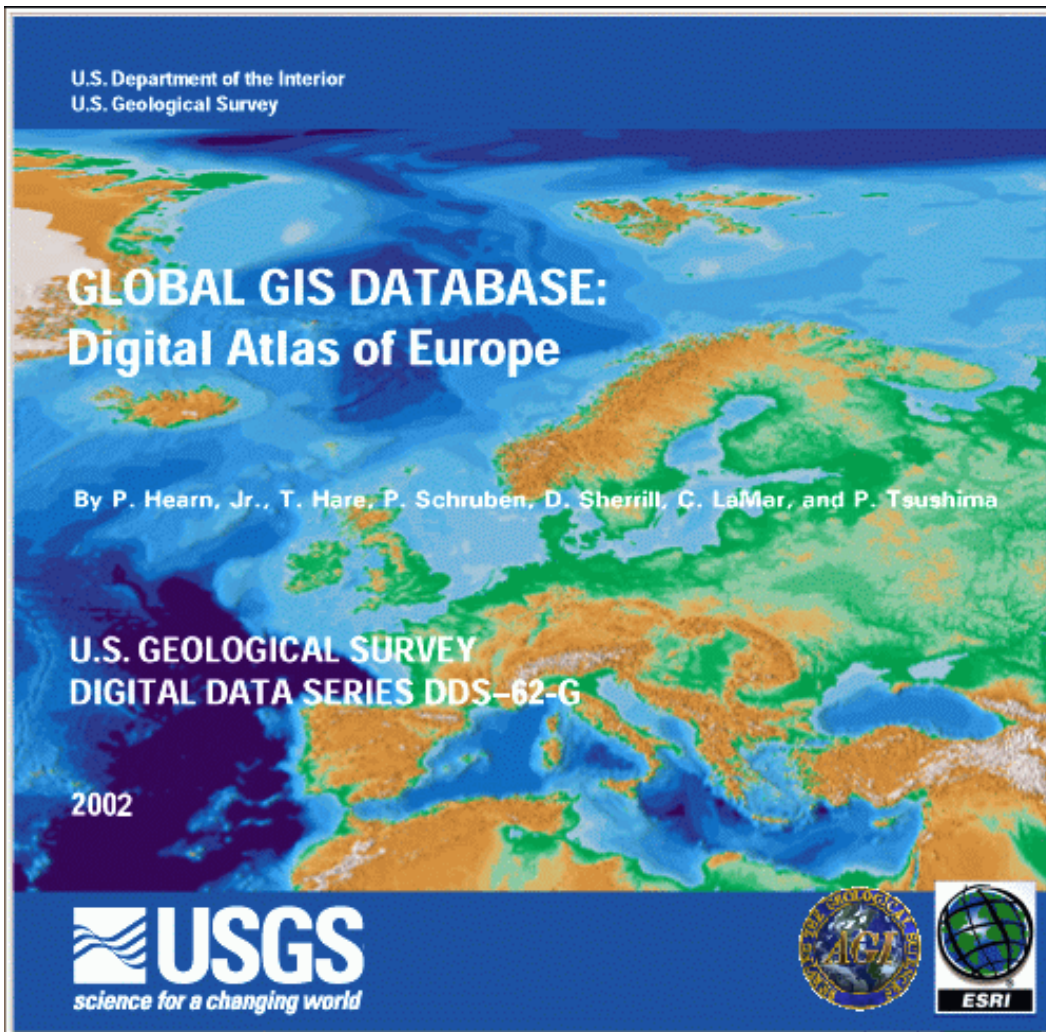# Global GIS Education:

Exploring Population in Europe

Author: Joseph J. Kerski, Ph.D.
Geographer
US Geological Survey
jjkerski@usgs.gov
rockyweb.cr.usgs.gov/outreach/

Global GIS Education: *Exploring Population Resources in Europe*

Description

In these lessons, students use Geographic Information Systems (GIS) together with the tools and data from the Europe Global GIS CD to investigate the relationships between population--in cities, countries, regions, and the whole continent--to landforms, rivers, ecological regions, and other features and phenomena. The lessons can be used with other data in the Global GIS project to investigate population on other continents. Furthermore, the methods used here can be applied to other map themes contained within the Europe GIS dataset.

The lessons are organized into 5 parts:

Part 1--Examining Cities and Countries
Part 2--Examining Urban Areas and Population
Part 3--Examining Population and Ecological Region
Part 4--Examining Infrastructure
Part 5--Examining Administrative Areas

Problem Setting

Population--where we live--is influenced by landforms, climate, vegetation, rivers and other aspects of our physical geography. Conversely, human populations also create pressure on water resources, mineral resources, and causes alterations in land use. Thus, physical geography affects human geography, and vice versa.

In these lessons, students have the opportunity to study the above issues involving population. They will analyze how populations are affected by physical features, and how physical features affect human populations.

Investigation

The U.S. Geological Survey was created in 1879 to help understand the geologic, biologic, hydrologic, and geographic characteristics and phenomena of the planet. Included in this mission is a thorough understanding of population. To help assess population in Europe, the U.S. Geological Survey has hired you as an earth systems scientist to analyze the spatial data.

●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●

•••• Part 1: Examining Cities and Countries

In this part, you will examine population throughout Europe.

After accessing the Global GIS interface, you will be viewing the "G" part of GIS with the map on the right side and a set of tools across the left and the top.

Turn off (uncheck) all themes except for the following:

- shaded relief base (at bottom of table of contents)

1) Parts of other continents besides Europe are shown on the map. What are they?

2) Describe at least three characteristics of the land surface in Europe, including areas where mountain ranges exist.

Turn on the Major Cities and Major City Labels by checking the box to the left of each theme name.

3) Describe the relationship of major cities to landforms, including in your paragraph an assessment of whether most major cities are in mountainous areas or flat areas.

4) Examine the Alps, mountains in the center of Europe. Do any major cities exist there? Why or why not?

Turn on Political Boundaries and Political Boundaries labels.

You can identify the cities by clicking once on the Major Cities theme to raise it up (make it "active"), then clicking on the identify button, and clicking on the city you wish to identify.

5) Identify the name of the northernmost major city in Europe, and the country in which it is located.

6) Identify the name of the easternmost major city in the data set, and the country in which it is located.

7) Is this city in Europe? If not, which continent is it on?

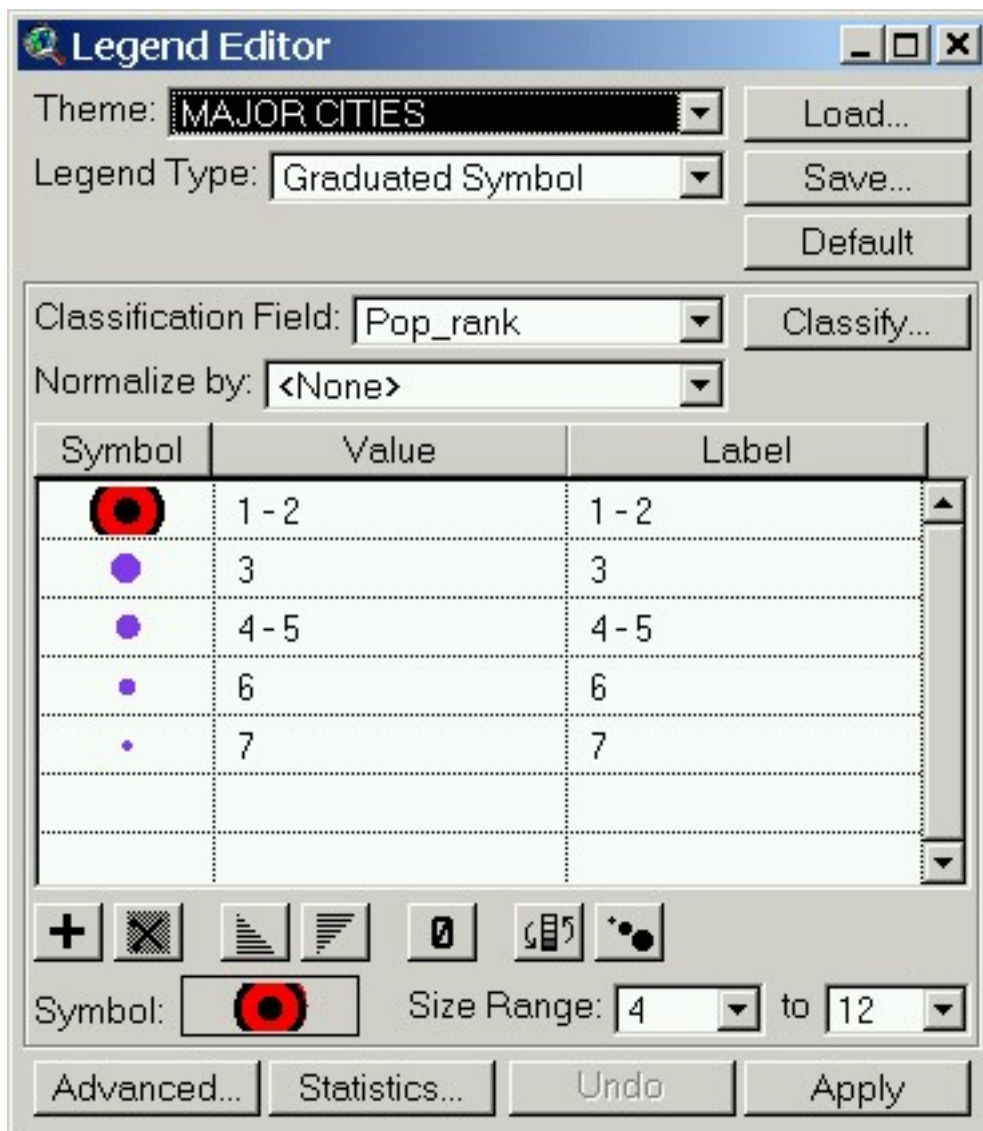8) Identify the name of the southernmost major city in the data set, and the country in which it is located.

9) Is this city in Europe? If not, which continent is it on?

10) Identify the name of the westernmost major city in the data set, and the country in which it is located.

11) Is this city in Europe? If not, which continent is it on?

12) Identify the country that you believe contains the most major cities.

13) Why do you believe this country contains so many major cities?

14) Identify the countries that you believe contains the second and third most major cities.

15) Why do you believe these countries contain so many major cities? Are the reasons the same for each country?

16) Identify the country that you believe contains the fewest major cities.

17) Why do you believe this country contains so few major cities?

18) Identify the countries that you believe contains the second and third fewest major cities.

19) Why do you believe these countries contain so few major cities? Are the reasons the same for each country?

Each city has the same symbol. Change it so that larger cities have a larger symbol, as follows:

Double-click on the Major Cities theme to access the legend editor.

Change the legend to a "Graduated Symbol" type, and change the classification field to "Pop_rank."

Near the bottom, to the right of the NULL sign, is an "invert symbols" button. Click on the "invert symbols" button so that the largest cities (with a population rank of 1-2) have the largest symbol, as follows:

Legend Editor   _ □ ✕

Theme: **MAJOR CITIES**   [Load...]

Legend Type: Graduated Symbol   [Save...]

[Default]

Classification Field: Pop_rank   [Classify...]

Normalize by: <None>

Symbol	Value	Label
◉	1-2	1-2
●	3	3
●	4-5	4-5
●	6	6
●	7	7

[+] [✕] [▰] [▰] [0] [▥] [••]

Symbol: [◉]   Size Range: 4 ▼ to 12 ▼

[Advanced...] [Statistics...] [Undo] [Apply]

Apply the legend and examine your map.

20) Describe in your own words the distribution of major cities in Europe. In what parts of Europe are major cities located? In what parts are they absent?

21) How many cities with a rank of 1-2 are on coastlines?

22) What was the importance of being on an ocean or sea to a city in the past?

23) What is the importance of being on an ocean or sea a city today?

24) What percent of the largest cities (with a population rank of 1-2) are on coastlines?

25) What determines if an area is classified as a city?

●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●

●●● Part 2: Examining Urban Areas and Population

Other themes besides cities might yield a better understanding of the population of Europe.

Turn off Major Cities and Major City Labels. Turn on Urban Areas. Toggle on and off Political Boundaries and Political Boundary Labels as needed.

26) Describe in your own words the pattern of urban areas across Europe, noting the Countries in which they fall and the regions in which they occur.

27) Which three countries would you say are the most urban?

28) Which three countries would you say are the most rural?

29) What factors determine how many people live in cities versus rural areas?

30) What theme do you think provides a more accurate assessment of the population of Europe--cities or urban areas?

Turn off Urban Areas and Turn on the Population Theme (near the bottom of the table of contents). This is a raster image of population, with red the most population, followed by yellow, followed by gray.

31) Describe in your own words the pattern of urban areas across Europe, noting the Countries in which they fall and the regions in which they occur.

32) Which three countries would you say are the most urban?

33) Which three countries would you say are the most rural?

34) Are the six countries you identified as most urban and most rural from analyzing the Population theme the same countries that you listed when you looked at the Urban Areas theme? Why or why not?

35) In your own words, discuss how the different ways data are displayed and presented affect our perception of the phenomenon, using your current study of population as the basis for the discussion.

36) What is the relationship of population to proximity to the Mediterranean Sea, particularly along the coast of North Africa?

37) Why do you suppose this relationship exists?

38) In your judgment, which of the three themes you have examined provides a more accurate assessment of the population of Europe--cities, urban areas, or population?

Turn off the Population Theme and Turn on Urban Areas.

●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●

●●●● Part 3: Examining Population and Ecological Region

Next you will examine the relationship of urban areas to ecological regions.

Double-click on your ecological regions theme and examine the legend.

39) What are examples of ecological regions?

Dismiss the legend editor.

To show the legend in your table of contents, on the bottom of the Global GIS Tools box, click on Advanced Interface. In the Theme pull down menu, select "Hide/Show Legend." The legend for the ecological regions should now appear.

40) In which Ecological Regions are Urban Areas most common in Europe?

41) Why?

Zoom in to Switzerland and examine Ecological Regions, Cities, Urban Areas, and Shaded Relief.

42) Where are cities most common in Switzerland--mountains or valleys?

43) Why?

●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●

•••• Part 4: Examining Infrastructure

Other themes of infrastructure--things humans have built--may help our understanding of population in Europe as well.

Turn off all themes except the shaded relief base.

Make the Utility Lines theme visible.

44) What are the types of utility lines are shown in this theme?

45) Do you think this theme shows a SELECTION of Europe's utility lines, or ALL utility lines? Why?

46) Describe the pattern of utility lines in Europe, noting areas of dense lines, and areas of few lines.

47) What is the relationship of utility lines to the location of cities? Why?

Turn off all themes except the shaded relief base.

Make the Railroads theme visible. Toggle cities on and off as needed.

48) Do you think this theme shows a SELECTION of Europe's railroads, or ALL railroads? Why?

49) Describe the pattern of railroads in Europe, noting areas of dense railroads, and areas of few railroads.

50) What is the relationship of railroads to the location of cities? Why?

Turn off all themes except the shaded relief base.

Make the Roads theme visible. Toggle cities on and off as needed.

51) Describe the pattern of roads in Europe, noting areas of dense roads, and areas of few roads.

You have been examining major cities only. You may have noticed that another theme exists called Cities, Towns, and Villages. You need to zoom in before these will become visible.

Zoom to an area of interest to you.

52) Are there more Cities, Towns, and Villages, or more Major Cities? Why?

Make Cities, Towns, and Villages the active theme by single-clicking on the theme name.

 Open the Cities, Towns, and Villages table with the leftmost button in the table tools:

.

53) What is the number of records (rows) in the table (listed in the upper right)? This corresponds to the number towns in the data set.

Close the table and examine the table for Major Cities.

54) How many major cities exist in the data set?

55) Go back and examine your map. Discuss the difference and similarities between the pattern of Major Cities and that of Cities, Towns, and Villages.

Zoom to the coast of Norway.

56) Discuss the pattern of cities, towns, and villages in relationship to the coast. Are there more towns nearer the coast or inland? Why?

Zoom to the coast of Germany, The Netherlands, and France.

57) Does this same relationship of coastline to towns exist? Why or why not?

Turn off all themes except the shaded relief base.

●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●●
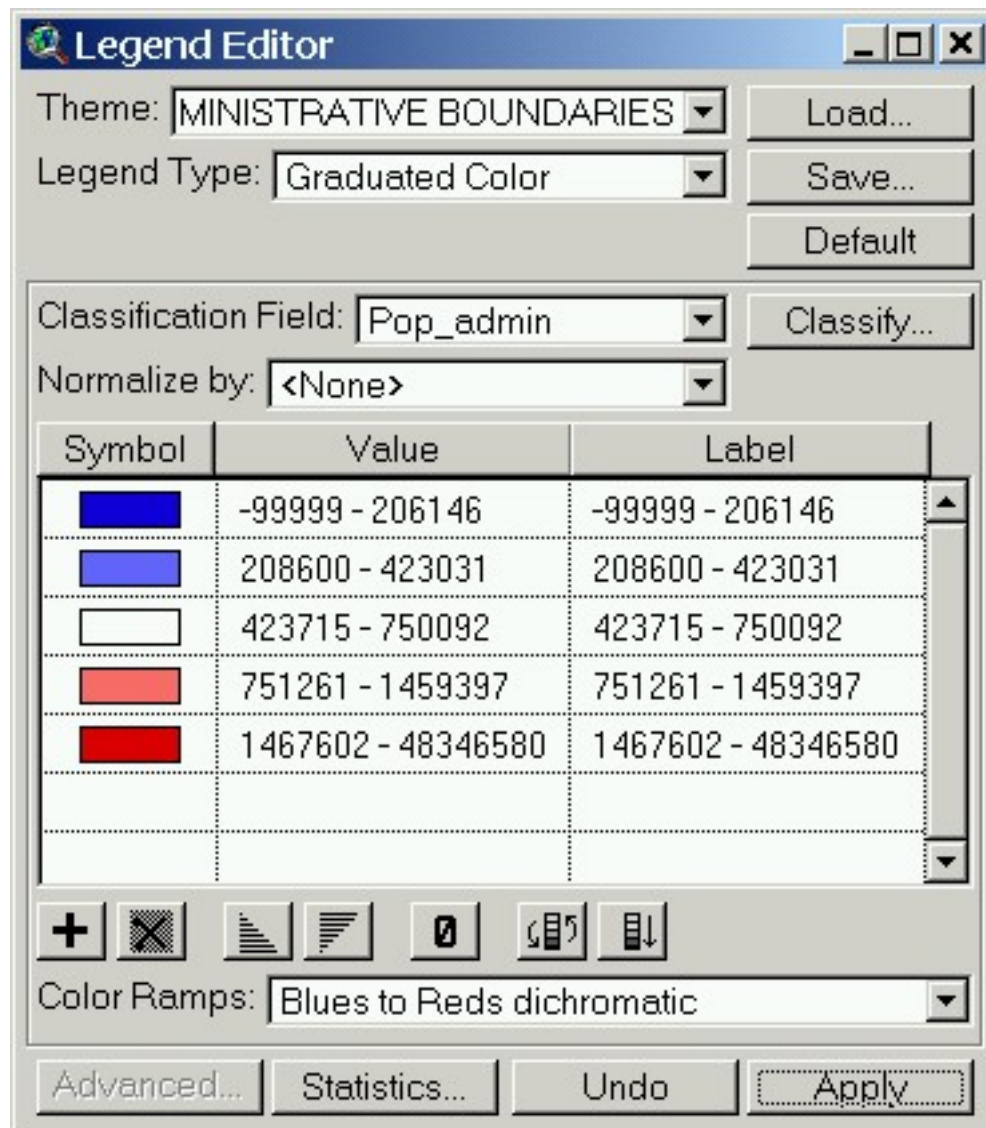
●●●● **Part 5: Examining Administrative Areas**

Turn on the Administrative Areas theme (near the bottom of the table of contents).

58) Are administrative areas smaller or larger than countries?

59) What are administrative areas?

60) Why do administrative areas "nest within" countries?

Next, you will analyze the population in Europe by making a choropleth map; a thematic map of polygons. In this case, the variable mapped will be the population in each administrative area. To do this, double-click on the Administrative Area theme to access the legend editor. Change the legend type to graduated color, and the classification field to Pop_admin, as follows:

Symbol	Value	Label
	-99999 – 206146	-99999 – 206146
	208600 – 423031	208600 – 423031
	423715 – 750092	423715 – 750092
	751261 – 1459397	751261 – 1459397
	1467602 – 48346580	1467602 – 48346580

Legend Editor

Theme: MINISTRATIVE BOUNDARIES   Load...
Legend Type: Graduated Color   Save...
    Default

Classification Field: Pop_admin   Classify...
Normalize by: <None>

Color Ramps: Blues to Reds dichromatic

Advanced...   Statistics...   Undo   Apply

Use whatever color ramp you would like. Click on the Classify button and change to quantile, as follows:

Classification ✕

Type: Quantile ▼

Number of classes: 5 ▼

Round values at: d.ddd ▼

OK   Cancel
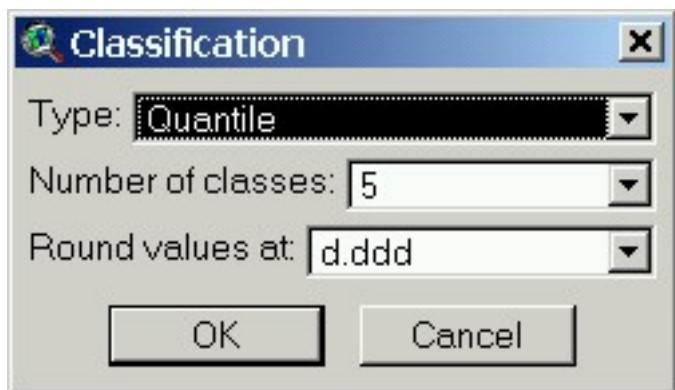
Quantile means that you will classify the data with the same number of administrative areas for each of your 5 population classes. Select OK in your Classify Box, and Apply in your legend editor. Observe the resulting map.

61) What do you observe about population in Europe, based on administrative area?

62) Does this change your perception of Europe's population distribution, as opposed to the urban areas, population, and cities themes you examined earlier? Why or why not?

To show the legend in your table of contents, on the bottom of the Global GIS Tools box, click on Advanced Interface. In the Theme pull down menu, select "Hide/Show Legend." The legend for the administrative areas should now appear.

63) Examine the legend. What is the highest population for any Administrative Area in the dataset?

Use caution when interpreting this or any data. As an example, use the identify button 🛈 and select the administrative areas of Bosnia, Serbia, or others on the eastern shore of the Adriatic Sea, east of Italy.

64) What is the population of these areas?

65) The code -99999 means that the population data is missing in this area. If you **did not** realize this, what would be your conclusion concerning the population of these areas based on analyzing the map alone?

Access the table for the Administrative Areas dataset with the leftmost button in the table tools: Table / Sele .
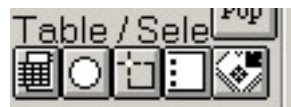
Click on the pop_admin and sort it in descending order .

Select the record at the top, the record corresponding to the area with the largest population, by using the black arrow. .

66) What is the name of the largest administrative area?

Zoom to this area on the map by clicking on the "zoom to selection" button, the right-most button below:

67) In what country is this area located in?

68) Why is it so populous? What effect does the areal size of the area have on its population?

Repeat the above procedures to identify the second most populous administrative area.

69) What is its name, and in which country is it located?

70) Is this area smaller or larger in extent than the most populous administrative area?

71) Would you say that the population density here is *less* or *more* than that of the most populous administrative area? Why?

72) Why is this area so populous?

Repeat the above procedures to identify the least populous administrative area.

73) What is its name, and in which country is it located?

74) Why is this area so sparsely populated?

75) Congratulations! You have completed your mission and have contributed much to the understanding of population in Europe. Indicate what you consider to be the most surprising thing you have learned, the most interesting thing, and the most significant thing.

Most surprising:

Most interesting:

Most significant:

76) Based on what you have learned about the population of Europe, write a short paper summarizing what you have learned. Include in your paper a discussion of the influence of physical geography on population, and the impact of population on the land use and issues facing Europe today.

U.S. Department of the Interior
U.S. Geological Survey
URL:http://rockyweb.cr.usgs.gov /public/outreach/globalgis/europe/population_europe.html
Last modified: 16 April 2004