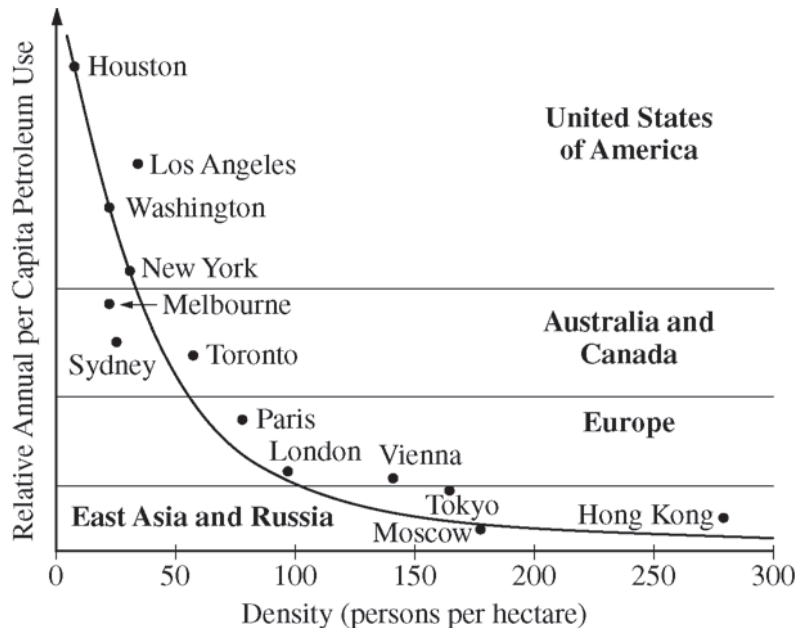


## 2015 AP<sup>®</sup> ENVIRONMENTAL SCIENCE FREE-RESPONSE QUESTIONS

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.
- Describe** TWO causes of urban sprawl.
  - Discuss** TWO human health effects associated with urban sprawl.
  - 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.



- 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.
- Highway systems and urban sprawl often threaten wildlife populations. **Describe** TWO methods to reduce harmful effects on wildlife populations from highways and urban sprawl.
- 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<sup>®</sup> 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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## 2015 SCORING GUIDELINES

### 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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## 2015 SCORING GUIDELINES

### 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