

Investigating Coal Production and Consumption with My World GIS Teacher Guide

Coal comes from the energy stored by land plants from swamps that lived hundreds of millions of years ago. In this activity, students will use My World GIS to investigate patterns of coal production and consumption. They will

1. Examine locations of coal fields in the USA.
2. Examine countries with coal reserves.
3. Compare coal production and consumption of countries in 1980 and 2008.
4. Analyze relationships between country populations and coal consumption.

Model the following procedural instructions with your students. It is recommended that you display your computer image at the front of the classroom.



Step 1: Download data.

- a. Open your Web browser. Go to www.ei.lehigh.edu/learners/energy/
- b. Click on **Investigating Coal Production and Consumption with My World GIS**.

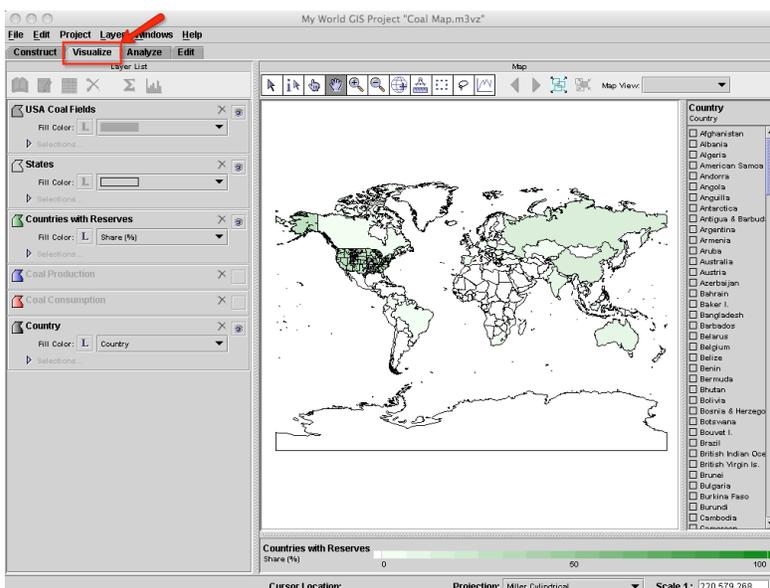
This downloads the **Coal Map.m3vz** file on to your desktop (see icon below).



Step 2: Load data in My World GIS.

- a. **Double click** on the **Coal Map.m3vz** icon to open the file in My World GIS.

The window below should open on your computer. Check to make sure you are in the **visualize** mode (see arrow below).





Step 3: Explore Coal Fields in the USA. (Questions 1 and 2)

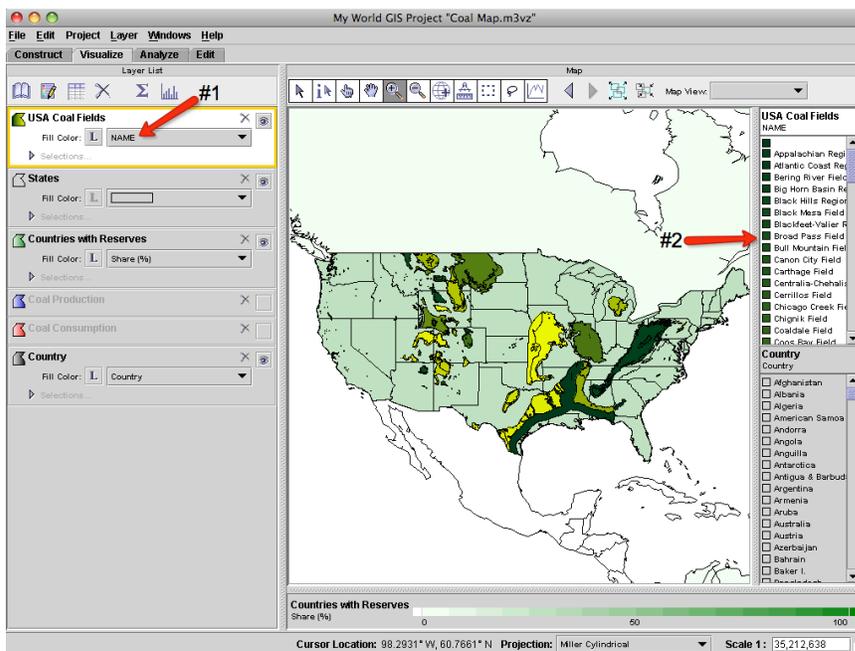
- a. **Zoom In**  to the United States to see regions with coal fields.



Use the GIS map to answer **question 1** on your investigation sheet.

- b. Click on the **USA Coal Fields** layer to make it active.
- c. Click the box in the USA Coal Fields layer and choose **NAME** from the drop-down list (see arrow #1 below).

My World GIS will highlight the different coal field in different colors and display their names in the panel on the right (see arrow #2 below).



Instruct students to use the GIS map to answer **question 2** on their investigation sheet.

- d. Close the **Information for layer “USA Coal Fields”** window.
- e. Click the eye in the upper right corner of the **USA Coal Fields** layer (see arrow below).



What happens to the map?

You should notice that you can no longer see the US coal fields on the map. The **USA Coal Fields** layer has been **turned off**.

- f. Click on the **Zoom To All** tool  to display the entire world.



Step 4: Explore Countries with Coal Reserves. (Coal Reserves Data Chart)

- a. Click the **Countries with Reserves** layer to make it active.
- b. Click on the **table** icon  on the **Layer List tool bar**. A data table for the **Countries with Reserves** layer will open.
- c. List the top 5 countries with the most coal reserves in the **Top 5 Countries with Coal Reserves Data Chart** on your investigation sheet.
Which 5 countries have the most coal reserves?
How much coal reserves in **Billions of Tonnes** do these countries have?
What percent share of all worldwide coal reserves does that amount represent?
Helpful hint: Click the **Total (Billions of Tonnes)** column or the **Share (%)** column twice to sort it in descending order.
- NOTE:** 1 tonne = 1000kg = 2204.6 pounds
- d. Close the **Table of Layer “Countries with Reserves”** window.
- e. Click the eye  in the upper right corner of the **Countries with Reserves** layer to turn it off.



Step 5: Explore Coal Production. (Coal Production Data Charts and Question 3)

Let's investigate which countries produced large amounts of coal in both 1980 and in 2008?

- a. Click the small square at the right end of the **Coal Production** layer to turn the layer on (see arrow below).



- b. Click the **Coal Production** layer to make it active.

This map displays countries that produced coal in 2008. Countries that produced a lot of coal have a darker blue color. Countries that produced a little coal have a lighter blue color. Countries that did not produce any coal are white. Countries whose coal production data was not yet available are gray in color.

Which countries produced a lot of coal in both 1980 and in 2008?

NOTE: **CP2008** means coal production in 2008 and **CP1980** means coal production in 1980.

- c. Click on the **table** icon  on the **Layer List tool bar**.
- d. Sort the **CP2008 (Thousand Short Tons)** column in descending order.
Helpful hint: Click the column twice.

NOTE: 1 short ton = 907.18 kg = 2000 pounds



Instruct students to write the top 5 countries that produced large amounts of coal in the **2008 Coal Production Data Chart** on your investigation sheet.

- e. Sort the **CP1980 (Thousand Short Tons)** column in descending order.
Helpful hint: Click the column twice.



Instruct students to write the top 5 countries that produced large amounts of coal in the **1980 Coal Production Data Chart** on their investigation sheet.

- f. Close the **Table of Layer “Coal Production”** window.



Instruct students to use both the **1980** and **2008 Coal Production Data Charts** to answer **question 3** on their investigation sheet.

- g. Click the eye  in the upper right corner of the **Coal Production** layer to turn it off.



Step 6: Explore Coal Consumption. (Questions 4 and 5)

Let's investigate,

- Which countries consumed **more** coal in 2008 than in 1980?
- Which countries consumed **less** coal in 2008 than in 1980?

- a. Click the small square at the right end of the **Coal Consumption** layer to turn the layer on.
- b. Click the **Coal Consumption** layer to make it active.

This map displays countries that consumed coal in 2008. Countries that consumed a lot of coal have a darker red color. Countries that consumed a little coal have a lighter red color. Countries that did not consume any coal are white. Countries whose coal consumption data was not yet available are gray in color.

Which countries consumed more coal in 2008 than in 1980? Which countries consumed less coal in 2008 than in 1980?

You will use the **analyze** mode to calculate the difference of coal consumed by countries in 2008 and in 1980.

- c. Click on the **Analyze** tab above the **Layer List** (see arrow below)



Click **By Math Operation** (see arrow #1 below).

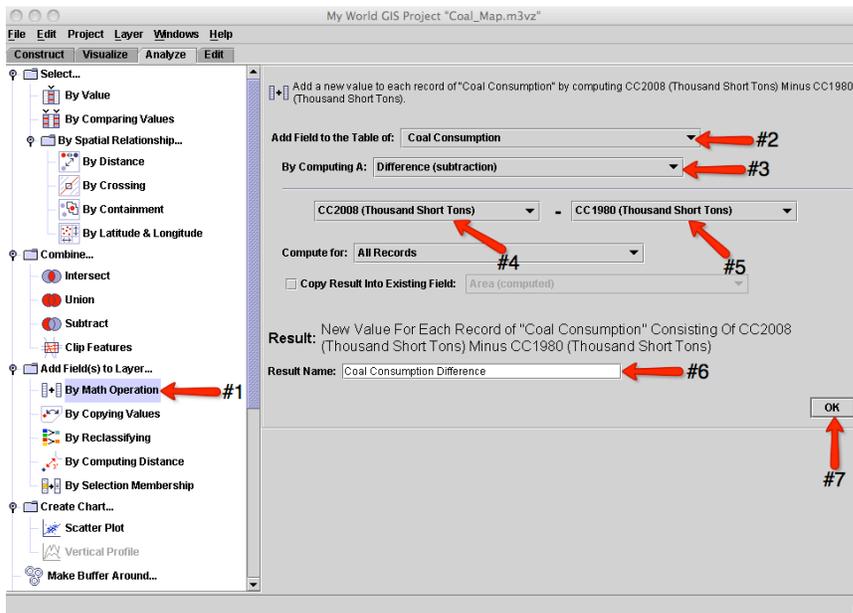
Click the box to the right of **Add Field to the Table of** and select **Coal Consumption** from the list (see arrow #2).

Click the box to the right of **By Computing A** and select **Difference (subtraction)** from the list (see arrow #3).

Below that, select **CC2008 (Thousand Short Tons)** in the box on the left (see arrow #4) and select **CC1980 (Thousand Short Tons)** in the box on the right (see arrow #5).

Type **Coal Consumption Difference** in the **Result Name** text box (see arrow #6).

Click **OK** (see arrow #7).



My World GIS will display the **Coal Consumption Difference** map.

- d. Click on the **table** icon  on the **Layer List tool bar**. You will notice that My World GIS added a column called **Coal Consumption Difference** to the Coal Consumption data table. This column displays the difference of coal consumed by countries in 1980 and 2008.
- e. Sort the **Coal Consumption Difference** column in descending order.
Helpful hint: Click the column twice.

The **positive numbers** at the top of that column mean that those countries **consumed more coal** in 2008 than in 1980. Their coal consumption increased.

The **zeros** mean that those countries **did not consume** any coal in 2008 and 1980. Countries that consumed the same amount of coal in 2008 and 1980 also have zeros because there was no difference in their coal consumption.

The **negative values** mean that those countries **consumed less coal** in 2008 than in 1980. Their coal consumption decreased.

The 2008 coal consumption data for some countries at the bottom of the column was not yet available.



Instruct students to use the **Coal Consumption Difference** column to answer **questions 4 and 5** on their investigation sheet.

- f. Close the **Table of Layer “Coal Consumption”** window.



Step 7: Explore populations of countries. (Questions 6 and 7)

Let's investigate which countries have the largest population differences since 1980.

- a. Click on the **Analyze** tab above the **Layer List**
Click **By Math Operation**.
Click the box to the right of **Add Field to the Table of** and select **Coal Consumption** from the list.
Click the box to the right of **By Computing A** and select **Difference (subtraction)** from the list.
Below that, select **Pop. 2008** in the box on the left and select **Pop. 1980** in the box on the right.
Type **Population Difference** in the **Result Name** text box.
Click **OK**.

My World GIS will display the **Population Difference** map.

- b. Click on the **table** icon  on the **Layer List tool bar**. You will notice that My World GIS added a column called **Population Difference** to the Coal Consumption data table.



Instruct students to use the **Population Difference** to answer **question 6** on their investigation sheet.



Instruct students to use the **Pop. 2008** column to answer **question 7** on their investigation sheet.

- c. Close the **Table of Layer “Coal Consumption”** window.



Instruct students to answer **questions 8 and 9** on their investigation sheet.