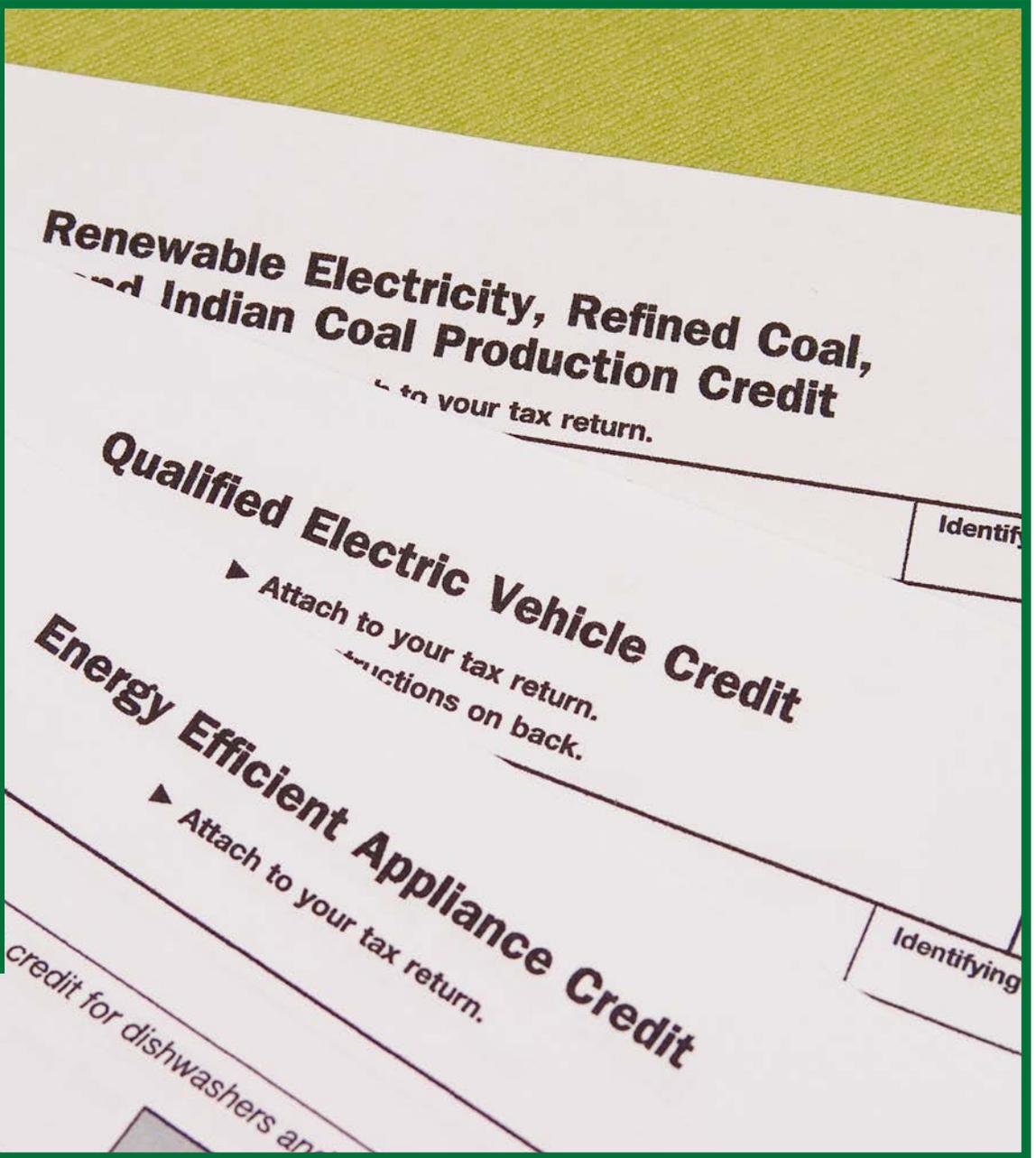


12

Economics
Standard
12.3.1.



Government and the Economy: An Environmental Perspective

California Education and the Environment Initiative

Approved by the California State Board of Education, 2010

The Education and the Environment Initiative Curriculum is a cooperative endeavor of the following entities:

California Environmental Protection Agency
California Natural Resources Agency
California State Board of Education
California Department of Education
Department of Resources Recycling and Recovery (CalRecycle)

Key Partners:

Special thanks to **Heal the Bay**, sponsor of the EEI law, for their partnership and participation in reviewing portions of the EEI curriculum.

Valuable assistance with maps, photos, videos and design was provided by the **National Geographic Society** under a contract with the State of California.

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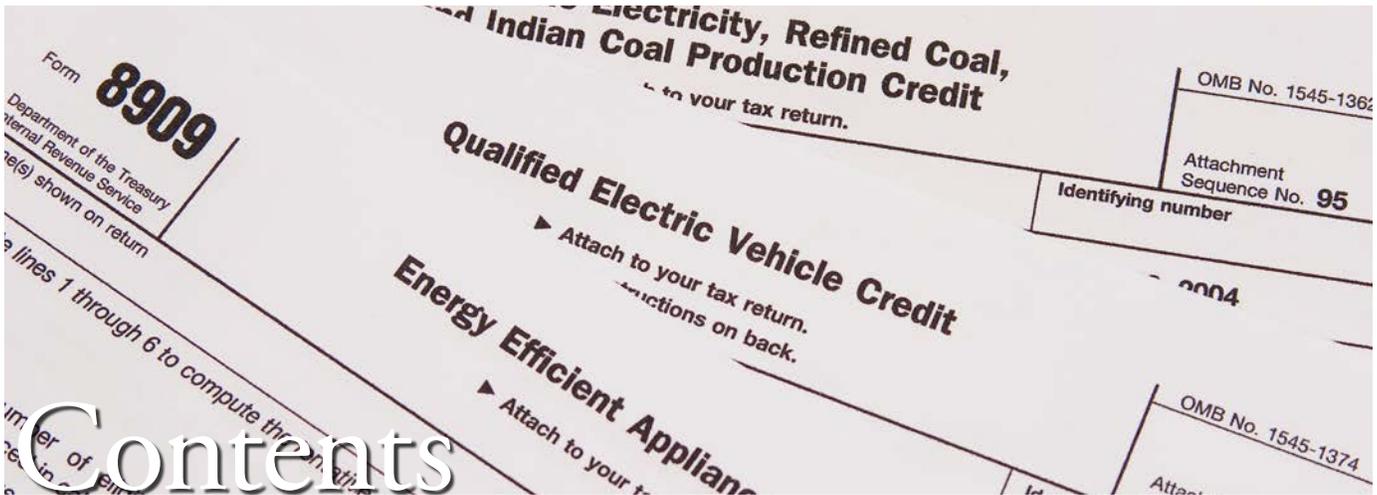
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LESSON 1 Turning Environmental Challenges into Economic Opportunities

None required for this lesson.

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VA #1 Zero Emission Vehicle (ZEV)



VA #2 *Exxon Valdez Oil Spill*



VA #3 Emissions Allowances and Environmental Protection

This presentation provides examples of how environmental laws, regulations, policies, and incentives influence the market economy.



VA #4 Economic and Environmental Costs

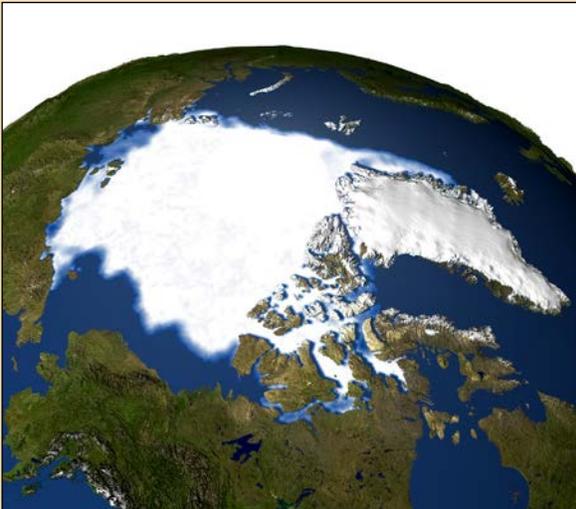
This is a photograph of downtown Los Angeles on a smoggy day.

What economic and environmental costs arise from this situation?



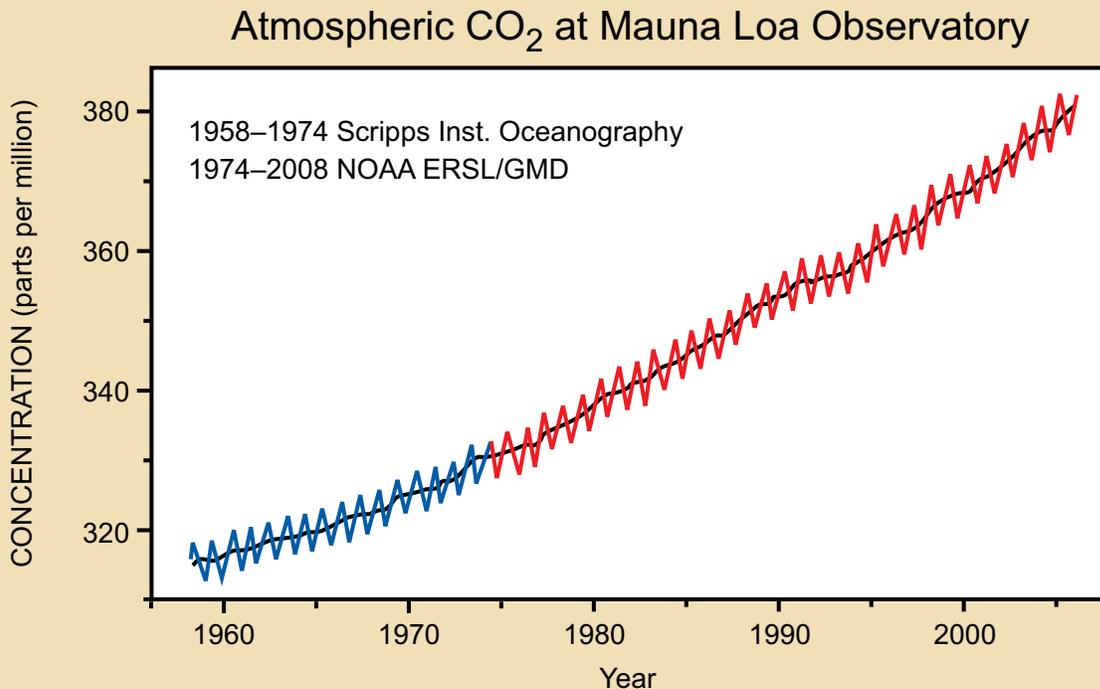
VA #5 Ice Coverage of the Arctic

These satellite photographs compare the ice coverage area of the Arctic region in 1970 and in 2008.



These pictures indicate there is a reduction in the ice coverage in the Arctic region. What might be some of the consequences of this change?

VA #6 Carbon Dioxide Levels



This graph shows carbon dioxide levels in the atmosphere from 1960 to 2000. What do you notice about the levels of carbon dioxide?

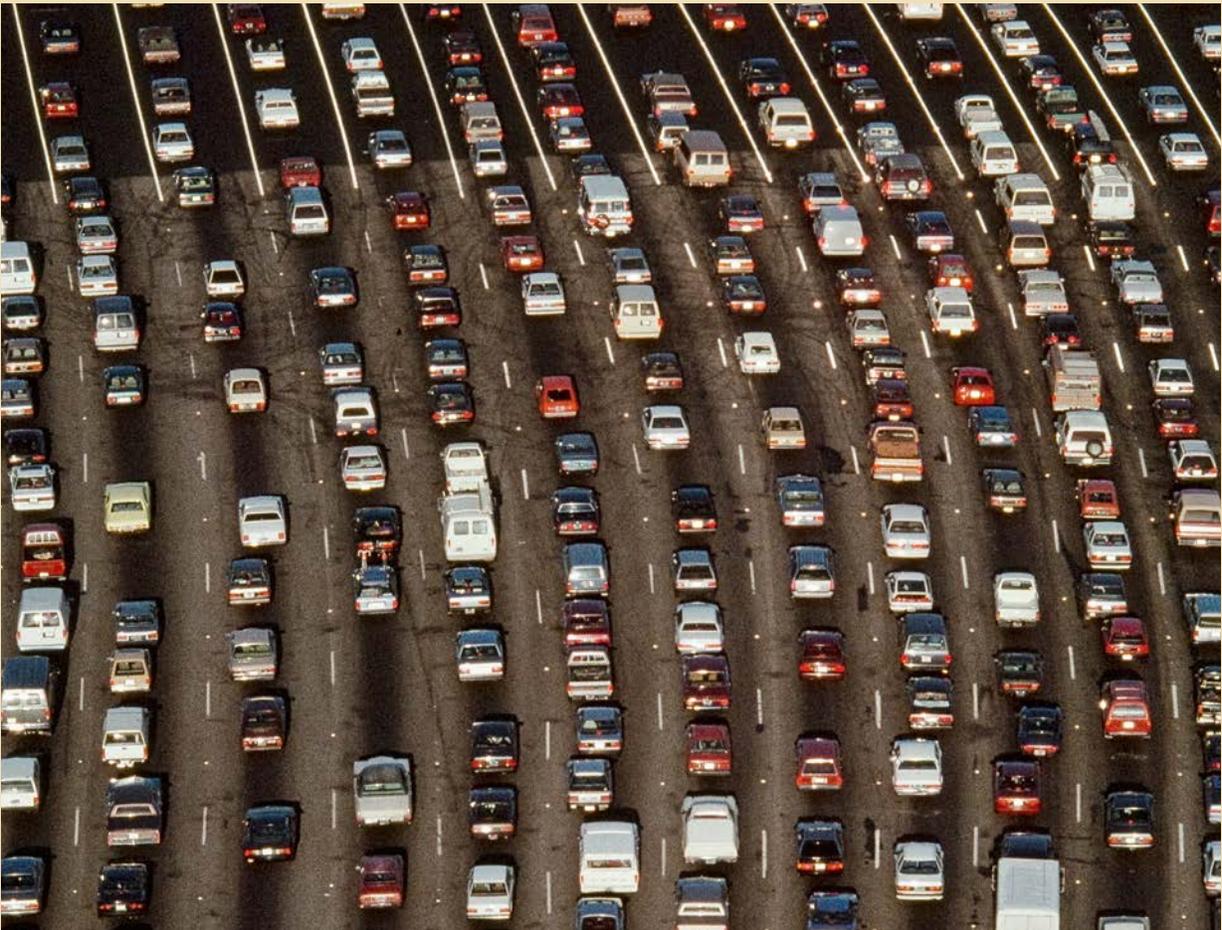
Many people believe that carbon dioxide levels are a factor in climate change.

Although there are many natural sources of carbon dioxide, levels of carbon dioxide in the atmosphere significantly increase when humans burn fossil fuels in the production of electricity and the powering of automobiles.

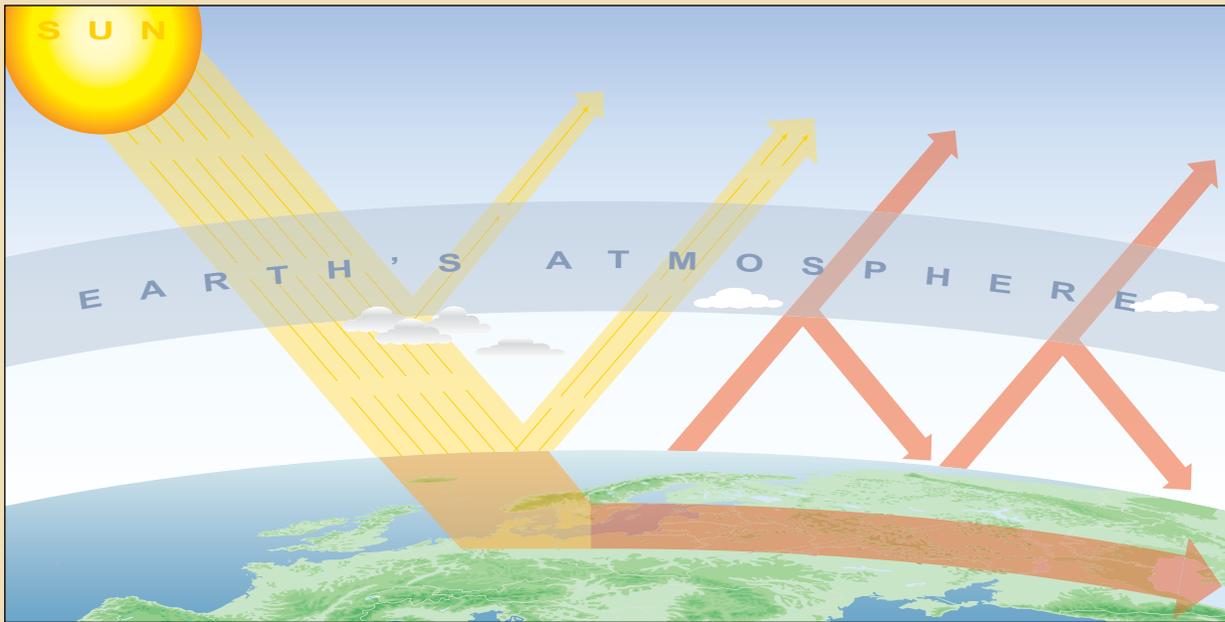
VA #7 Climate Change and the Economy

What makes global climate change an economic problem?

What are some possible solutions to this problem? What would you recommend?



VA #8 The Greenhouse Effect



How the greenhouse effect works:

When solar radiation gets to Earth, some of it passes through the atmosphere and is absorbed by Earth and some of it is reflected out into space.

The atmosphere contains “greenhouse gases,” such as water vapor, carbon dioxide, and methane. Increases in greenhouse gases cause the atmosphere to absorb more energy.

When the heat from Earth’s surface rises, greenhouse gases reflect it back to the surface, further warming Earth.

VA #9 Reducing Carbon Emissions



What would be ways that the government might get industries to reduce their carbon emissions?

How effective do you think they would be?

What would the costs be?

Could taxes be used? How would they work?

Could subsidies be used to encourage new energy sources? How effective would they be?

VA #10 Cap and Trade

What is cap and trade?

Cap and trade is a regulatory tool that places a mandatory cap on emissions while providing sources flexibility in how they comply. The goal of cap and trade is to steadily reduce carbon dioxide and other greenhouse gas emissions in a cost-effective manner. Because it may be easier for some businesses to reduce their emissions more than others, these businesses may sell, or trade, their allowances to businesses less able to reduce their emissions. Over time, the limits become stricter. This system rewards efficient businesses and ensures that the cap can be met with the lowest possible cost to businesses.

VA #11 Emissions Trading Systems



The European Union (EU) has the largest emissions trading program, called the EU emissions trading system (ETS). It has been in operation since 2005.

VA #12 Problems with Emissions Trading Systems



Phase one of the EU's ETS was not a complete success. Some critics claimed that too many carbon allowances were circulated, meaning that air quality would not improve substantially.

Phase two of the ETS began in January 2008, and many improvements have been made. Recent studies indicate that an emissions trading regime can help to reduce greenhouse gas emissions. It appears that this approach has facilitated the development of the market.

Do you think the emissions trading scheme could work in spite of the problems that critics point out about the European program? Why or why not?

VA #13 Carbon Offsets

Carbon offsets are financial instruments (measured in metric tons of carbon dioxide-equivalent) that represent reductions in carbon emissions. These instruments can be traded or purchased to help businesses maintain their emissions levels below an established cap.

Voluntary markets involve selling carbon offsets to consumers, businesses, and institutions. They differ from compliance markets, in which the government mandates emission reductions and offsets serve as a tool for meeting emission reduction targets.

Factories can buy offsets from other countries or receive credits for supporting projects that could be completed for lower costs than within the country. The **Clean Development Mechanism (CDM)** program is an example of this strategy.

In order to be a CDM, the project must meet the approval of inspectors. One of the project features they look for is **additionality**. An additionality requires proof that the project would not otherwise be built without the incentive of the sale of credits.

VA #14 Clean Development Mechanism

What is a Clean Development Mechanism (CDM)?

CDM is a program created under the Kyoto Protocol. It provides a method by which developing countries can undertake emission reduction projects and get paid for verified emission reductions. For example, an industrialized country with a greenhouse gas reduction commitment could invest in a carbon-reducing project in Kenya, where the cost of building a solar power plant would be cheaper than building one in Europe.

Additionality is one criterion adopted by the CDM program for offset projects.



VA #15 Additionality



What is additionality?

The criterion of additionality requires proof that a project would not otherwise be built without the incentive of the sale of credits.

The assessment of additionality is an important part of the process because it is one of the standards for reviewing CDM projects.

VA #16 Carbon Sinks

A “carbon sink,” such as a forest, is a natural absorber of carbon because trees naturally take in carbon and store it. Because the growth of new trees can reduce carbon levels in the atmosphere, some countries allow such projects to be counted as carbon offsets.

In some cases, it might cost less to plant a forest than to make a factory emit fewer emissions. The carbon sink has the extra benefit of giving a forest monetary value, other than just for lumber.



VA #17 Costs and Benefits of Carbon Sinks



What is a carbon sink?

What is the benefit to industry of a carbon sink?

Are there any costs to industry in using carbon sinks?

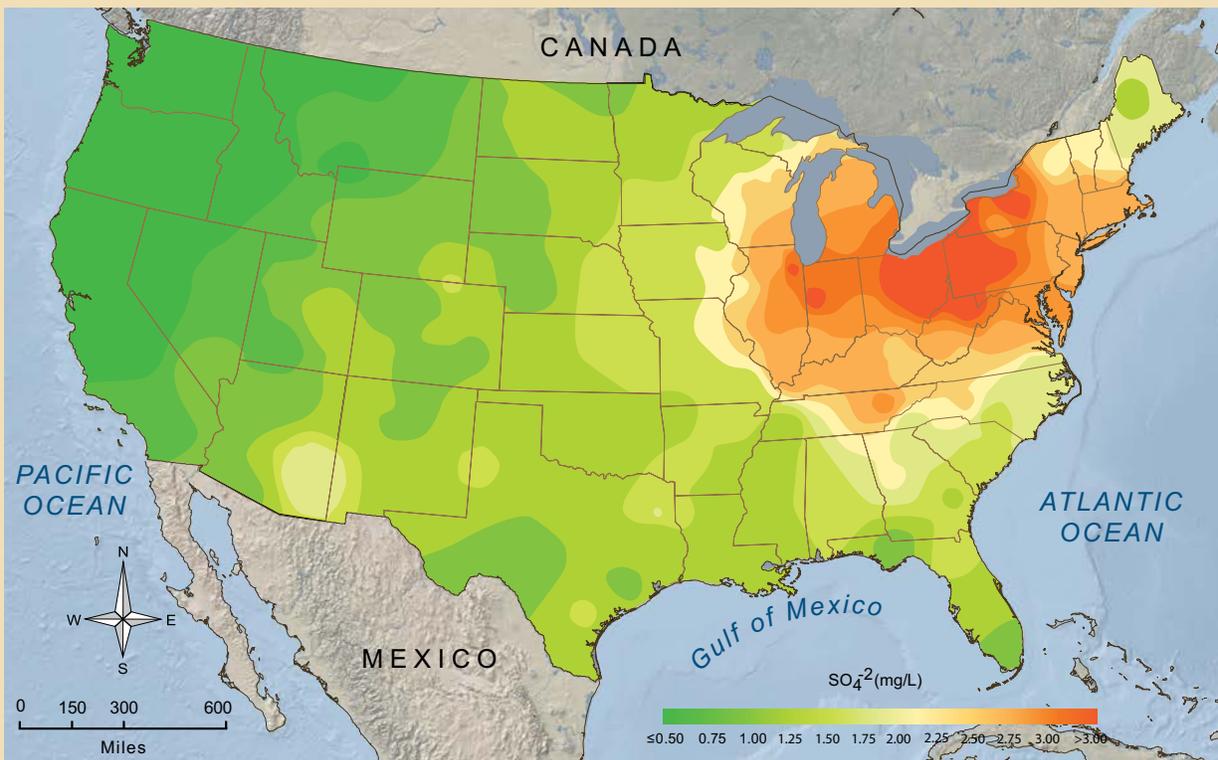
VA #18 Acid Rain

In the 1980s, acid rain—the contamination of rain with sulfur oxide and nitrogen oxide—became recognized as an environmental problem. Acid rain damages buildings and monuments, affects forests and lakes, and causes health problems.

What are the costs of acid rain?

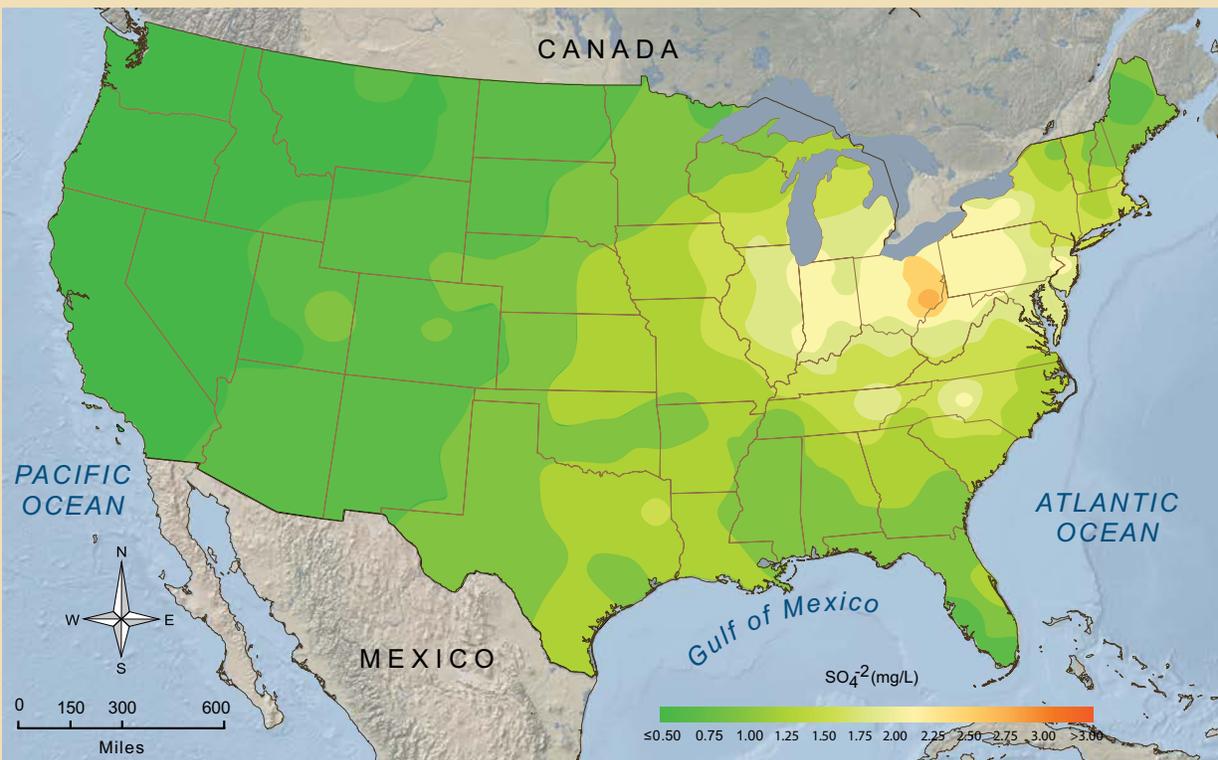


VA #19 Sulfate Ion Concentrations in 1985



In 1985, the highest concentrations of sulfate ions in the atmosphere were in the northeastern region of the U.S.

VA #20 Sulfate Ion Concentrations in 2005



By 2008, although the highest concentrations of sulfate ions in the atmosphere were still highest in that region, as a result of better emission controls, the concentration had decreased substantially. Thus, reducing some of the problems associated with acid rain.

VA #21 Sulfur Dioxide Reduction Program



Cap and trade programs can work!

In 1990, Title IV of the Clean Air Act amendment created a program to address the acid rain problem. Title IV's goal was to reduce sulfur dioxide in the atmosphere to below 1980 levels.

The Sulfur Dioxide Reduction Program was a success. In 1980, sulfur dioxide emissions were at 25.9 million tons, and in 2005, they were measured at 15 million tons.

This program used a cap and trade scheme.

VA #22 Environmental Protection and the Economy

No Longer “Environment” vs. “Economy”

The Sulfur Dioxide Reduction Program was criticized by many who thought, at first, that the program would hurt the economy. A report from the U.S. EPA about the U.S. experience using economic incentives to achieve environmental protection states that, “Economists have long understood that economic incentives have the potential to reduce pollution at a cost below that imposed by traditional regulations. The national experience of using economic incentives over the past decade reinforces this point of view.”

This bolsters the case of those who argue that programs, such as cap and trade can be a way for the government to protect the environment and support the economy.

VA #23 Comparing Elements of Fiscal Policy

Case Study	Program Description	Type of Program	Problems with Program
Partnership for a New Generation of Vehicles			
Environmental Tax Shifting			

VA #24 Environmental Protection Scenarios: Scenario 1

Americans rely on modern chemistry for everyday products. Chemistry helps produce everything from cleansers for the bathroom to the plastics that make toys, car parts, and even paint. Manufacturers produce a lot of toxic waste (an externality) in making these products. When consumers use cleansers, they go down the drain and can end up in rivers or the groundwater. The solids, such as plastics, take years to break down, and they often end up in landfills. When they end up in oceans and rivers, wildlife may get trapped in them or eat them.

What would be the best approach to eliminating these problems, since people are not going to stop using these products as long as they need cleansers, paints, and plastics?

VA #25 Environmental Protection Scenarios: Scenario 2

Traditional farming practices involve rotating crops and planting a diversity of crops. Crop rotation keeps the soil healthy, and a diversified crop prevents one disaster from destroying an entire farm. For example, a particular insect may target corn, but not tomatoes, or a late rain may hurt wheat or grapes, but not corn. However, in the modern economy, farming has become large-scale, and in the interests of economic survival, many farmers have abandoned traditional methods. Some large-scale farmers may grow one crop rather than many crops because then they can buy or rent one kind of harvesting machine and harvest the whole crop at once. When farmers grow the same crop year after year, the soil can become depleted. To compensate, they use chemical fertilizers that can damage the soil and leech into the rivers and groundwater, which provide drinking water. They may also spray pesticides to prevent insects from destroying crops. Pesticides can cause birth defects, lung ailments, and other health problems. Pesticides may also spread beyond the farm crops into the environment.

What can be done to decrease the damage caused by farming practices that rely on chemical fertilizers and pesticides?

VA #26 Environmental Protection Scenarios: Scenario 3

Farmers need honey bees to pollinate their crops so that plants can reproduce. Many wild plants also rely on bees for pollination. Over the past decade, bees have begun disappearing, and no one knows why. There are currently many theories about the cause. Some suggest global climate change is causing environmental changes that make bees more susceptible to diseases. Others say that a bacteria is getting into bee hives and killing bees. There is also some evidence suggesting that varroa mites are killing the bees. Yet, another hypothesis is that the nicotine-based pesticides many farmers have been using is killing bees. Because bees are essential to plant reproduction, scientists say that if the bees disappear, crop production will drop dramatically, with many ramifications to agriculture and economic systems.

What can be done about this problem? Should the government wait until the cause is known for certain before acting?

VA #27 Environmental Protection Scenarios: Scenario 4

Modern society consumes very large amounts of electricity. The generating plants that produce electricity are powered by a variety of energy sources including natural gas, coal, nuclear energy, and renewable resources. Energy production results in several pollutants including chemical air and water pollutants, hot water (nuclear power plants), and others. One practical approach to reducing the pollution created by power plants is to reduce electricity use. Since 9% of electricity is used for lighting, promoting the use of compact florescent light (CFL) bulbs has become a popular approach for conserving electricity. CFLs use approximately one-fifth the electricity of standard incandescent bulbs, so switching to CFLs can produce savings in electricity and money. But, CFLs use mercury, a highly toxic liquid metal, to produce light. When these bulbs burn out, many go to landfills where they could eventually release mercury, possibly contaminating groundwater. On the other hand, power plants that burn coal also release mercury and other pollutants into the environment. As more and more people have been switching to CFLs, the tradeoffs are becoming clearer—increased mercury pollution from the CFLs or decreased mercury pollution from coal-fired power plants.

What is the best way to deal with the fact that both CFL bulbs and coal-fired power plants can release mercury that can damage human and environmental health?



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