

# International Perspectives to Climate Change

Last Updated: September 19, 2013

## **Background**

Different countries have different perspectives on energy. The US lets the market regulate fuels and uses a mixture of fuel sources including petroleum, natural gas, coal, nuclear, and some renewables. China, a developing country, has an abundance of coal, very cheap (old) technologies, and economies of scale. France, for energy security purposes, pursued nuclear immediately after the 70s oil shock. Neighboring Germany, also for policy reasons, has installed a large amount of renewables in the form of solar. Other countries try to make use of surrounding resources; for instance, Brazil's top-down approach exploits water (hydroelectricity), and Iceland's democratic approach exploits their geothermal and hydro resources.

The stock of anthropogenic greenhouse gases can be attributed to each country and reflects both fuel choices as well as the length of time they spent as an industrialized country. Historically, the top five emitters have been the US (~33%), China (~10%), Russia (9%), Germany (8%), and the United Kingdom (7%). Recently, many developing countries are beginning to contribute much more than the developed countries. In 2012, of the roughly 8Gt emitted globally, the top emitters were China (23.5%), US (18.27%), India (5.83%), Russia (5.72%), and Japan (4.04%).

Country	Population (millions)	Land Area (million sq km)	GDP (2010, trillion USD)	2012 annual emissions (billion tonnes)
China	1,338	9.3	10.2	8.2
US	309	9.1	14.6	5.3
Brazil	195	8.5	2.2	0.42
Iceland	65	0.10	0.011	0.36
France	0.31	0.54	2.2	0.005

(The Carbon Map)

## **Objectives**

Students will be able to:

- Understand how energy and emissions are linked.
- Define energy intensity and GDP per capita
- Rank five countries in their energy intensity and GDP per capita.

**Materials Needed**

- Large map of world
- Poker chips
- Powerpoint presentation “International Perspectives to Global Warming Presentation.pptx”

**Safety Concerns**

None.

**Vocabulary**

- Energy intensity: Energy intensity is a measure of the energy efficiency of a nation's economy. It is calculated as units of energy per unit of GDP.
- Gross domestic product (GDP): Gross domestic product (GDP) is the market value of all officially recognized final goods and services produced within a country in a given period of time. GDP per capita is often considered an indicator of a country's standard of living.

**Procedure**

Time	Activity	Description	Supplies
30 minutes	Group discussion	<ol style="list-style-type: none"> <li>1. How are energy and emissions linked?</li> <li>2. Discuss the top three coal, oil, gas, and uranium nations for exports and for consumption.</li> </ol>	“International Perspectives to Global Warming Presentation.pptx”
30 minutes	Interactive	<ol style="list-style-type: none"> <li>1. Introduction - Examine five countries that have chosen to pursue entirely different paths for economic growth. Outline these different paths and highlight the disparate reasons countries choose to go down one instead of the others (including when and why each of the five countries took their decisions). Note countries generally do what they're good at - there is no "fixed formula"               <ol style="list-style-type: none"> <li>a. Brazil: top-down approach: we have water, let's use it, economies of scale.</li> <li>b. China: abundance of coal, very cheap (old) technologies, economies of scale.</li> <li>c. France: energy security: pursued nuclear immediately after the 70s oil shock.</li> <li>d. Iceland: democratic choice: we have geothermal and hydro, let's use them.</li> <li>e. US: economics. Saudi Arabia of coal, Saudi Arabia of gas.</li> </ol> </li> <li>2. Assignment - Divide the students into five groups and assign a country to each.               <ol style="list-style-type: none"> <li>a. Give each group basic information about</li> </ol> </li> </ol>	Large map of world, poker chips, “International Perspectives to Global Warming Presentation.pptx”

		<p>their country's population, land area, GDP, annual emission, etc.</p> <ul style="list-style-type: none"> <li>b. Ask each group to calculate measures like energy intensity and GDP per capita.</li> <li>c. For each metric, ask the students to guess where their country ranks among the five under investigation.</li> </ul> <p>3. Group discussion – Share numbers and rankings.</p> <ul style="list-style-type: none"> <li>a. Use stacked poker chips to compare the emissions and energy consumption of the five countries.</li> <li>b. What percentage of annual global emissions the annual emissions of these five countries constitute?</li> <li>c. What percentage of cumulative global emissions the annual emissions of these five countries constitute?</li> </ul>	
--	--	--	--

### **Additional Resources**

#### **Opinion / Newspaper**

List of Climate Change Initiatives | Wikipedia

[http://en.wikipedia.org/wiki/List\\_of\\_climate\\_change\\_initiatives](http://en.wikipedia.org/wiki/List_of_climate_change_initiatives)

The Carbon Map <http://www.carbonmap.org/>

### **Author(s)**

Lesson idea from Felipe Faria and Ahmed Abdulla; final product compiled by Kelly Klima on behalf of the Leonard Gelfand Center for Service Learning and Outreach.

### **Funding Sources**

Portions of this work were supported by a) the Leonard Gelfand Center for Service Learning and Outreach, and b) the Center for Climate and Energy Decision Making (SES-0949710) through a cooperative agreement between the National Science Foundation and Carnegie Mellon University.

### **Next Generation Science Standards Alignment**

HS-ESS3-2: Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources on cost-benefit ratios.

Crosscutting Concepts: Influence of Science, Engineering and Technology on Society and the Natural World, Science Addresses Questions About the Natural and Material World

PS3.B: Conservation of Energy