Introduction to Human Geography Using ArcGIS Online

Chapter 11 Exercises

Exercise 11.1: How gerrymandered is your congressional district?

Introduction

Your textbook describes the gerrymandering strategies of packing and cracking. Packing is where a group is concentrated in a small number of districts, so that while they win those districts, they lose the rest. With cracking, a group's electoral strength is diluted by breaking it up into many different districts. This dilution ensures that they cannot get enough votes to elect their desired candidate in any of the districts.

A common technique to see if a district may be gerrymandered is to measure its degree of compactness. If a district is not compact, but rather has long tentacles stretching to seemingly random parts of the state, it may reflect attempts to manipulate the electoral process.

The Polsby-Popper technique measures the ratio of a district's area to the area of a circle with the same perimeter of the district. The logic behind this is that a circle represents the most compact shape for any given perimeter. Results range from 0 to 1. Districts with a more irregular shape will have a value closer to 0, while districts with a more compact shape will have a value closer to 1.

The Polsby-Popper equation is as follows:

$$4\pi * A/p^2$$

A is the area of the district, and p is the perimeter of the district.

In this exercise, you will use the Polsby-Popper technique to visualize potential gerrymandering of districts used for the 114th Congress (2015–17).

Objectives

- Calculate the degree of gerrymandering using the Polsby-Popper equation.

- Evaluate the degree of gerrymandering in your Congressional district.

- Determine the level of racial gerrymandering in North Carolina.

- Apply the concepts of cracking and packing to gerrymandering in North Carolina.

1. **Open the Chapter 11 Gerrymandering map and sign in to your ArcGIS Online account: http://arcg.is/089mSW**

   The map contains the following layers:

   a. **Congressional Districts. This layer shows US Congressional Districts (114th Congress, 2015-17)**

   b. **Predominant Race/Ethnicity. This layer show US Census data on the predominant race/ethnicity for each census tract in the US.**

   c. **North Carolina Congressional Districts. This layer shows districts mapped with a custom expression to reflect Polsby-Popper scores.**

2. **Use the Expression Builder to map potentially gerrymandered districts using the Polsby-Popper method.**

- **Hover your mouse over the Congressional Districts layer and click Change Style.**

- **In step 1, choose an attribute to show: scroll down and select New Expression.**

- **In the Custom expression window, enter the Polsby-Popper equation in the script box on the left. Translated into Arcade script format, it is written as follows (you can copy and paste the text):**

(4 * PI) * ($feature.Shape__Area/($feature.Shape__Length * $feature.Shape__Length))
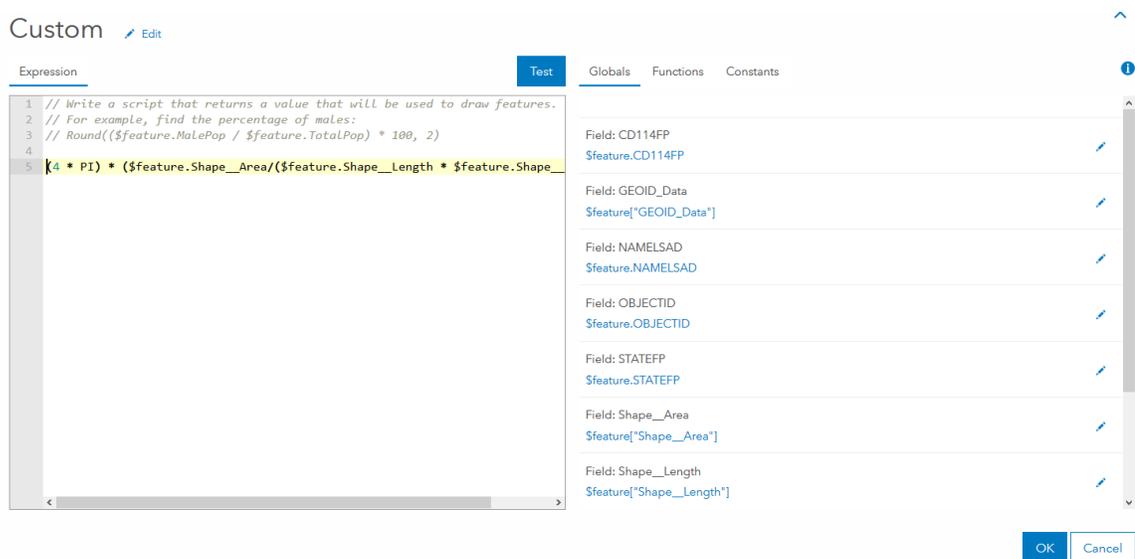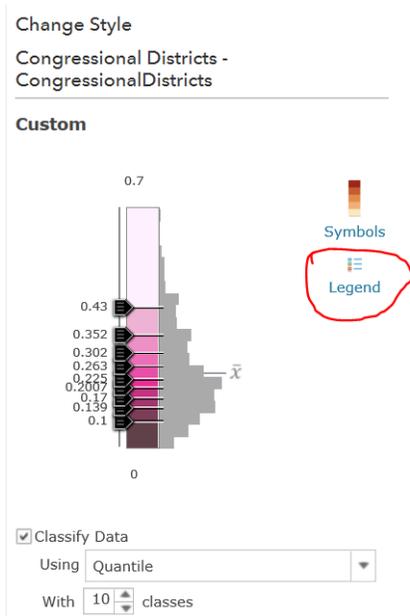

- **Click OK.**

- **In step 2, select a drawing style, select Counts and Amounts (Color), then click Options.**
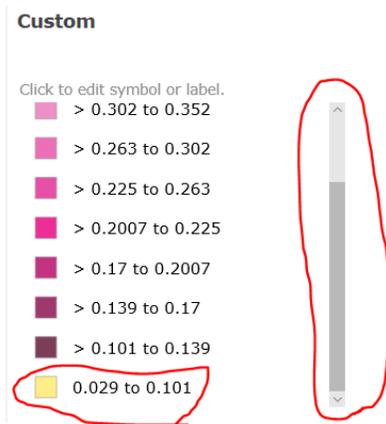

- **Classify the Polsby-Popper score into deciles (quantiles with 10 categories), so as to identify the 10% of districts with the least compact shape.**

- **In the Change Style window, check the box for Classify Data.**

  - **Using: Quantile**

  - **With: 10 classes**

- **In the Change Style window, click the Legend icon.**

- **Scroll down the categories to see the lowest decile.**

- **Click the color square for the lowest decile and change the color to a bright color.**

  This highlights the 10 percent least compact Congressional districts.

  Custom

  Click to edit symbol or label.
  > 0.302 to 0.352
  > 0.263 to 0.302
  > 0.225 to 0.263
  > 0.2007 to 0.225
  > 0.17 to 0.2007
  > 0.139 to 0.17
  > 0.101 to 0.139
  0.029 to 0.101

- **Click OK, Ok, then click Done.**

Question 11.1.1

Zoom to your congressional district. How potentially gerrymandered is it? Does it have a more compact form (score closer to 1) or less compact form (score closer to 0)?

Question 11.1.2

Print or take a screenshot of your congressional district.

Question 11.1.3

Which state seem to have the most potentially gerrymandered districts? (Look at lowest decile, which you highlighted in a bright color.)

In 2016, the US Supreme Court looked at a case in North Carolina alleging gerrymandering of Congressional districts that violate the Voting Rights Act by reducing the opportunity of minority voters to elect the candidates of their preference. In the following section you will look at the districts in detail. In North Carolina, blacks disproportionately vote Democrat, while whites disproportionately vote Republican.

3. **Turn off the Congressional Districts layer and turn on North Carolina Congressional Districts. Zoom to North Carolina.**

The layer shows the districts mapped by their Polsby-Popper score. Several are clearly seen as falling in the bottom decile due to their unusual shapes.

4. **Turn off the North Carolina Congressional Districts layer and turn on the North Carolina, Predominant Race/Ethnicity layer. This shows the predominant race/ethnicity for each census tract. You can see the legend by hovering over the layer name and clicking the legend icon .**

5. **Use the Summarize Within tool to determine the racial distribution within each North Carolina Congressional District.**

As you can see on the map, the most significant racial minority in North Carolina is African Americans. This is also the group allegedly harmed by gerrymandering according to the 2017 lawsuit.

6. **Click the Analysis button, click Summarize Data, then click Summarize Within.**

7. **In step 1 choose an area layer to summarize other features within its boundaries, select North Carolina Congressional Districts.**

8. **In step 2 choose a layer to summarize, select North Carolina, Predominant Race/Ethnicity.**

9. **In step 3 add statistics from the layer to summarize, set the values as follows:**

- **Field: Total_Population   Statistic: Sum**

- **Field: White_Non_Hispanic   Statistic: Sum**

- **Field: Black_Non_Hispanic   Statistic: Sum**

10. **In step 5 result layer name, give your layer a unique name.**

Summarize Within ⓘ ◄

1 Choose an area layer to summarize other features within its boundaries ⓘ

North Carolina Congressional Distr... ▼

2 Choose a layer to summarize ⓘ

North Carolina, Predominant Race/... ▼

3 Add statistics from the layer to summarize
ⓘ

☑ Sum Area in | Square Kilomet... ▼

Total_Popula.. ▼	Sum ▼	✖
White_Non_... ▼	Sum ▼	✖
Black_Non_... ▼	Sum ▼	✖

11. **Uncheck the Use current map extent box to make sure all North Carolina districts are included in the analysis.**

12. **Click the Show credits link. It should use about 2.2 credits. If not, check your settings in each step.**

13. **Click Run Analysis.**

14. **Calculate the proportion of blacks in each of the 13 districts.**

- **Hover your mouse over the new Summarize North Carolina layer you just created and Show Table.**

- **Click the CD114FP field and Sort Ascending.**

- **From the attribute table, fill in the values for columns A and B in the following table.**

- **Use a calculator for the values in column C.**

Congressional District	A. Sum Black_Non_Hisp	B. Sum Total_Pop	C. % black (Divide Black/Total Pop)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			

Question 11.1.5

Based on the table above, which two districts have the highest proportion of blacks?

15. **Turn off all layers except North Carolina Congressional Districts.**

16. **Click the districts in the map and locate the two districts with the highest proportion of blacks that you found previously.**

Question 11.1.6

Do these two districts appear to be gerrymandered according to the Polsby-Popper score?

17. **Turn off all layers except North Carolina Congressional District Outlines and North Carolina, Predominant Race/Ethnicity.**

18. **Zoom in and look at the two districts with the highest proportion of blacks from the preceding table.**

Question 11.1.7

When you examine the districts, it appears that they were clearly drawn with race in mind. For each of the two districts, list some of the urban areas with a predominance of blacks that fall within these irregularly shaped polygons.

District ___: Cities include…

District ___: Cities include…

Question 11.1.8

If you are the plaintiff, arguing that these districts are gerrymandered and violate the Voting Rights Act, would you argue that the State used packing or cracking to create the districts? Explain your answer.

Question 11.1.9

If you are the defendant, would you try to argue that the districts were created to avoid packing, or to avoid cracking? Explain your answer.

Conclusion

Gerrymandering has a long history in the United States and continues to influence election outcomes. Ongoing court challenges are working their way through the US court system, but in the ultracompetitive world of politics, many continue to fight for any advantage their party can gain.

Exercise 11.2: Borders and boundaries

Introduction

The location of fixed territorial borders is an essential component of states and sovereignty. Because of their importance, border delineation can lead to peace or conflict between countries. In this exercise, you will find examples of different types of borders and contemplate how they can lead to conflict when cultural groups disagree over their location.

Objectives

- Identify geometric, physical, and cultural borders.

- Evaluate how borders have led to conflict in the Balkans, Middle East, and Africa.

1. **Open the Chapter 11 Borders and Boundaries map and sign in to your ArcGIS Online account: https://arcg.is/PDC1**

    The map contains the following layers:

    a. **World Countries. Borders are drawn with a thick purple line to emphasize their locations.**

    b. **Ecoregions. These polygons reflect distinct assemblages of plant and animal species prior to major land use change. They can be**

useful in helping locate physical barriers, especially mountain ranges, that serve as political borders today.

c. **Ethnic Power Relations Dataset. This dataset shows the geographic location of politically relevant ethnic groups. It can be useful in ascertaining if borders were drawn based on the settlement patterns of distinct cultural groups.**

The map opens showing the National Geographic basemap, a good reference map that shows state borders and natural features.

As described in the textbook, there are different ways in which borders are delimited. You will begin by finding examples of geometric borders.

2. **Navigate around the map and zoom in as necessary. Find at least three examples of geometric borders, one from the Americas, one from Africa, and one from Eurasia. Complete the table.**

Question 11.2.1

Region/continent	Name of countries on either side of the geometric border
The Americas	
Africa	
Eurasia	

3. **Physical borders are even more common than geometric ones. Navigate around the map and locate one physical border on each of the five continents in the table.**

Many physical features such as rivers and mountains can be seen on the National Geographic basemap.

You can also turn on the Ecoregions layer to help identify borders that correspond with mountains. This layer shows distinct ecoregions, which are often delineated by mountains.
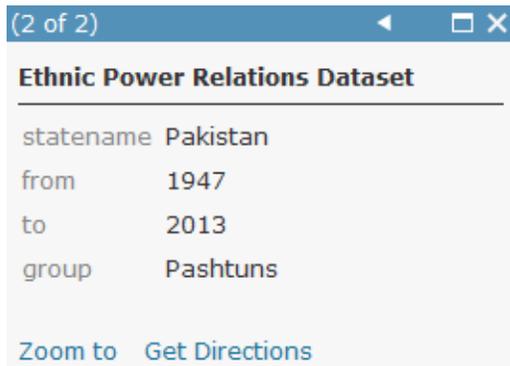
Question 11.2.2

Continent	Name of countries on either side of the physical border	Type of physical feature (river, mountain, etc.)
North America		
South America		
Africa		
Europe		
Asia		

Sometimes cultural boundaries drive the placement of political borders, leaving relatively homogenous groups in states on either side. These types of states are often referred to as nation states. It must be noted, however, that populations are almost never completely homogenous, so minority cultural groups can still be found on either side of the border. Furthermore, once state borders are drawn, there are many cases where people move to the side where they are part of the majority, either through voluntary or forced migration.

4. **Turn on the Ethnic Power Relations Dataset.**

Each polygon in this layer represents a politically relevant ethnic group. You can click the polygons to see the name of the group. In many cases, you will have to click the Next Feature arrow in the pop-up window to see data from the Ethnic Power Relations Dataset instead of just the country name.

```
(2 of 2)                    ◀   □ ✕

Ethnic Power Relations Dataset
─────────────────────────────────
statename  Pakistan
from       1947
to         2013
group      Pashtuns


Zoom to   Get Directions
```

Question 11.2.3

Navigate around the map and compare state borders to cultural boundaries. Does it appear that most countries are nation states or multination states?

Since the European partitioning of Africa under the Berlin Conference, borders and culture groups have been a regular source of conflict in the region. In recent years, a civil war has been fought between the Dinka and the Nuer people. Find the country these groups are fighting over by using the Filter tool.

5. **Hover your cursor over the Ethnic Power Relations Dataset and select the Filter tool.**

6. **In the Filter window, set the expression so that group is Dinka. Add another expression so that group is Nuer.**

7. **Near the top of the window, select Display features in the layer that match any of the following expressions. Then click Apply Filter.**

Question 11.2.4

Which country are the Dinka and Nuer fighting over?

8. **Hover your cursor over the Ethnic Power Relations Dataset and select the Filter tool again. Remove filter.**

Question 11.2.5

The Dinka, Nuer, and other ethnic groups fought for many decades for independence from their northern neighbor. What is the name of the country to their north, and which group, located around its capital city of Khartoum, once dominated them?

9. **Zoom to Europe.**

Question 11.2.6

Name two countries where political borders appear to be aligned with cultural borders.

10. **Zoom to the country of Bosnia and Herzegovina.**

Question 11.2.7

Does Bosnia and Herzegovina have political borders that match its cultural borders? If not, list the names of the major groups found within its borders.

A substantial amount of conflict in the Middle East is related to political struggles between different cultural groups, many of which would like to redraw state borders to their advantage.

11. **Zoom to Iraq, Syria, and Turkey.**

Question 11.2.8

Which major groups, which have been at odds for many years, are found in Iraq?

Question 11.2.9

Which group, which would like to have its own country, is found along the shared borders of Iraq, Syria, and Turkey?

Conclusion

In this exercise, you identified geometric, physical, and cultural borders. Oftentimes, these borders split unified cultural groups into separate states, while lumping rival groups into

the same state. While multi-nation states can still be stable and unified, in some instances groups refuse to work together, leading to civil wars and border conflicts.

Exercise 11.3: Location: the economic consequences of being landlocked

Introduction

A handful of countries have the misfortune of being landlocked, lacking access to ocean trade routes. One common theme throughout this book is that greater spatial interaction between places almost always leads to more economic activity, sharing of knowledge, and innovation, which in-turn lead to greater economic development. In a global economy, ocean shipping is the most efficient means of economic interaction, allowing for easier exporting and importing, and facilitating each country's use of comparative advantage. In this exercise you will compare income per capita for landlocked countries with those that have ocean access.

Objectives

- Analyze per capita income data for landlocked developing countries and their non-landlocked neighbors.

- Describe routes that goods from landlocked developing countries much travel along and how costs increase as a result.

1. **Open the Chapter 11 Location: Landlocked and Poor map and sign in to your ArcGIS Online account: https://arcg.is/1u8e1T**

The map contains the following layers:

    a. **Landlocked Countries. This layer contains all countries that are landlocked, with no access to open ocean.**

    b. **Landlocked Developing Countries. This layer is filtered to include only landlocked countries identified by the World Bank as "landlocked developing countries."**

2. **Begin by comparing average income per capita in landlocked developing countries with that of adjacent countries.**

If being landlocked is truly a disadvantage, you would expect them to be poorer than their neighbors that are not landlocked.

- **Click two to three landlocked developing countries and make note of their GNI per capita (PPP). Then click on a neighbor for each and make note of income. From what you see, does it appear that landlocked countries are poorer?**

- **Find the average GNI per capita for all landlocked developing countries and the average for all countries adjacent to them.**

- **Turn off the Landlocked Countries layer and turn on the Landlocked Developing Countries layer. Note that several landlocked countries in Europe are no longer visible.**

- **Hover your cursor over the Landlocked Developing Countries layer and click Show Table.**

- **In the attribute table, click on the field heading for GNI_PPP_Per_Cap_2015 and select Statistics.**

- **From the Statistics window, write the Average GNI per capita in the table (question 11.3.1).**

Question 11.3.1

	Average GNI Per Capita
Landlocked Developing Countries	
Non-landlocked countries adjacent to landlocked developing countries	

- **Now use the Find Existing Location tool to identify countries adjacent to landlocked developing countries.**

Once these non-landlocked countries are identified, you will find their average income as well.

- **Click the Analysis button, click Find Location, then click Find Existing Locations.**

- **In step 1 of the Find Existing Locations window, select Landlocked Countries. This layer includes all countries of the world, both landlocked and non-landlocked.**

- **In step 2, click Add Expression.**

- **In the Add Expression window, set Landlocked Countries intersects Landlocked Developing Countries. Then click Add.**

Edit Expression

| Landlocked Countries | ▼ | intersects | ▼ |

| Landlocked Developing Countries | ▼ |

ADD   CLOSE

This expression will identify all countries that intersect, or touch, a landlocked developing country.

Find Existing Locations   ❶ ◀

❶ **Choose layer containing features you want to find using attribute and spatial queries**   ❶

Landlocked Countries   ▼

❷ **Build a query to find features**   ❶

Landlocked Countries *intersects* Landlocked Developing Countries

ADD EXPRESSION

- **In step 3, give your layer a unique name.**

- **Uncheck Use current map extent so that all countries can be selected, regardless of your zoom level.**

- **Click Show credits. You should use less than 1 credit. If not, check the above settings.**

- **Click Run Analysis.**

Your new layer includes all countries that intersect, or touch, a landlocked developing country. Since you do not want to include the average income for people in the landlocked developing countries, use Filter to exclude them.

3. **Hover your cursor over your new layer and select Filter.**

4. **In the Filter window, set the expression so that Status is blank.**

5. **Click Apply Filter.**

You now have only countries that are not landlocked but are adjacent to landlocked developing countries. Now you can find their average income.

6. **Hover your cursor over your filtered layer and click Show Table.**

7. **In the attribute table, click the field heading for GNI_PPP_Per_Cap_2015 and select Statistics.**

8. **From the Statistics window, write the Average GNI per capita for non-landlocked countries that are adjacent to landlocked developing countries in the table in question 11.3.1).**

Question 11.3.2

Are landlocked developing countries richer or poorer than their adjacent neighbors?

9. **Zoom in to three landlocked developing countries, one in Latin America, one in Africa, and one in Asia, and determine their most likely transit country—the country goods must be moved through to reach an ocean port.**

10. **Begin by changing the Basemap so you can see transportation infrastructure.**

- **Click the Basemap button and select National Geographic.**

- **Zoom in to your first country and turn off all layers so you can clearly see the basemap.**

- **Locate the capital city of your selected country. It is shown in the National Geographic basemap as a small circle around a star. Write the name of your LLDC and its capital in the table (question 11.3.3).**

- **Follow a major highway or river from the capital city to its end point at a coastal city. We will assume that imported and exported goods move along this route.**

- **Write the name of the transit country and name of the coastal city in the table.**

- **Click the Measure tool and set it for distance in Miles.**
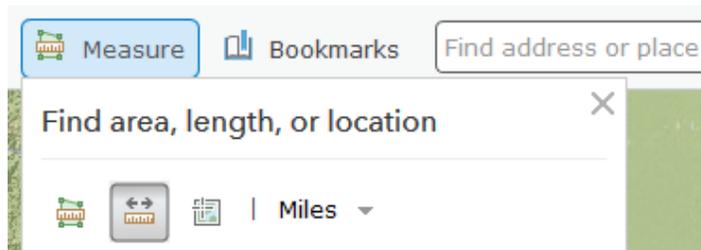
- **Click along the highway or river from the capital city to the coastal city. Write down the distance in the table.**

- **Turn the Landlocked Countries layer on and click your selected LLDC and the transit country. In the pop-up window, you can see the trading across borders rank (lower is better), as well as the cost in time and money to move goods across borders.**

- **Write the name of the country with a better trading across borders score (lower number) in the table.**

Question 11.3.3

LLDC and capital (one from Latin America, one from Africa, one from Asia)	Transit country and coastal city	Distance	Country with best trading across border rank (the landlocked one, or its transit neighbor).

Question 11.3.4

Based on the textbook explain why landlocked countries are at a disadvantage in terms of trade, and ultimately economic development.

Question 11.3.5

Describe the route that goods must travel along from your selected countries, and how costs are likely higher than if goods could go directly to a port without crossing a transit country.

Question 11.3.6

From the preceding table, did your selected LLDCs have better trading across border rankings or lower ones compared to its transit neighbor? Explain how trade efficiency in a LLDC can be negated by the lack of efficiency in its transit country.

Conclusion

As you have seen in this exercise, landlocked countries are at a disadvantage compared with those with direct ocean access. They are generally poorer, in large part because they are more isolated from the benefits of global trade and have less interaction with other places. Minimizing this disadvantage is not easily solved, and requires strong trade agreements with transit countries, investments in transportation infrastructure, reductions in corruption, and more.

Exercise 11.4: Law of the sea: global flash point in the South China Sea

Introduction

The United Nations Convention on the Law of the Sea states that countries have sovereign control 12 nautical miles beyond their coast, and exclusive economic zones for 200 nautical miles. China makes territorial claims on most of the South China Sea, even though much of the sea lies within 200 miles of Vietnam, the Philippines, Malaysia, and Brunei. To boost its claim, China claims sovereignty over myriad islands, such as the Spratly Islands, Paracel Islands, and others. In this exercise you will use the Buffer tool to visualize how claims to these islands help China argue for their right to economic control over much of the South China Sea.

Objectives

- Create 200-mile buffers that represent exclusive economic zones in the South China Sea.

- Examine Chinese land reclamation on reefs and islands in the South China Sea.

- Map the overlapping claims that can arise from China's assertion of its territorial expansion.

1. **Open the Chapter 11 South China Sea map and sign in to your ArcGIS Online account: https://arcg.is/1rLajm**

   The map contains the following layers:

   a. **Chinese Claims. This layer includes circles around three sets of islands claimed by China in the South China Sea.**

   b. **China. This layer includes an outline around China.**

   c. **Other South China Sea Countries. This layer includes outlines around Vietnam, the Philippines, Malaysia, the Brunei, all of which also make claims on parts of the South China Sea.**

   d. **Pansharpened Landsat and Panchromatic Landsat. These include time enables satellite imagery from Landsat satellites.**

   The map opens with the National Geographic basemap, focused on the South China Sea.

2. **Create a 200-mile buffer around China and the other countries facing the South China Sea. This will allow you to see the theoretical exclusive economic zones for each country. Note that the 200-mile zone is a starting point for negotiations. The specific boundaries of zones are modified as needed based on bilateral treaties.**

- **Hover your cursor over the China layer and select Perform Analysis.**

- **In the Perform Analysis window, select Use Proximity, then Create Buffers.**

- **In the Create Buffers window, set the parameters as follows:**

   o **Set step one to the China layer.**

   o **Set step two to a buffer size of 200 miles.**

   o **In step three give your layer a unique name.**

- **Click Show credits. You should use less than one credit.**
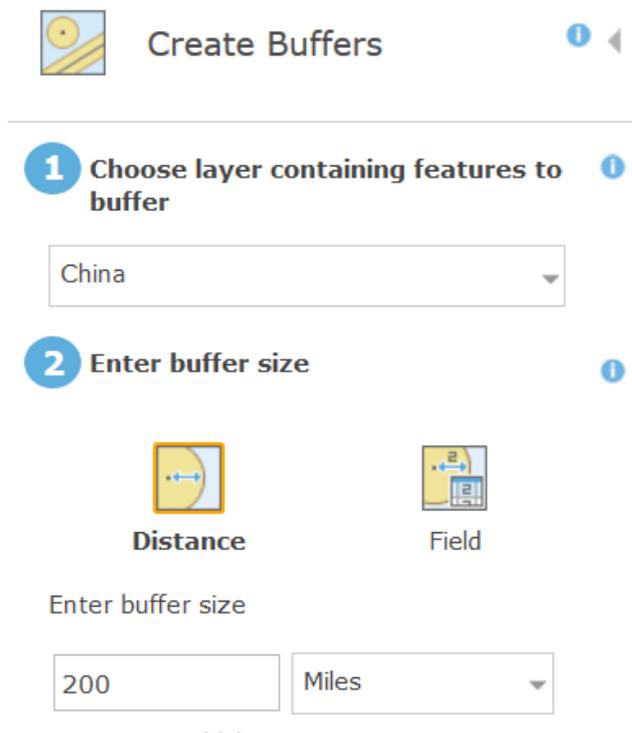
- **Click Run Analysis.**

3. **Repeat the preceding steps to create a 200-mile buffer around the Other South China Sea Countries layer.**

You can now see the 200-mile exclusive economic zones that should roughly correspond to each country.

China's claims to most of the South China sea lie in its claims over small islands and reefs. To bolster these claims, China is building and occupying military facilities in several locations.

4. **Turn on the Pansharpened Landsat layer. You may want to turn off your buffer layers as well so they don't obscure the images.**

5. **Click the Bookmarks button and select Fiery Cross Reef.**

6. **With the time slider at the bottom of the screen, view the reef between 1998 and 2000.**

7. **Click the Next button and move the slider to 2016 to 2018.**

December 31, 2016 - December 31, 2018
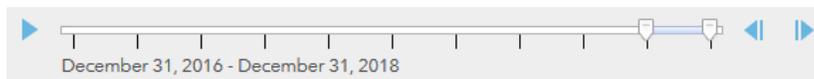
Question 11.4.1

What do you see on Fiery Cross Reef in the 2016–18 image?

8. **Click Bookmarks again and view the Landsat imagery of Woody Island and North Island.**

Question 11.4.2

What do you see on Woody Island? The North Island image is harder to make out, but what clearly human-built shape do you see?

The Scarborough Shoal and Paracel Islands bookmarks show the general location of Chinese territorial claims.

9. **Click the South China Sea bookmark to return to the broader study area.**

10. **Turn off the Pansharpened Landsat layer.**

11. **Turn on the Chinese Claims layer.**

12. **Create a 200-mile buffer around the Chinese Claims layer to see how it affects claims of exclusive economic zones in the South China Sea.**

- **Hover your cursor over the Chinese Claims layer and select Perform Analysis.**

- **In the Perform Analysis window, select Use Proximity, then click Create Buffers.**

- **In the Create Buffers window, set the parameters as you did previously, but with the Chinese Claims layer selected for step one.**

- **To make the map a bit clearer, change the colors for the buffers around China and around the Chinese claims.**

- **Hover your cursor over your China buffer layer and select Change Style.**

Step one should be Show location only.

- **In step two, click Options.**

- **In the Change Style window, click the colored square next to Symbols.**

- **Change the Fill color.**

- **Repeat the preceding steps on your Chinese Claims buffer layer and select the same color.**

Your map should now show the buffers around China and around its claims in the South China Sea as the same color.

Question 11.4.3

Print or take screenshot of your map, showing the South China Sea and your buffers around China, Chinese Claims, and Other South China Sea Countries.

Conclusion

As you can see, there are conflicting territorial claims in the South China Sea. This has become a point of potential conflict in recent years, as Chinese warships enforce claims while fishing vessels from countries such as Vietnam and the Philippines attempt to fish in disputed waters. Furthermore, the United States has refuse to acknowledge many of the Chinese claims and has sent US naval vessels into exclusive economic zones and even 12-mile territorial waters around disputed islands and reefs. Encounters between different militaries and civilian fishing fleets in this region increases the chances of miscalculation and intensifying conflict.

Exercise 11.5: The challenges of European integration

Introduction

Beginning in the 1950s, European integration began, with the goal of ending conflict on the continent after two bloody world wars. The original members of this union were Belgium, France, Germany, Italy, Luxembourg and the Netherlands. Over the next 60 years or so, new members joined the union. Three major programs have constituted European integration: the European Union, the Eurozone, and the Schengen area, all of which are discussed in your textbook. While these programs have streamlined the movement of people, goods, and services across Europe, they have not been without problems. In this exercise, you will explore how different levels of economic development and varying levels of government debt have presented challenges to the stability of the union.

Objectives

- Calculate the ratio of GDP per capita for new EU members to the average of selected existing members.

- Discuss how the flow of manufacturing investment and migrants likely responded to the addition of new EU members.

- Analyze the impact that subsidies, debt, and austerity programs have on stability of the EU.

- Understand differences in membership between the European Union, the Eurozone, and the Schengen Area.

1. **Open the Chapter 11 European Union map and sign in to your ArcGIS Online account: https://arcg.is/eny1T**

   The map contains the following layers:

   a. **EU Members and GDP Per Capita (1972-2016). These five layers show the GDP per capita for members of the European Union as it expanded over time.**

   b. **Debt as Percent of GDP 2016. This layer shows government debt as a percent of annual GDP in the year 2016.**

   c. **EU Outline. This layer shows the outline of European Union countries as of 2016.**

   d. **Eurozone and Schengen. This layer includes fields showing which countries are members of the Eurozone and the Schengen area.**

   The map opens showing EU members by GDP per capita in 1973.

2. **Using the EU Members and GDP Per Capita layers, fill in the table (question 11.5.1).**

   With this information, you will be able to see how a sample of countries compare to three of the largest and most powerful members of the union: Germany, France, and the United Kingdom.

3. **With the EU Members and GDP Per Capita 1973 layer active, click Ireland. From the pop-up window, write the value in column A of the table.**

4. Turn off the EU Members and GDP Per Capita 1973 layer and turn on the EU Members and GDP Per Capita 1981 layer. Click Greece and write the value in column A of the table.

5. Turn off the EU Members and GDP Per Capita 1981 layer.

6. Fill in column A for each of the remaining countries in the table, based on the corresponding year of the EU Members and GDP Per Capita layers.

7. Once you have completed column A, calculate column C by dividing the value in column A by the value in column B for each row. This shows how close each country's GDP per capita was to the average for France, Germany, and the UK in the year they joined the EU.

8. Turn on the EU Members and GDP Per Capita in 2016 layer, then click each country listed in the table and fill in column D.

9. For column E, divide the value in column D by 39,795. This is the average GDP per capita for Germany, France, and the UK in 2016.

A. New EU Member and Year of Ascension to EU	B. Average GDP Per Capita of UK, Germany, and France in year of new member's ascension to EU.	C. Ratio of New Member's GDP per Capita to UK, French, and German Average. (=A/B)	D. GDP per Capita in 2016	E. Ratio of country to average of Germany, UK, and France in 2016. Average = $39,795 (=D/39,795)
Ireland GDP per capita in 1973 =	$4,473 in 1973			
Greece GDP per capita in 1981 =	$10,293 in 1981			
Portugal GDP per capita in 1986 =	$12,526 in 1986			
Spain GDP per capita in 1986 =	$12,526 in 1986			
Poland GDP per capita in 2004 =	$36,008 in 2004			
Hungary GDP per capita in 2004 =	$36,008 in 2004			
Estonia GDP per capita in 2004 =	$36,008 in 2004			
Czech Republic GDP per capita in 2004 =	$36,008 in 2004			

Question 11.5.2

Based on the table, you can see that many countries joined the EU at a much lower level of economic development when compared to France, Germany, and the UK. Two possible geographic trends discussed in previous chapters could result from these differences. Describe how manufacturing jobs could shift location and which migration flows could occur. Based on the maps and data, give examples of which countries they could have potentially left and which countries they could have potentially moved to.

Question 11.5.3

One goal of European integration is to reduce national disparities in economic development by strengthening the economies of members. Based on columns C and E, describe how new EU members' economies changed in relation to those of Germany, France, and the UK. If instructed by your professor, you can also calculate the percent change or compound annual growth rate between the two periods.

Question 11.5.4

The European Union directs funds to poorer cities and regions to improve employment, education, and infrastructure. Based on the EU Members and GDP Per Capita in 2016 layer, which countries probably pay more into these funds, and which probably receive more from these funds. Describe how this could lead to political pushback from the countries that pay more.

Difference in levels of economic development have led to shifting spatial patterns of manufacturing, migration, and investment of EU funds. These changes have led to some friction between countries, as some face the loss of manufacturing jobs, a large influx of lower-wage immigrants, or the perception that rich countries are unfairly paying to subsidize poorer ones. In addition, EU countries face different levels of government debt.

10. **Turn off all layers except Debt as Percent of GDP 2016.**

Question 11.5.5

Based on the map, which three countries have the greatest proportion of debt relative to GDP?

Question 11.5.6

EU regulations limit the level of government debt a country can take on. To help high debt countries, EU regulators have injected money into them, but also forced them to make substantial cuts in government spending, known as austerity measures. Describe how lower debt countries may be upset about sending money to support high debt countries. Also, describe how high debt countries may be upset about mandatory cuts to public spending.

Lastly, we will look at the different types of integration within Europe. The three major components of integration, the European Union, Eurozone, and Schengen area have substantial overlap, but with some variation.

11. **Turn on the EU Outline layer. Turn off all other layers. This shows all countries in the European Union as of 2016.**

12. **Turn on the Eurozone and Schengen layer. The map shows all countries in the EU as of 2016.**

13. **Hover your cursor over the Eurozone and Schengen layer and select Change Style.**

14. **In the Change Style window, set step 1 to Eurozone. This will show all countries that use the Euro currency.**

15. List the nine EU countries that are not members of the Eurozone in the table (question 11.5.7). Each has chosen to keep using its own national currency rather than the Euro.

16. With the Change Style window still open, set step 1 to SchengenArea. This shows all countries in the Schengen Area.

17. In the table (question 11.5.8), list the six EU countries that are not part of the Schengen area. These countries do not allow for passport-free travel. Note: one of the countries in the Mediterranean Sea close to Turkey is difficult to see.

18. Finally, list the four Schengen countries that are not part of the European Union in question 11.5.9. These allow passport-free travel, but do not participate in other economic and political programs via the European Union.

Three of the four may be difficult to see. You may need to scroll your map north and west to see one of the countries. Another is landlocked and may be difficult to identify. The third is very small. To find this one, enter these latitude and longitude coordinates in the Find address or place search box: 47.1660 N, 9.5554 E.

Question 11.5.9

Conclusion

As you can see, European integration has tied together much of the continent via economic, political, and social policies. This has had a positive impact on economic development in many countries. But with this integration, friction has occurred. Countries with differing levels of economic development and debt have led to changing flows of manufacturing, migrants, and subsidies. This has created resentment in some places, where people feel they are losing jobs, absorbing too many immigrants, or paying to fix the economic problems of other countries. These pressures continue to threaten the stability of the union, as opposition, anti-EU parties push for less integration.