

GEOGRAPHIC INFORMATION SYSTEMS

Talking *points*

COMPREHENSION

1. What is environmental justice? How can GIS be used to highlight and address issues surrounding environmental justice?
2. Why must people be considered at the heart of all conservation efforts? What problems might arise if local communities are not consulted or included?

APPLICATION

3. How could you apply GIS to your hobbies? What spatial data about your interests would you want to analyze, and what maps would you want to create?
4. How do you think a meteorologist, an epidemiologist, and an urban planner would use GIS in their jobs?

ANALYSIS

5. Why do you think urban neighbourhoods with low tree density experience higher temperatures?
6. Lindsay mentions that maps of low tree density also commonly correlate with maps of marginalized populations and poor health outcomes. Why do you think this is?

EVALUATION

7. The people featured in this article highlight the range of careers that use GIS. Which of these different careers most appeals to you, and why?
8. According to Carmen, while a picture speaks a thousand words, a map speaks a million words. To what extent do you agree that maps are more efficient and effective than pictures at communicating issues to the public?

Activities

1. Get a grip on GIS!

This activity is the first in a series of six lessons that will introduce you to ArcGIS Online. ArcGIS Online is a free GIS platform that allows you to analyze spatial data, and this lesson series will teach you some of the different skills this requires.

Visit the GIS team's Futurum webpage to access the full lesson series: www.futurumcareers.com/careers-in-gis

Lesson 1: Part A – Importing, displaying and filtering data

Visit ArcGIS Online at www.arcgis.com/apps/mapviewer/index.html to open an interactive world map. This exercise will investigate air quality data from Chicago, Illinois, USA.

Importing data

On the left side of the screen, under 'Layers', you have the option to 'Add' layers of publicly available data to the map. Click 'Add', then enter 'Chicago_Air_Quality ryanmillerWLHS' in the 'Search for layers' box (make sure it says 'ArcGIS Online', not 'Living Atlas' at the top. You can change this by clicking on the drop-down icon). Click on the image and select 'Add to map'.

This layer contains polygons of the US Census Tracts with some general demographic information and air quality measurements. Under the 'Styles' tab (Σ) on the right side of the screen, you can choose which attributes, or data fields, you want to map. Click on '+ Field', select 'AQHINdexsc' then 'Add' this attribute to your map. AQHINdexsc is the name of the air quality data field, which measures levels of particulate matter (air pollution) in units of parts per million (ppm).

Displaying data

Ensure the air quality data is styled as 'Counts and Amounts (color)' so areas of high particulate matter (poor air quality) are displayed with dark colors while areas of low particulate matter (good air quality) are displayed with pale colors. You can change the color scheme under 'Style options'.



More resources

- Teachers and students interested in engaging more with GIS can contact The Learning Partnership team at www.jointhepartnership.net/contact-us. The team has developed a Geospatial Semester curriculum and can co-develop GIS-focused units for schools.
- ESRI provides a wealth of resources for schools and teachers: www.esri.com/en-us/industries/k-12-education/overview
- ESRI also has a YouTube channel full of videos about GIS: www.youtube.com/user/esritv

Filtering data

According to the Environmental Protection Agency, particulate matter levels lower than 50 ppm are not considered a risk to public health. Particulate matter levels over 50 ppm but below 100 ppm are considered acceptable; however, people sensitive to air pollution (e.g., those with breathing difficulties or asthma) may be at risk.

Applying a filter to the data will allow you to analyze which areas of Chicago have lower air quality. A filter selects a subset of data while hiding all other values. It can be easily modified and will not change the original data layer. A filter uses a query, or logic statement, to select the data of interest. There are three steps to any query:

1. Choose an attribute (i.e., the data field being analyzed)
2. Choose a logic statement (e.g., is equal to, is not equal to, is greater than, etc.)
3. Choose a value

To locate areas in which Chicago residents may be at risk from air pollution, you can add a filter under the

'Filter' tab on the right side of the screen (🔍). Click on '+ Add expression', select 'AQHIndexsc' as the attribute field and click on 'replace'. Then select 'is greater than' for the logic statement and enter '50' as the value.

Explore how the map changes as you change the filter parameters, then consider the following:

- What is the distribution of particulate matter (air pollution) in Chicago?
- In which areas might residents be at risk from health problems caused by air pollution?
- Why do you think these areas have lower air quality? Look closely at the base map and research online to discover the features and characteristics of these areas (e.g., are there major roads or polluting industries nearby?)
- What is the maximum level of particulate matter (in ppm) recorded in Chicago. In which areas does it occur, and why might this be?
- Which areas have the lowest levels of air pollution? Why do you think this might be?

Lesson 1: Part B – Creating permanent data subsets

Applying a filter to a dataset is sufficient if

your goal is to analyze the data within the map. However, if your goal is to use the data as part of a larger analysis, it is necessary to save this subset of data permanently. Creating a permanent data subset requires the use of an analysis tool. Visit www.futurumcareers.com/careers-in-gis to find the remainder of Lesson 1 with instructions for how to achieve this.

2. Inspiring change with maps

How could you use maps to communicate an environmental or social problem to policymakers and the public?

Choose a local or global environmental or social issue, such as deforestation or homelessness. What data would you want to analyze to investigate this problem? Search for and download relevant data that is publicly available online and import this into GIS software (e.g., ArcGIS Online or QGIS). Create maps that highlight your chosen issue. How will you ensure your maps effectively communicate the problem to policymakers and the public?