# Megacities

**Audience** – High school environmental science  
**Time required** – 15 minutes

<table>
<thead>
<tr>
<th>Activity</th>
<th>Explore urban sprawl, factors, and impacts.</th>
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| Science Standards | APES Benchmark: IV. Land and Water Use (urban land development; planned development, suburban sprawl, urbanization)  
|-------------------|-------------------------------------------------------------------------------------------------|

| Learning Outcomes | Students will be able to describe the scale of urbanization.  
Students will be able to analyze environmental impacts and advantages of urban centers. |
|-------------------|------------------------------------------------------------------------------------------------------------------|

**Map URL:** http://esriurl.com/enviroGeoinquiry4

## Engage

**What characteristics define a city?**

- Click the map URL above to open the map.  
- List at least three observations from the initial map. *Earth at Night.*  
- What patterns do you notice? [Answers will vary.]  
- What is the difference between “city” and “urban”? *Cities include business, population, and cultural landscape; urban areas include non-rural areas, cities, and suburbs.*  
- What is a megacity? *Urban areas with populations greater than 10 million.*

## Explore

**What are some examples of megacities?**

- What are some possible characteristics of a megacity? *A dense population center, large surface footprint, and extensive transportation system*  
- Using the Details pane, click the button, Show Contents Of Map.  
- Click the checkbox to the left of the layer name, World Urban Sprawl.  
- Zoom out to a world view.  
- Why is the layer not visible? *It is set to be visible at a specific scale.*  
- Zoom in and out to view and explore some of these cities.  
- What cities around the world might be megacities? [Answers may include Paris, Tokyo, and Los Angeles.]

## Explain

**What factors influence urban center geography?**

- What might be some factors leading to an increase in urbanization? *Industrialization, climate, waterways, and other transportation*  
- Click the checkbox to the left of the layer name, Megacities.  
- Where are most megacities located? *Southeast Asia and India*  
- Hover over the Megacities layer name and click the button, Show Table.  
- In the table, click the column header, % Growth, sort ascending.  
- Which cities are growing the fastest? *Karachi, Delhi, Dhaka, and Guangzhou*  
- Investigate three cities by clicking their map markers.  
- What are the growth rates for these cities? [Answers will vary.]
Elaborate

How have cities changed over time?

? What are some possible factors leading to urban sprawl? [Open space, desire for privacy, highways, and telecommunication]

» Click the button, Show Map Contents.
» Turn off the layer, World Urban Sprawl.
» Toggle between the three years. Observe how Tokyo has changed over time.
? Click the button, Measure. Calculate the square kilometer footprint of urban growth for Tokyo 1929. Hint: See tool tip below. [Approximately 300 sq. km.]

Evaluate

What is wrong with sprawl?

» Repeat the measuring step for the remaining two years (1954, 1972).
? What is the square kilometer footprint for each year? [1954 - 400 sq. km.; 1972 - 1,400 sq. km.]
? What patterns of growth do you notice? [Answers will vary. Cities grow along main transportation routes, and along water boundaries.]
? What are some potential negative effects related to urban sprawl? [Traffic congestion, pollution, and land consumption.]

USE THE MEASURE TOOL

• Click the button, Measure.
• Select the Area button and choose a unit of measurement.
• On the map, click once to start the measurement, click again to change direction, and double-click to stop measuring.
• Hint: Position the area of interest on the map so that it is not obscured by the Measure window.

SHOW TABLE AND SORT

• Tables are only available for certain map layers.
• With the Details pane open, click the button, Show Contents of Map.
• Hover over a layer name.
• Click the button, Show Table.
• Click on field name (top row).
• Choose sort ascending or descending

Next Steps

DID YOU KNOW? ArcGIS Online is a mapping platform freely available to U.S. public, private, and home schools as a part of the White House ConnectED Initiative. A school subscription provides additional security, privacy, and content features. Learn more about ArcGIS Online and how to get a school subscription at http://connected.esri.com.

THEN TRY THIS...
• Using an ArcGIS Online organizational subscription for schools, create a drive-time analysis layer for that city and explore the transportation network.
• Explore the story map, The Age of Megacities, at http://esriurl.com/Geo41114131.

TEXT REFERENCES

This GIS map has been cross-referenced to material in sections of chapters from these texts.

• Environmental Science: A Global Concern (12th) by McGraw-Hill — Chapter 22
• Living in the Environment (15th) by Thomson — Chapter 23
• Environment: The Science Behind the Stories (3rd) by Pearson — Chapter 13