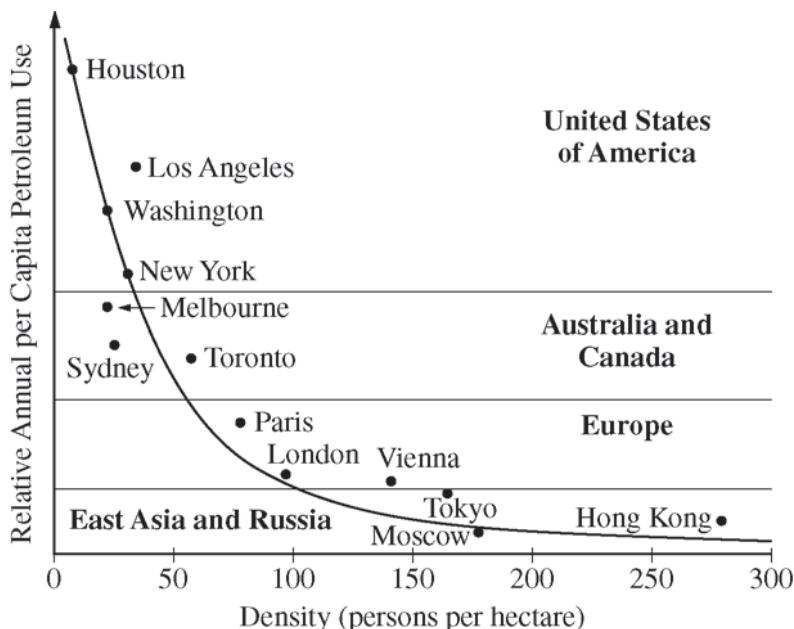


2015 AP® ENVIRONMENTAL SCIENCE FREE-RESPONSE QUESTIONS

4. The term “urban sprawl” describes the expansion of cities into rural areas. This phenomenon has occurred around the world and has had economic, health, and environmental consequences.
- (a) **Describe** TWO causes of urban sprawl.
- (b) **Discuss** TWO human health effects associated with urban sprawl.
- (c) The graph below shows the relationship between population density and petroleum use in selected cities. **Describe** the relationship between population density and petroleum use shown in the graph.



- (d) Smart growth focuses on ways to encourage sustainable urban development. **Describe** TWO steps a municipality could take to encourage smart growth in order to limit urban sprawl.
- (e) Highway systems and urban sprawl often threaten wildlife populations. **Describe** TWO methods to reduce harmful effects on wildlife populations from highways and urban sprawl.
- (f) Urban sprawl often results in the loss of productive agricultural land near cities. **Describe** one practical way to increase food production within urban areas.

STOP

END OF EXAM

AP® ENVIRONMENTAL SCIENCE 2015 SCORING GUIDELINES

Question 4

The term “urban sprawl” describes the expansion of cities into rural areas. This phenomenon has occurred around the world and has had economic, health, and environmental consequences.

(a) Describe TWO causes of urban sprawl.

(2 points: 1 point for each reasonable cause; only the first two causes can earn a point)

Transportation

- Increased use of/reliance on automobiles
- Improved/expanded roads
- Low gas prices promote driving
- Telecommuting has made it possible to work remotely

Economic

- Increasing wealth/affluence providing choice
- Higher taxes in inner city
- High land/property costs in city vs. less expensive land prices outside the city (cannot earn both)
- Tax deductions for home mortgages interest
- Jobs move out and employees follow
- Home buying subsidies/reduced interest rates e.g., GI Bill
- Lack of/poor city-regional planning: (urban centers plan in isolation; lack of cohesive plan for growth)
- Lower cost of living in suburbs

Quality of Life

- Desire for property/yard/lower density
- Better quality suburban schools
- Urban blight/declining infrastructure in inner cities
- High crime rates in inner cities
- Seek natural environments, aesthetics, cleaner air, less noise pollution, etc.

(b) Discuss TWO human health effects associated with urban sprawl.

(2 points: 1 point for each human health effect, which can be positive or negative)

- Asthma, bronchitis, emphysema, airway inflammation, irritation of mucus membranes, respiratory irritation, lung irritation, aggravated heart disease from increased air pollution
- Obesity, impaired immune response, diabetes, hypertension, high blood pressure from less exercise due to auto travel time and/or a commuter diet
- Depression, anxiety, suppressed immune response from social isolation due to spread out housing
- Personal injuries associated with automobile crashes due to increased driving
- Hearing loss, high blood pressure, impaired immune response from noise pollution
- Survival rate/recovery rate hindered due to delays in emergency medical services response and fire department response times due to spread out housing
- Reduction in disease spread in lower density areas

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Question 4 (continued)

- (c) The graph below shows the relationship between population density and petroleum use in selected cities. **Describe** the relationship between population density and petroleum use shown in the graph.

(1 point for a description)

- Petroleum use is inversely proportional to population density ;
- Petroleum use increases as population density decreases;
- Petroleum use and population density are inversely related
- There is a negative (exponential) relationship between petroleum use and population density

- (d) Smart growth focuses on ways to encourage sustainable urban development. **Describe** TWO steps a municipality could take to encourage smart growth in order to limit urban sprawl.

(2 points: 1 point for each step; only the first two steps can earn a point)

Transportation

- Subsidize mass transit to encourage less automobile use
- Build bike paths to encourage less automobile use
- Establish moratoria on highway and new road construction
- Develop master plans which direct new residents/jobs to busy hubs

Zoning/Design

- Modify zoning ordinances to encourage multi-use/mixed land uses, create minimum development densities; promote compact communities; a range of housing opportunities; vertical development
- Establish development barriers surrounding cities and towns (Urban Growth Boundaries)
- Preserve and protect farms/agricultural lands by designating these areas as agricultural land reserves or conservation easements
- Create a range of housing opportunities & choices (Urban Village Strategy): dense, multi-family- and single-family housing near shops, cafes, & public transit
- Foster communities that provide a sense of place: promote appreciation of unique environments, community involvement, and social context of cities
- Promote gentrification
- Promote reclamation of brownfields

Tax Incentives

- Create tax incentives/reduced taxes for living in city

Increased Amenities

- Enhance the quality of living/increase amenities in cities (e.g., schools, parks, pools, recreation to encourage people to remain in cities); efforts to reduce pollution/improve air quality

Other

- Carry out public education campaign

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Question 4 (continued)

(e) Highway systems and urban sprawl often threaten wildlife populations. **Describe** TWO methods to reduce harmful effects on wildlife populations from highways and urban sprawl.

(2 points: 1 point for each correct method; only the first two methods can earn a point)

- Create wildlife corridors/tunnels between green areas
- Create wildlife crossing zones/tunnels/overpasses, etc.
- Plan highways around existing migratory routes and prime habitats
- Avoid fragmentation of habitat by housing developments
- Set aside land for/increase size of refuges; increase green space and buffer zones along highways
- Construct highway fencing, especially along migratory routes
- Promote planting of native plants to provide habitat
- Enforce anti-littering laws along highways; reduce highway speed limits; “wildlife caution signs”
- Encourage carpooling (fewer cars, fewer wildlife collisions)

(f) Urban sprawl often results in the loss of productive agricultural land near cities. **Describe** one practical way to increase food production within urban areas.

(1 point for a practical way to increase urban food production, such as one of the following)

- Gardens/victory gardens; roof-top gardens; vertical farming, hydroponics, greenhouses
- Edible gardens in public/open spaces
- Green roofs can include edible plants (“green roof” by itself should not earn a point)
- Zoning to allow the raising of bees, chickens, microlivestock
- Provide incentives for: use of greenway/area gardens, vacant lots for community agriculture; land under power lines, in floodplains;
- Brownfield reclamation and conversion to gardens