

Investigating Natural Gas Production and Consumption with Web GIS Teacher Handout

Natural gas is made up of remains of dead plants and animals that lived millions of years ago. In this activity, students will use Web GIS to investigate patterns of natural gas production and consumption. Students will

1. Examine countries with natural gas reserves.
2. Compare natural gas production and consumption of countries in 1980 and 2008.

Students should read **all** instructions and answer **each** question on their investigation sheet.



Step 1: Download Data

Open your Web browser. Go to www.ei.lehigh.edu/learners/energy/


Under **Natural Gas**, select “Investigating Natural Gas Production and Consumption with Web GIS.”




Step 2: Basic Features of Web GIS

- a. Your screen should open to a global view as shown in the picture below.
- b. To navigate in Web GIS students can use the navigational tools (# 1) or the hand (# 2). They can move around the map by selecting different areas or scrolling to them.
- c. Students can zoom into an area by using the zoom in tool options (# 3).
- d. They can find your exact location on the map by viewing the latitude and longitude location of the cursor in the bottom left corner of the map (# 4).



- e. Students can get back to the main view by using the **Bookmark** icon in the toolbar at the top of the screen (# 2 below). In the box that appears, select **World View**.
- f. The data for each activity can be activated using the **Map Legend Tool** (# 1 below). Place the mouse over this box and click on it. The Map Legend window will appear. In the Map Legend window, activate the data layer you wish to display by clicking in the checkbox. You can expand or shrink a legend item by clicking on the globe icon  next to each data layer label.

- g. To observe the legend for a specific data layer, select the globe icon  next to that item in the list (# 3). The legend can be closed by clicking the globe icon a second time.



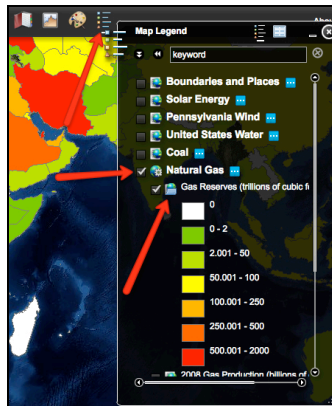
- h. Students can also activate portions of the data layers by selecting options from the top toolbar menus.



Step 3: Examine countries with natural gas reserves. (Question 1)

Let's investigate which countries have large amounts of natural gas reserves.

- a. Activate the Natural Gas Reserves data layer. In the Map Legend window, select **Natural Gas**, as shown below. Click on the globe next to Natural Gas. Then click on the globe next to Gas Reserves to view the legend for that data layer.



- a. Query Gas Database as shown below (# 1). In the box that opens select to Sort By: Gas Reserves.
- b. In the Reserve Query box that appears select to Sort By: **Country and Ascending**. When finished, click Submit Query.
- c. In the data chart that appears sort the columns based on Reserves (Trillions of Cubic Feet). To sort a column in descending order click the top of this column twice.



Instruct the students answer **question 1** on their investigation sheet.

Gas reserves are listed in amounts of trillions of cubic feet. 1 trillion = 1,000,000,000,000.
 1 cubic foot = 28.32 liters

d. Students should close the **Query Gas Database** window by selecting the “x” in the top right corner.



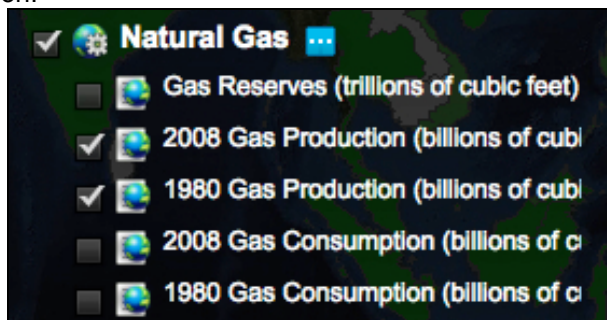
Step 4: Analyze natural gas production. (Questions 2 - 4)

Let’s investigate...

- Which countries produced large amounts of natural gas in both 1980 and in 2008?
- Which countries produced more natural gas in 2008 than in 1980?
- Which countries produced less natural gas in 2008 than in 1980?

a. In the **Map Legend** activate the 2008 Gas Production and the 1980 Gas Production layers. Deactivate the Gas Reserves Layer.

b. Students should toggle back and forth between the 1980 and 2008 layers to see which countries changed their production.



c. Open the Query Gas Database using the Natural Gas top toolbar.

d. Choose to **Sort By: Gas Production**. Click **Select Sort**.

e. In the window that appears, sort by: **Country** and **Ascending**. When finished click **Submit Query**.



- f. In the Production Query window, locate the **Billions of Cubic Feet, 2008** column. If students can not see the entire data set, the columns can be widened by placing the mouse between two columns. Click and drag the mouse to make a column wider or smaller.

Sort the column in Ascending and Descending order by clicking on the top of the column.

Country	Billions of Cubic Feet, 1980	Billions of Cubic Feet, 2008	Change in Production
Algeria	60	6,760	6,700
Canada	10	1,800	1,790
China	471	2047,000	2046,529
France	4,178	24,214	19,036
Germany	0	0	0
Indonesia	200	100,000	99,800
Iran	0	0	0
Italy	212,000	120,000	-92,000
Japan	79,000	61,000	-18,000
North Korea	0	0	0
North Macedonia	0	0	0
Poland	0	422,000	422,000
Russia	1,270	0	-1,270
USA	0	0	0
Ukraine	0	0	0
Uzbekistan	0	0	0



Have the students answer **question 2** on their investigation sheet.

Have the students record the 4 countries that produced largest amounts of natural gas in the **2008 Natural Gas Production Data Charts** on their investigation sheet.

- d. Sort the **Billions of Cubic Feet, 1980** column in descending order.
Helpful hint: Click the column twice.



Have the students record the 4 countries that produced largest amounts of natural gas in the **1980 Natural Gas Production Data Chart** on their investigation sheet.

- e. In the Query Gas Database, locate the **Change in Production** column. If the students can not see the entire data set they can widen the columns by placing the mouse between two columns. Click and drag the mouse to make a column wider or smaller.
- f. Sort the column in Ascending and Descending order by clicking on the top of the column.

Numbers that are **positive** represent countries that consumed **more** natural gas in 2008 than in 1980.

Numbers that are **negative** represent countries that consumed **less** natural gas in 2008 than in 1980.

Country	Billion of Cubic Feet, 1980	Billion of Cubic Feet, 2008	Change in Production
Algeria	0	13788	13788
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575
Algeria	18	12593	-12575

Important Notes for Questions 3-6:

1. In 1980, Russia and other countries in Eastern Europe belonged to the Soviet Union. No natural gas production and consumption amounts were reported for Russia in 1980. Therefore students should not include Russia in your responses to Questions 3-6 below.
2. In 1980, Germany was two separate countries: East Germany and West Germany. No natural gas production and consumption amounts were reported for Germany in 1980. Therefore you should not include Germany in your responses to Questions 5-6 below.



Have the students use the **Change in Production** column to answer **questions 3** and **4** on their investigation sheet.

g. Close the **Query Gas Database** window by selecting the “x” in the top right corner.

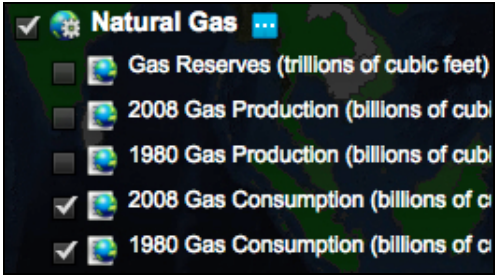


Step 5: Examine natural gas consumption. (Questions 5 - 6)

Let’s investigate,

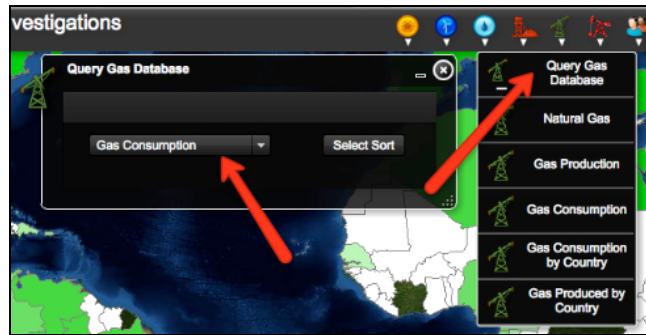
- Which countries consumed **more** natural gas in 2008 than in 1980?
 - Which countries consumed **less** natural gas in 2008 than in 1980?
- a. In the **Map Legend Tool** activate the 2008 Gas Consumption and the 1980 Gas Consumption layers. Deactivate the 2008 and 1980 Gas Production Layers.

Students should toggle back and forth between the 1980 and 2008 layers to see which countries changed their consumption.



- b. Open the Query Gas Database using the Natural Gas top toolbar menu.
- c. Choose to Sort By: **Gas Consumption**. Click **Select Sort**.

- d. In the window that appears select to sort by: **Country** and **Ascending**. When finished click **Submit Query**.



- e. In the Query Gas Database window, locate the **Change in Consumption** column. If students can not see the entire data set they can widen the columns by placing the mouse between two columns. Click and drag the mouse to make a column wider or smaller.
- f. Sort the column in Ascending and Descending order by clicking on the top of the column.

Numbers that are **positive** represent countries that consumed **more** natural gas in 2008 than in 1980.

Numbers that are **negative** represent countries that consumed **less** natural gas in 2008 than in 1980.

Country	Billions of Cubic Feet, 1980	Billions of Cubic Feet, 2008	Change in Consumption	2008 per Capita	2008 per Capita, 1980	Per Capita Change
Algeria	0	0.7365	0.7365	0.0219	0.0000	0.0219
Algeria	70	1.0000	0.0000	0.0219	0.0000	0.0219
Algeria	460	101.0000	101.0000	0.0219	0.0219	0.0000
Algeria	0.58	20.8040	20.2240	0.0110	0.0190	0.0080
Algeria	0	0	0	0	0	0
Algeria	0	1075.0000	1075.0000	0.0219	0.0219	0.0000
Algeria	0	0	0	0	0	0
Algeria	101.7000	101.0000	-0.7000	0.0219	0.0219	0.0000
Algeria	100.0000	100.0000	0.0000	0.0219	0.0219	0.0000
Algeria	0	0	0	0	0	0
Algeria	0	0	0	0	0	0
Algeria	0	0	0	0	0	0
Algeria	0	0	0	0	0	0
Algeria	0	0	0	0	0	0
Algeria	0	0	0	0	0	0
Algeria	0	0	0	0	0	0
Algeria	0	0	0	0	0	0
Algeria	0	0	0	0	0	0
Algeria	0	0	0	0	0	0
Algeria	0	0	0	0	0	0
Algeria	0	0	0	0	0	0



Instruct students to use the **Change in Consumption** column to answer **questions 5 and 6** on their investigation sheet.

- g. In the Gas Consumption table that is open sort the column **Billions of Cubic Feet, 2008** in descending order. Students should record the amount of natural gas consumed in 2008 for each of the countries listed in Question 7. The countries in the Natural Gas Data Chart should be near the top. If they are not, students can scroll through the list until they find them. Record the amount of natural gas consumed in 2008 by each contry in the **Natural Gas Consumed in 2008 (Billion Cubic Feet)** column of your data chart.
- h. When students are finished, have them close the Query Gas Database by selecting the “x” in the top right corner.
- i. Open the Query Gas Database using the Gas dropdown tool at the top of the page.
- j. Choose to **Sort By: Gas Production**. Use the drop down box to select this feature. Click **Select Sort**.

- k. In the window that appears, select to sort by: **Country** and **Ascending**. When finished click **Submit Query**.



- l. In the Query Gas Database, navigate to the **Billions of Cubic Feet, 2008** column. If students can not see the entire data set, they can widen the columns by placing the mouse between two columns. Click and drag the mouse to make a column wider or smaller.

Sort the column in Descending order by clicking on the top of the column.

Country	Billions of Cubic Feet, 2008	Billions of Cubic Feet, 2008	Change in Production
Algeria	50	4,7583	48,2837
Algeria	50	1,02945	4,54055
Algeria	50	2847,02888	2846,02888
Algeria	42.18	24,2192	14,8992
Algeria	0	0	0
Algeria	280	150,079	170,079
Algeria	0	0	0
Algeria	210,0294	150,079	150,0294
Algeria	19,08728	24,22398	25,22398
Algeria	0	0	0
Algeria	0	0	0
Algeria	0	0	0
Algeria	1,37728	0	-1,37728
Algeria	0	0	0
Algeria	0	0	0
Algeria	0	0	0

- m. Students should record the amount of natural gas produced by the 5 countries listed in the **Natural Gas Data Chart** on their Worksheet. These countries should be near the top of the list. If they are not students can scroll through the list to find them.

Record the **Billions of Cubic Feet** Produced in 2008 for each of the countries on your Natural Gas Data Chart.

Country	Billions of Cubic Feet, 2008	Billions of Cubic Feet, 2008	Change in Production
Algeria	50	4,7583	48,2837
Algeria	50	1,02945	4,54055
Algeria	50	2847,02888	2846,02888
Algeria	42.18	24,2192	14,8992
Algeria	0	0	0
Algeria	280	150,079	170,079
Algeria	0	0	0
Algeria	210,0294	150,079	150,0294
Algeria	19,08728	24,22398	25,22398
Algeria	0	0	0
Algeria	0	0	0
Algeria	0	0	0
Algeria	1,37728	0	-1,37728
Algeria	0	0	0
Algeria	0	0	0
Algeria	0	0	0



Instruct students to answer **questions 8 - 10** on their investigation sheet.