



Seasonal differences

from the Esri GeoInquiries™ collection for World Geography

Target audience – World geography learners

Time required – 15 minutes

Activity	Observe patterns of monsoon rainfall in South Asia and analyze the relationship of those patterns to the region's physical features and agriculture.
Social studies Standards	C3:D2.Geo.1.6-8. Construct maps to represent and explain the spatial patterns of cultural and environmental characteristics. C3:D2.Geo.3.6-8. Use paper-based and electronic mapping and graphing techniques to represent and analyze spatial patterns of different environmental and cultural characteristics.
Learning Outcomes	<ul style="list-style-type: none">Describe the patterns of monsoon rainfall in South Asia.Explain the influence of landforms on patterns of precipitation.

Map URL: <http://esriurl.com/WorldGeoInquiry11>

Ask

What are the rainfall patterns in South Asia's coastal cities?

- Click the link above to launch the map.
- With the Details button underlined, click the button, Show Contents.
- In the map, click the city of Mumbai (with arrow pointing to it), and then in the pop-up, scroll down and view the list of monthly and annual rainfall by millimeters.
- ? Which months get rainfall greater than (>) 50mm in Mumbai? [June-Oct]
- ? What is the highest monthly rainfall in Mumbai (in millimeters)? Highest annual? [Monthly = 650mm, Annual = 2,100mm]
- Close the Identify pop-up window and click the coastal city of Mangalore, directly to the south of Mumbai.
- ? Which months gets rainfall > 50mm in Mangalore? Highest monthly? Highest annual? [>50mm = May-Nov; Monthly = 1000mm; Annual = 3400mm]

Acquire

How does precipitation compare between coastal and inland cities in South Asia?

- Click the city of Bangalore, directly east of Mangalore.
- ? What is the rainfall pattern in Bangalore? [>50mm = May-Nov; Monthly = 175mm; Annual = 900mm]
- ? How does the rainfall pattern of Bangalore compare with that of Mangalore? [Rainy season between May and November but Mangalore gets four times more rainfall in a year]
- ? Click the Measure tool and measure the distance in kilometers between the two cities. (See the ToolTip on the next page for details)
- ? What is the distance between the two cities? [Approximately 270 kilometers]

Explore

What does the physical geography look like between coastal and inland South Asian cities?

- In the Contents pane, check the Physical Features layer box to turn on the layer, and then click the Show Legend button.
- ? Observing the Physical Features layer, hypothesize why Bangalore receives far less rainfall than the coastal city of Mangalore. [A narrow coastal mountain range separates the two cities and differences in precipitation result from the orographic effect (monsoon winds forced to rise over mountains, condense in the cooler upper atmosphere, and fall on the western side of the mountains)]
- Turn off the Physical Features layer and collapse the legend.

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Analyze

What is the pattern of yearly precipitation across South Asia?

- Investigate the precipitation of Kabul in Afghanistan and the eastern cities of Kolkata, India, and Dhaka, Bangladesh, using the previously learned methods.
- ? Describe the pattern of rainfall in these cities. *[Kabul is extremely dry while Kolkata and Dhaka have long rainy season with significant annual rainfall]*
- ? What happens to the rainfall pattern as it moves from west to east across South Asia? *[Amount of rainfall increases from west to east and rainy season gets longer]*



Act

What is the monsoon's impact on agriculture in South Asia?

- Turn on the Yearly Rain South Asia and South Asian Agriculture layers and click the Show Legend buttons.
- Toggle between the two layers and observe which crops are grown in the areas with the most and least precipitation.
- ? What can you say about yearly rain relative to the types of agriculture in South Asia? *[Crop farming is in the areas with moderate and higher rainfall, and grazing/herding and oasis agriculture are in the very lowest amounts of rainfall]*

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.

IDENTIFY A MAP FEATURE

- Click a feature on the map, and a pop-up window will open with information.
- Links and images in the pop-up are often clickable.
- An arrow icon in the upper right of the window indicates that multiple features have been selected.
- Click the button to scroll through the features.

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...

- Add the population density layer and compare population density to precipitation and physical features in South Asia.
- Use the Data Enrichment tool on the Cities South Asia layer to compute the 2018 population for those cities.



TEXT REFERENCES

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

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