Investigating Oil Production and Consumption with My World GIS
Teacher Guide

Crude oil (petroleum) was formed from the remains of tiny sea animals and plants that lived millions of years ago in marine (water) environment. In this activity, students will use My World GIS to investigate patterns of crude oil (petroleum) production and consumption. They will

1. Examine countries with oil reserves.
2. Compare oil production and consumption of countries in 1980 and 2008.
3. Examine populations of countries.

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 Oil Production and Consumption with My World GIS.**
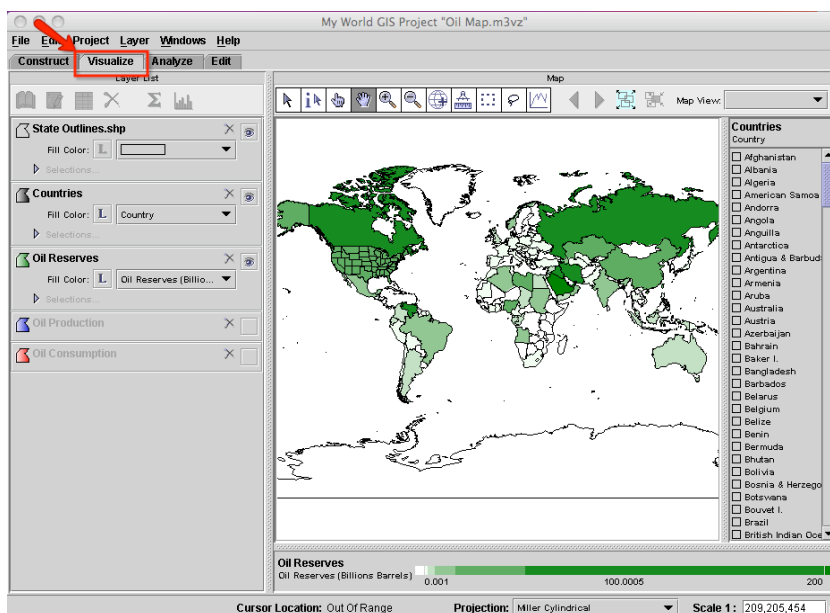
This downloads the **Oil Map.m3vz** file on to your desktop (see icon below).
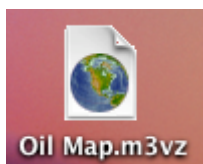
Step 2: Load data in My World GIS.

a. **Double click** on the **Oil 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: Examine countries with oil reserves. (Questions 1 and 2)

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

a. Click on the **Oil Reserves** layer to make it active.

b. Click on the **table** icon on the **Layer List** tool bar.

   Instruct students to answer **questions 1** and **2** on their investigation sheet.

   Oil reserves are the amount of oil that can be economically taken from crude oil reservoirs.
   Oil reserves are listed in amounts of billions of barrels.
   1 barrel = 42 gallons.1 billion = 1,000,000,000.

c. Close the **Table of Layer "Oil Reserves"** window.

d. Click the eye in the upper right corner of the **Oil Reserves** layer to turn it off (see arrow below).

Step 4: Analyze oil production. (Questions 3 - 5)

Let's investigate,
   ➢ Which countries produced **more** oil in 2008 than in 1980?
   ➢ Which countries produced **less** oil in 2008 than in 1980?

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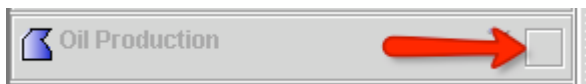

b. Click the **Oil Production** layer to make it active.

   This map displays countries that produced oil in 2008. Countries that produced a lot of oil have a darker blue color. Countries that produced a little oil have a lighter blue color. Countries that did not produce any oil are white.

   Which countries produced more oil in 2008 than in 1980? Which countries produced less oil in 2008 than in 1980?

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

c. Click on the **Analyze** tab above the **Layer List** (see arrow below).
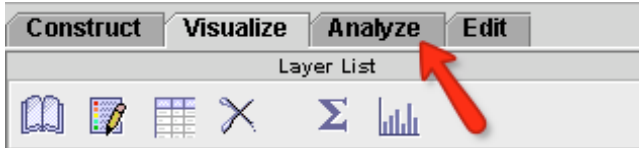
Click **By Math Operation** (see arrow #1 below).
Click the box to the right of **Add Field to the Table of** and select **Oil Production** from the list (see arrow #2).
Click the box to the right of **By Computing A** and select **Difference (subtraction)** from the list (see arrow #3).
Below that, select **OP2008 (Thousand Barrels per Day)** in the box on the left (see arrow #4) and select **OP1980 (Thousand Barrels per Day)** in the box on the right (see arrow #5).
Type **Oil Production Difference** in the **Result Name** text box (see arrow #6).
Click **OK** (see arrow #7).
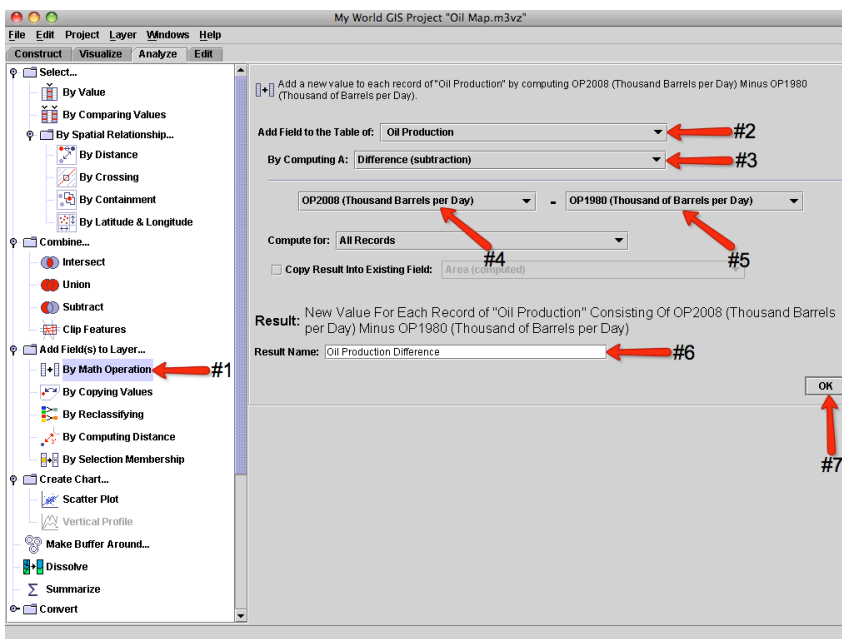
NOTE: **OP2008** means oil production in 2008 and **OP1980** means oil production in 1980.

My World GIS will display the **Oil Production 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 **Oil Production Difference** to the Oil Production data table. This column displays the difference of oil produced by countries in 1980 and 2008.

e. Sort the **Oil Production Difference** column in descending order.
   Helpful hint: Click the column twice.

   The **positive numbers** at the top of that column mean that those countries **produced more oil** in 2008 than in 1980. Their oil production increased.

   The **zeros** mean that those countries **did not produce** any oil in 2008 and 1980. Countries that produced the same amount of oil in 2008 and 1980 also have zeros because there was no difference in their oil production.

The **negative values** mean that those countries **produced less oil** in 2008 than in 1980. Their oil production decreased.

Look at the last four countries at the bottom of the column. The oil production data for 1980 for these countries was not available. However, their oil production data for 2008 was available.

Instruct students to use the **Oil Production Difference** column to answer **questions 3, 4,** and **5** on their investigation sheet.

f.   Close the **Table of Layer "Oil Production"** window.

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

Step 5: Examine oil consumption. (Questions 6 - 8)

Let's investigate,
➢   Which countries consumed more oil in 2008 than in 1980?
➢   Which countries consumed less oil in 2008 than in 1980?

a.   Click the small square at the right end of the **Oil Consumption** layer to turn the layer on.

b.   Click the **Oil Consumption** layer to make it active.

This map displays countries that consumed oil in 2008. Countries that consumed a lot of oil have a darker red color. Countries that consumed a little oil have a lighter red color. Countries that did not consume any oil are white.

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

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

c.   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 **Oil Consumption** from the list.
Click the box to the right of **By Computing A** and select **Difference (subtraction)** from the list.
Below that, select **OC2008 (Millions Tonnes)** in the box on the left and select **OC1980 (Millions Tonnes)** in the box on the right.
Type **Oil Consumption Difference** in the **Result Name** text box.
Click **OK**.

NOTE: OC2008 means oil consumption for 2008 and **OC1980** means oil consumption for 1980.

My World GIS will display the **Oil 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 **Oil Consumption Difference** to the Oil Consumption data table. This column displays the difference of oil consumed by countries in 1980 and 2008.

e. Sort the **Oil 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 oil** in 2008 than in 1980. Their oil consumption increased.

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

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

    Look at the last six countries at the bottom of the column. The oil consumption data for 1980 for these countries was not available. However, their oil consumption data for 2008 was available.

    Instruct students to use the **Oil Consumption Difference** column to answer **questions 6, 7, and 8** on their investigation sheet.

f. Close the **Table of Layer "Oil Consumption"** window.

Step 6: Examine populations of countries. (Questions 9 and 10)

   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 **Oil Consumption** from the list.
    Click the box to the right of **By Computing A** and select **Difference (subtraction)** from the list.
    Below that, select **POP2008** in the box on the left and select **POP1980** in the box on the right.
    Type **Population Difference** in the **Result Name** text box.
    Click **OK**.

    NOTE: POP2008 means population for 2008 and **POP1980** means population for 1980.

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

    Instruct students to use the My World GIS map to answer **question 9** on their investigation sheet.

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 Oil Consumption data table.

    Instruct students to use the **Population Difference** column to answer **question 10** on their investigation sheet.

c. Close the **Table of Layer "Oil Consumption"** window.

Step 7: Examine per capita oil consumption. (Questions 11 - 17)

Let's investigate each country's per capita oil consumption. Per capita oil consumption means the **average** amount of oil each person consumed.

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 **Oil Consumption** from the list.
    Click the box to the right of **By Computing A** and select **Quotient (division)** from the list.
    Below that, select **OC2008 Barrels Per Year** in the box on the left and select **POP2008** in the box on the right.
    Type **Per Capita Consumption 2008** in the **Result Name** text box.
    Click **OK**.

   My World GIS will display the **Per Capita Consumption 2008** map.

    Per capita consumption means the **average** consumption of oil per person. The the **Oil Consumption – Per Capita Consumption 2008 bar and legend** at the bottom of the map displays the lowest per capita consumption in 2008, 0.0361, and the highest per capita consumption, 57.0875.

b. Click on the **table** icon on the **Layer List tool bar.** You will notice that My World GIS added a column called **Per Capita Consumption 2008** to the Oil Consumption data table. This column displays the average consumption of oil per person in different countries in 1980 and 2008.

    Instruct students to use the **Per Capita Consumption 2008** column to complete the **Oil Data Chart** on their investigation sheet.

    Students can use the **Find** feature located in the top left side of the data table (see arrow below) to search for the countries.
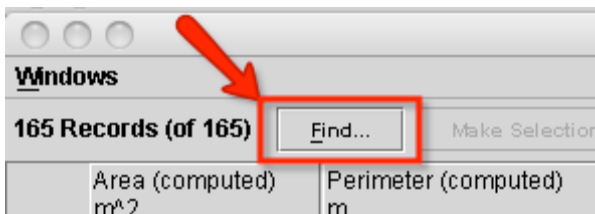
    Instruct students to answer **questions 11 - 17** on their investigation sheet.