

Lesson Plans



MOSS

McCALL OUTDOOR SCIENCE SCHOOL

University of Idaho

College of Natural Resources



Title: Google Public Data Explorer as a Scientific Tool in the Classroom

Grade Level: 9th - 12th Grade

Topic:	Google Public Data Explorer and Greenhouse Gases
Background:	<p>Google Public Data Explorer is a tool that helps one explore and visualize public datasets that are made available by government and other agencies that track statistics from around the world. It is part of Google Labs Experiments.</p> <p>It offers four kinds of visualizations for most of the datasets: line chart, bar chart, map or bubble chart which show the combination of two variables over time and can be an extremely interactive data representation.</p> <p>http://support.google.com/publicdata/answer/1100640?hl=en</p> <p>Visual representation of Data is an important way of analyzing data with significant historical instances such as John Snow's Cholera outbreak map of London (see Additional Resources).</p>
Next Generation Standards:	LS2.C, ESS2.C, ESS2. E, ESS2.A, ESS3.C, & PS1.B
Goals:	<p>Students will use and explore Google Public Data Explorer to answer their own questions about data made available in the Google Public Data Explorer databases and then use the graphs to present their findings to the class.</p> <p>How can Google Public Data Explorer help us understand statistical information?</p> <p>How can I use Google Public Data Explorer to most effectively show my findings?</p>
Objectives:	<ul style="list-style-type: none"> • Students will be able to use Google Public Data Explorer as a scientific tool to retrieve data. • Students will be able to analyze visual data representations and be able to critically analyze them.
Materials:	<ul style="list-style-type: none"> • Computers with internet for each student • Modern Cholera Map (provided in Additional Resources)
Set up:	<p>Familiarize yourself with Google Public Data Explorer and the Cholera outbreak of 1854: See Additional Resources.</p> <p>Print Cholera Maps of 1854.</p>
Classroom Time:	Two or three class periods. One to introduce and the second to present, with as much time provided in-between to finish projects as is appropriate (which may be the additional class period).
Introduction (Engage):	<p>First, hand out a map of London 1854 (provided in Additional Resources) and discuss what it might mean.</p> <p>After a few questions explain the historical background and map (outbreak of Cholera with deaths shown as red dots and blue dots being water pumps).</p>

	<p>Ask the students to work in groups towards a solution and then present solutions briefly to the class using the map. Students should see a connection between water pumps and deaths. Reveal the historical significance of this particular map. Then give a quick overview of Google Public Data Explorer as a modern means to populate similar maps and charts. Reference Additional Resources for greenhouse gases example.</p>
Activity (Explore):	<p>Task the students with considering one major world problem (like the cholera outbreak but consider a modern topic like greenhouse gases). These topics should be restricted to ones that can be explored in Google Public Data Explorer. Give students a brief tutorial in using Google Public Data Explorer (greenhouse gas emissions tutorial found in Additional Resources).</p> <p>Several of Google Public Data Explorer's databases that students may use are:</p> <p>Global Greenhouse Gas Emissions, Water and Sanitation Data, Unemployment in Europe, Minimum Wage in Europe, Government debt in Europe, Broadband penetration in Europe, Fuel prices in Europe, infectious disease outbreaks, unemployment in the US, Population in the US, FBI crime reporting statistics, Drug use in the United States, US population since 1900, etc. (There are 76 databases in total). Have students, in small groups, develop a specific question concerning the data such as "which country produces the most greenhouse gases? And why?"</p> <p>Have students explore their specific research question utilizing Google Public Data Explorer.</p> <p>After exploring the data students can adapt their questions or make them more specific.</p>
Explanation	<p>Encourage students to bring any questions to you, or each other. Each student is responsible for their own specific project but collaboration is encouraged. The classroom should be buzzing with active discussion as students delve in the data. Set up time with groups before their presentation to see where they are in their projects and explain any misconceptions of the data or possibly explain the data further.</p>
Elaboration:	<p>During the one-on-one with each group, develop a couple of specific questions you want the student to answer for their presentations which will elaborate on the research they have already done. Such as "what are the greenhouse gases per capita, and what does that mean?" or "what causes greenhouse gases in one country to increase in recent years?"</p> <p>Encourage students to seek similar feedback from peers by explaining that peer evaluation, collaboration and elaboration</p>

Evaluation:	<p>will be considered in assessment of presentation.</p> <p>Students will present their projects showing:</p> <ul style="list-style-type: none"> • Their Question/Questions • Answers and possible answers • At least 4 maps, graphs or charts • Additional questions answered • How can this data help guide future decisions to solve this problem? (There are no wrong answers to this question but every student must attempt an answer).
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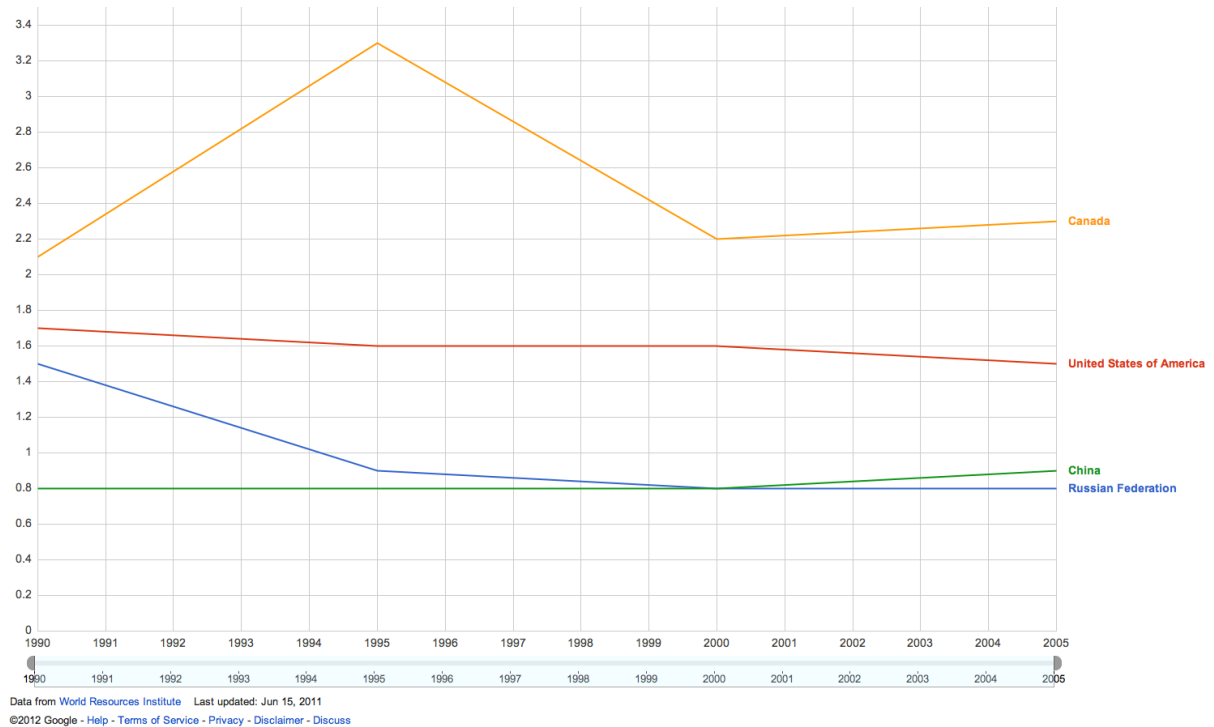
Original John Snow Map to the Right and updated Map Above.

- Below is a tutorial Google Public Data Explorer exploring greenhouse gas emissions.

Let's compare per capita greenhouse emissions of four countries: The United States, Canada, China, and Russia. *Note that you can also compare by greenhouse gas and sector, but in this tutorial we'll be comparing by country.*

<http://www.google.com/publicdata/explore?ds=cjsdgb406s3np>

Per capita greenhouse gas emissions - Agriculture ?



Screen Shot 1:

This line chart shows per capita agriculture greenhouse emissions for the four countries from 1990 to 2005. A narrower year range can be viewed by sliding the tick at the bottom of the chart.

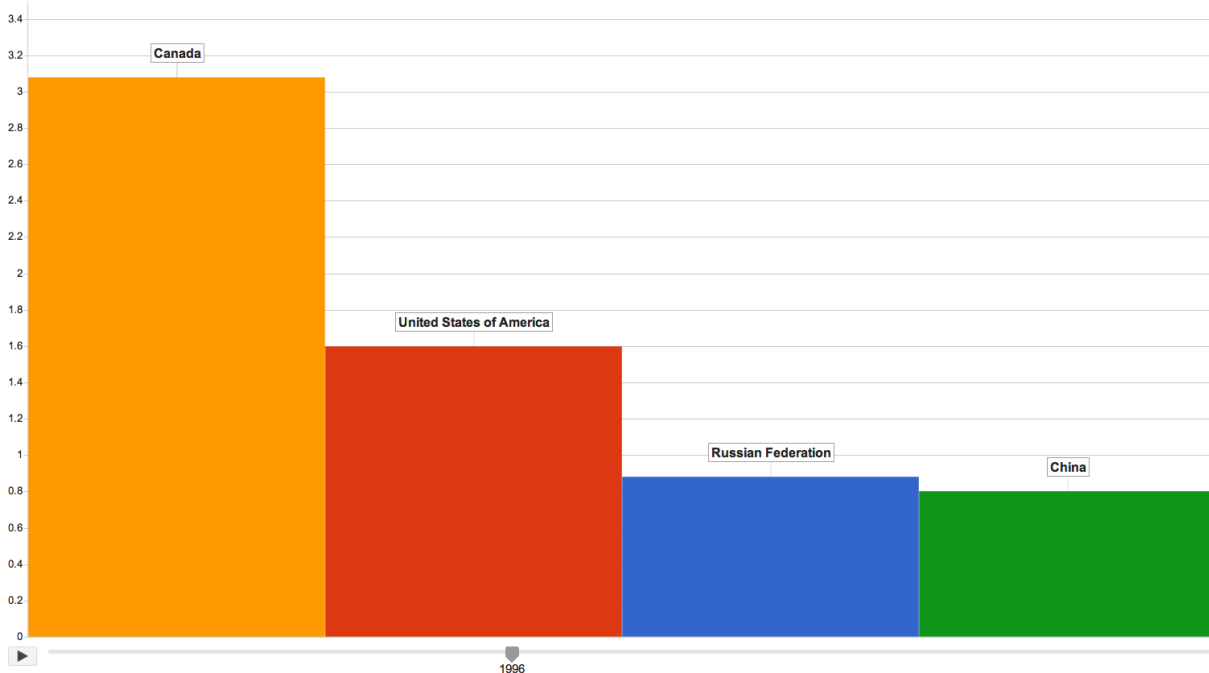
To get this chart:

Select the four countries in question from the list on the left-hand-side. Select “per capita greenhouse gas emissions” above the list of countries. Select “Agriculture” from the Sector drop down menu below the list of countries. The default graph you should see is the graph above.

Per capita greenhouse gas emissions - Agriculture ?

Countries - Descending order ?



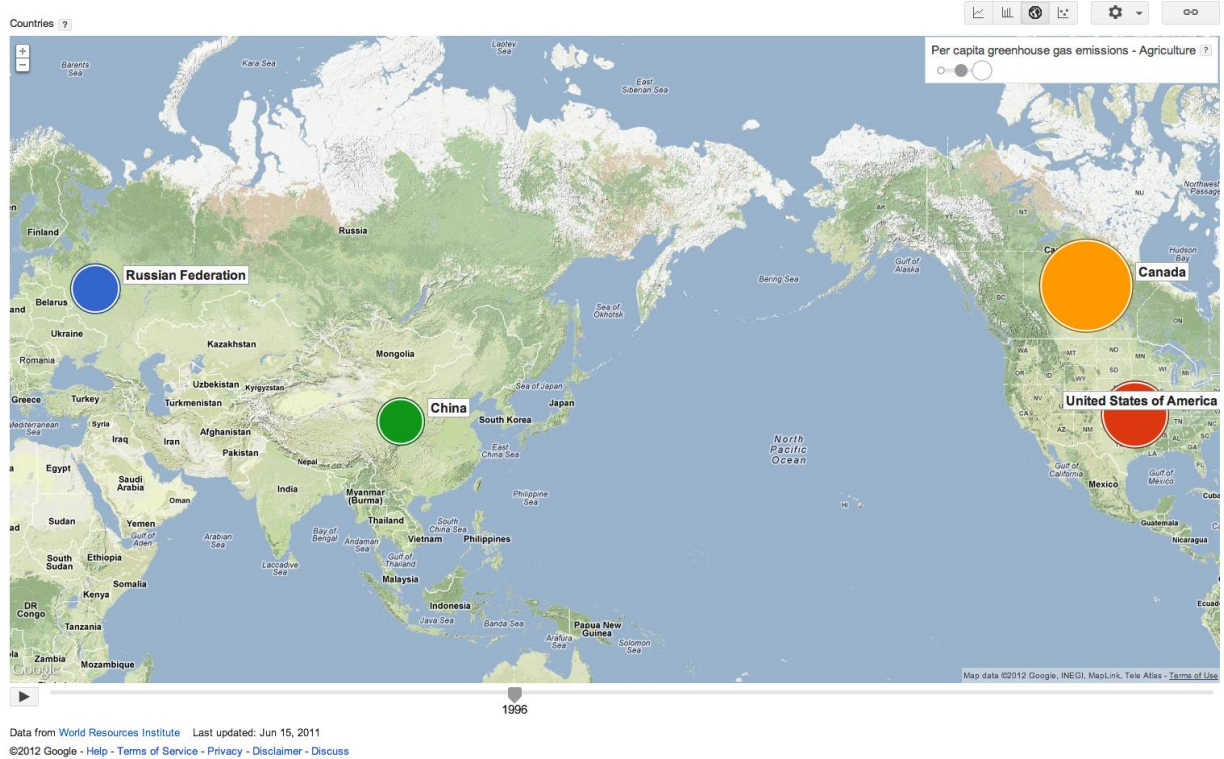
Data from [World Resources Institute](#) Last updated: Jun 15, 2011
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Screen Shot 2:

This bar chart compares the per capita agriculture greenhouse emissions for the four countries in the year 1996. By pressing the play button on the bottom of the chart one can see how these bars change over time. Additionally, one can choose to view every countries' data, with the four selected countries highlighted, by changing the settings in the settings button on the upper right hand side of the chart.

To get this chart:

In the upper right-hand-corner click the bar graph icon. Then, in the Settings menu, deselect "show non-selected bars". This allows you to see just the four countries you selected.

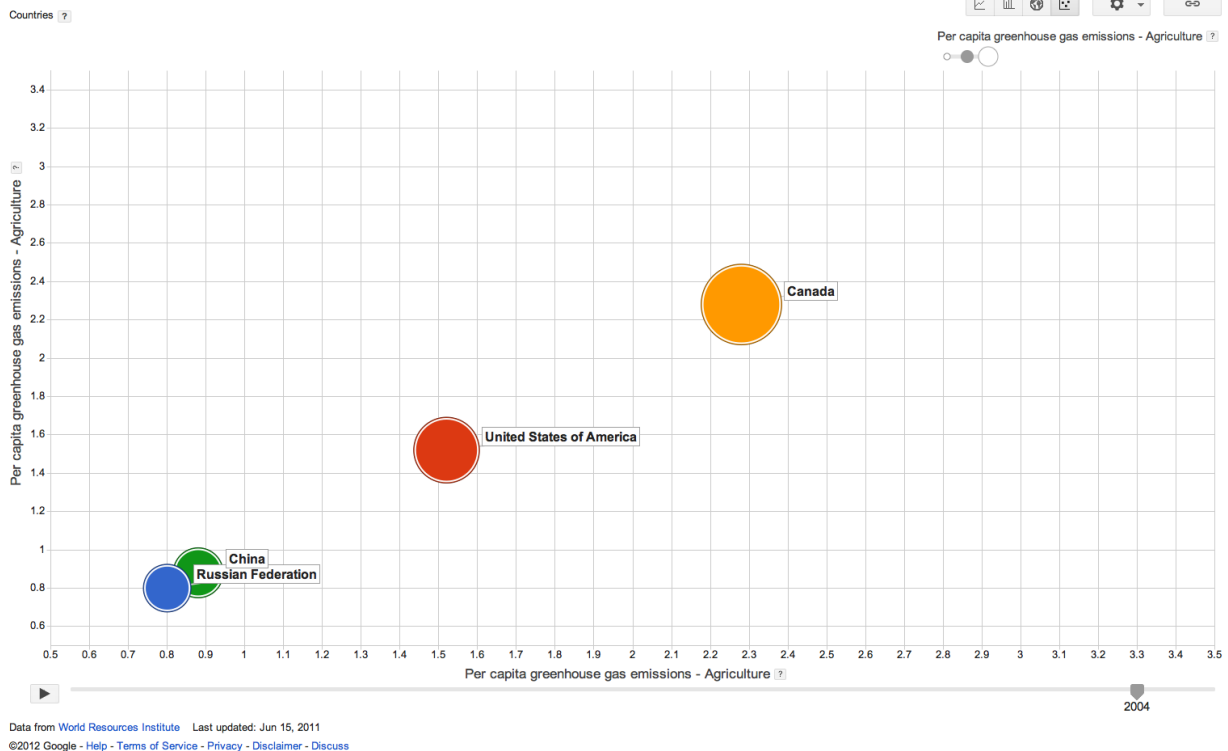


Screen Shot 3:

This map chart compares the per capita agriculture greenhouse emissions for the four countries in the year 1996. The size of each bubble represents the amount of emissions. The bubbles can be set to the same size in the settings button in the upper right hand side of the chart, as well as selecting other countries' emission bubbles. By pressing the play button on the bottom of the map chart, one can see how the bubbles change over time.

To get this chart:

Click on the map chart icon (which is to the right of the bar graph icon). Then press play.



Screen shot 4:

This chart compares the per capita agriculture greenhouse emissions of the four countries in the year 2004. The size of each bubble represents the amount of emissions. The bubbles can be set to the same size in the settings button in the upper right hand side of the chart. Also, one can select other countries' emission bubbles. By pressing the play button on the bottom of the map chart, one can see how the bubbles change over time.

To get this chart:

Click on the bubble chart icon (to the right of the map chart icon). Then press play and you can observe the change in emissions over time.

The interactive nature of these graphs is crucial to their function as an informative tool. For each chart, by clicking on the settings in the upper right hand corner, one can change specific features unique to that chart.

Additional Resources:

1. You can find the Google Data Explorer Here:

- <http://www.google.com/publicdata/directory>
2. John Snow's Original Map and the updated GIS map of the same information are below with links to sites explaining them in more detail:

<http://www.r-bloggers.com/john-snow%E2%80%99s-famous-cholera-analysis-data-in-modern-gis-formats/>

<http://www.csiss.org/classics/content/8>