pavements are suitable in all soil types.
- 21** The passage states that pumps often fail because they are deliberately damaged.
- 22** The passage suggests that service metrics can reveal trade-offs between different aims, such as infiltration and cooling.

Questions 23–26

Complete the notes below. Choose **ONE WORD ONLY** from the text for each answer.

Implementing hybrid resilience

- Allowing runoff to soak into the ground is known as **23**
- Hybrid designs can improve reliability by building **24**



- Long-term **25** must be secured so that green infrastructure continues to function beyond political cycles.
- To handle uncertainty, planners may begin with **26** districts before expanding work over time.

Answer Key

14. B

15. C

16. A

17. D

18. B

19. NO

20. NO

21. NOT GIVEN

22. YES

23. infiltration

24. redundancy

25. budgets

26. pilot