



Life on the edge

from the Esri GeoInquiries™ collection for World Geography

Target audience – World geography learners

Time required – 15 minutes

Activity	Analyze population density, plate boundaries, volcanoes, and earthquake activity, identifying areas of subduction along plate boundaries in South and Southeast Asia.
World Geography Standards	C3:D2.Geo.1.6-8. Construct maps to represent and explain the spatial patterns of cultural and environmental characteristics.
Learning Outcomes	<ul style="list-style-type: none">• Describe the relationship between zones of high earthquake or volcanic activity and tectonic plate boundaries.• Identify densely populated areas that are most at risk for volcanic and/or seismic disasters.

Map URL: <http://esriurl.com/worldGeoInquiry4>

? Ask

Where are the most densely populated areas in Asia?

- Click the link above to launch the map.
- With the Details button depressed, click the button, Show Contents.
- ? Where the darkest colors indicate high population density and the cream colors indicate low population density, describe the pattern of population density in East Asia. [*Areas of high population density are in the southeastern part of the region. Specific areas may include eastern China, the Indian subcontinent, Southeast Asia peninsula, Japan, and some islands. The remainder of East Asia has generally low population density*]
- Click the button, Bookmarks. Choose Mumbai, India.
- Click the green dot on the map to view its population. (Zoom out, if necessary.)
- ? What is Mumbai's population? [*9,950,000*]
- ? Using the Kunming, China, and Tokyo, Japan, bookmarks, what are the populations of both these cities? [*Tokyo = 23,620,000; Kunming = 1,280,000*]

! Acquire

Where did high-magnitude earthquakes occur?

- In the upper-left corner of the map, click the Default Extent (house) button.
- Turn on the Earthquake Magnitude 5.7+ (2004-2007) layer.
- ? In general, where did earthquakes with a magnitude of ≥ 5.7 occur? [*Many of the earthquakes occurred along the islands of the Pacific Rim, with some occurring under the ocean.*]
- ? Did these earthquakes occur near densely populated areas? Where? [*Yes: Japan, Indonesia, the Philippines, and Taiwan*]

🔍 Explore

Are cities in East Asia near active volcanoes?

- Turn off the layer, Earthquake Magnitude 5.7+ (2004-2007).
- Turn on the layer, Volcanoes By Type.
- Pause your pointer over the Volcanoes By Type layer name and click the Show Legend icon.
- Volcanoes are grouped in three types: active, potentially active, & solfatara state (venting mostly hot gas).
- Note the different symbols used for each type of volcano.
- Find a city near a volcano and measure in kilometers between the nearest active volcano and that city. (See the *Use the Measure Tool ToolTip* on the next page for details.)
- ? What distance is the city to the volcano? [*Answers will vary, but some cities are as near as 20 km to volcanoes.*]

Analyze

Where might plate subduction occur?

- Turn off all layers except the layer, Earth's Tectonic Plates.
- Click the plates to discover their names.
- Many of the plate boundaries around the Pacific Rim have areas called subduction zones, where one plate is diving underneath another one, and can be identified by deep underwater trenches and volcanic island arcs along plate boundaries.
- Turn on the layer, World Imagery.
- ? Turning the Plate Boundaries layer on and off as needed, where do you think subduction may be occurring?
[Along the western boundary of the Pacific plate and the eastern and southern boundaries of the Indo-China plate.]

Act

Where are future cities at risk?

- Turn on the two layers, Major Cities and Volcanoes by type.
- Zoom and pan the map, clicking cities to find the closest to active volcanoes and subduction zones.
- ? List three cities that may be at risk of volcanic or seismic events in the future. *[Answers will vary.]*

USE THE MEASURE TOOL

- Click Measure, select the Distance button, and from the drop-down list, 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.

ZOOM TO A BOOKMARK

- Click Bookmarks.
- Click a bookmark name to zoom to a map location and scale.

Next Steps

DID YOU KNOW? ArcGIS Online is a mapping platform freely available to public, private, and home schools. A school subscription provides additional security, privacy, and content features. Learn more about ArcGIS Online and how to get a school subscription at <http://www.esri.com/schools>. **THEN TRY THIS...**

- Find major East Asia cities within 20 kilometers of an active volcano by creating buffers.
- Create a buffer for the Major Cities layer with a distance of 20 kilometers (0.612 credits).

TEXT REFERENCES

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

- *World Cultures and Geography* by McDougal Littell
- *My World Geography* by Pearson