

Heat Teacher's Guide

www.pbs.org/frontline/heat

ABOUT THE FILM

Melting glaciers, rising sea levels, fires, floods and droughts. On the eve of a historic election, award-winning producer and correspondent Martin Smith investigates how the world's largest corporations and governments are responding to Earth's looming environmental disaster. With that sense of urgency in mind, Smith traveled to 12 countries on four continents to investigate whether major corporations and governments are up to the challenge. The report paints an ominous portrait. Despite increasing talk about "going green," across the planet, environmental concerns are still taking a back seat to shorter-term economic interests.

WATCHING THE FILM

Teachers can either assign the film for viewing as homework or show the film in class. Suggested discussion questions are provided. The lessons and activities in this guide are focused on excerpts from the film and can be viewed on DVD in class or online. Introduction and exit indicators are provided for each segment

A NOTE TO TEACHERS

This guide is intended for classes in social studies, civics and government, environmental studies, language arts, current events and history; Grade Level 9th – 12th. The guide examines the political, economic, and social costs and benefits of addressing the global change issue as presented in the *HEAT* documentary. You can modify the lesson to accommodate instructional time and student abilities..

DISCUSSION QUESTIONS

This guide includes a list of questions for students to discuss after viewing *HEAT*.

FEATURED LESSON PLAN

A Daunting Task: Cost/Benefit Analysis of Acting on Global Warming

LESSON OBJECTIVES:

Students will:

- Analyze the political, economic, and social costs and benefits of addressing issues surrounding global climate change

ADDITIONAL LESSON IDEAS

■ **FRONTLINE'S Hot Politics**

www.pbs.org/wgbh/pages/frontline/hotpolitics

FRONTLINE'S Hot Politics examines the politics behind the U.S. government's failure to act on the biggest environmental problem of our time. The teacher's guide examines the wide range of viewpoints and scientific evidence that surrounds the issue of global warming and climate change.

■ **Energy Companies' Media Messages**

Students review and analyze energy companies' media messages on global warming.

■ **The President's Energy Policy**

Assessing President-elect Barack Obama's energy policy for addressing climate change

■ **PBS NOW with David Brancaccio The Heat over Global Warming Lesson Plan**

www.pbs.org/now/shows/304/index.html

This lesson is based on the 2007 NOW episode *The Heat over Global Warming*. Students will explore the causes and impact of global warming and explore perspectives on the global warming debate.

■ **ADDITIONAL RESOURCES**

An annotated list of relevant Web sites.

■ **PURCHASING THE FILM**

HEAT can be purchased from Shop PBS for Teachers. Also, teachers and students can watch the film streamed on FRONTLINE's Web site www.pbs.org/frontline/heat

■ **CREDITS**

This teacher's guide was developed by Simone Bloom Nathan of Media Education Consultants. It was written by Greg Timmons, curriculum writer and educational consultant. Advisers were Ellen Greenblatt of The Bay School, San Francisco, and Debra Plafker Gutt, Stuyvesant High School, New York.

DISCUSSION QUESTIONS

- 1 In what ways might climate change affect the way people live?
- 2 Describe how our economy and way of life are dependent on fossil fuels.
- 3 Describe the problems developing countries face in trying to modernize.
- 4 Describe how U.S. policy toward global warming changed between the Kyoto Protocol and the 2007 United Nations Climate Change Conference held in Bali.
- 5 Why is the expression “America is addicted to coal” true?
 - Why is “clean coal” technology going to be difficult to implement as an environmentally acceptable fuel for producing electricity?
 - What is President-elect Barack Obama’s position on clean coal?
- 6 Historically, what has been the U.S. automakers’ policy on fuel-efficient cars?
 - How has this policy benefited the automakers and cost the American consumer?
- 7 Explain how the oil industry’s attitude toward renewable energy is similar to the U.S. automakers’ attitude toward fuel-efficient cars?
- 8 Describe the lesson learned after the Clinton administration’s attempt to encourage U.S. automakers to produce fuel-efficient vehicles.
 - Explain why corn-based ethanol might ultimately be an impractical alternative to gasoline.
- 9 Describe how Europe has taken the lead in developing fuel-efficient vehicles and renewable energy.
 - How will T. Boone Pickens’ natural gas and wind plan and building more nuclear power plants help address America’s dependence on fossil fuels?
- 10 With all the evidence indicating that fossil fuel consumption contributes to global warming, why do you think Congress is still unable to come up with a plan to address the problem?

FEATURED LESSON PLAN

A Daunting Task: Cost/Benefit Analysis of Acting on Global Warming

LESSON OBJECTIVES

Students will:

- Examine the costs and benefits of the continued use of fossil fuels, developing fuel-efficient vehicles and renewable resources
- Analyze the political, economic and social costs and benefits of addressing issues surrounding global climate change

MATERIALS NEEDED

- Internet access
- Copy of the FRONTLINE documentary *HEAT* or access to the *HEAT* Web site www.pbs.org/wgbh/pages/frontline/heat/
- *HEAT* Teacher's Guide and student handouts
- Six large sheets of butcher paper, felt pens, pencils, pens.

GLOSSARY: You may wish to review the following terms with students.

- **CAFÉ Standards (Corporate Average Fuel Economy):** Government standards that establish the average fuel economy (in miles per gallon) for a manufacturer's fleet of passenger cars and light trucks sold in the United States. (Source: *About.com*)
- **Cap-and-Trade Program:** A flexible environmental regulation that sets an overall limit on the emission of certain pollutants, but allows companies to buy "carbon credits" to pollute over the limit or sell carbon credits when they don't. (Source: *ProQuest Information & Learning*)
- **Clean Coal:** Coal for which efforts have been taken to reduce the emission of pollutants, such as sulfur dioxide and nitrogen oxides. (Source: *ProQuest Information & Learning*)
- **Climate Change:** Long-term alteration in global weather patterns, especially increases in temperature and storm activity, regarded as a potential consequence of the greenhouse effect. (Source: *Encarta Dictionary*)
- **Cost/Benefit Analysis:** A method of project evaluation that compares the potential benefits with the anticipated costs (Source: *Encarta Dictionary*)
- **Intergovernmental Panel on Climate Change (IPCC):** An organization created in 1998 by the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP). The IPCC produces climate change assessment reports on the basis of scientific and technical information. (Source: *IPCC Web site*)
- **Kyoto Protocol:** An international agreement negotiated in 1997 that aimed to reduce carbon dioxide emissions and the presence of greenhouse gasses. (Source: *Answers.com*)
- **Lieberman-Warner Climate Security Act (2008):** A bill presented in the U.S. Senate to establish a cap-and-trade system for reducing carbon emissions. (Source: *EPA Web site*)

TIME NEEDED

- Opening Activity (optional): *20 to 30 minutes*
- Main Activity:
 - Viewing and gathering information: *20-30 minutes (for each program segment)*
 - Discussions over segment material: *30 minutes*
 - Discussion on accumulated cost/benefit charts: *30 minutes*
- Research and writing of persuasive letter (*time will vary*)

PROCEDURE

Opening Activity (Optional)

Invite students to share some of the ways they can be (or are) environmentally responsible. Choose a few actions and ask students to list the associated costs and benefits. Encourage students to consider costs and benefits beyond themselves, such as to the producers of the products or services, the government and the environment.

Main Activity

- 1 Divide the class into six groups and distribute the handouts, butcher paper and writing implements to each group.
- 2 Review the directions at the top of the handouts with students.
- 3 Provide time for students to view the program segments either from the FRONTLINE HEAT Web site www.pbs.org/wgbh/pages/frontline/heat/view/ or from the DVD. (This can also be assigned as homework.)
- 4 Help facilitate students' small group discussions and chart creation.
- 5 Ask a representative from each group to present an overview of their group's findings to the class.
- 6 Invite all students to review the posted charts, then discuss the following questions as a whole class:
 - a Where do you see similar patterns or courses of action taken by different governments, industries, or populations
 - b Review how the United States and countries in Asia and Europe are addressing climate change. What similarities and differences do you see in the attitudes of each country's government and leaders, industries and/or citizens?
 - c Discuss why government, industry and the public play a larger or smaller role in each energy area.
 - d What are some of the challenges for countries to develop an all-inclusive plan involving government, industry and the public in addressing climate change?
 - e Which country do you feel has the most important role to play in addressing global climate change and why?

ACTIVITY ASSESSMENT

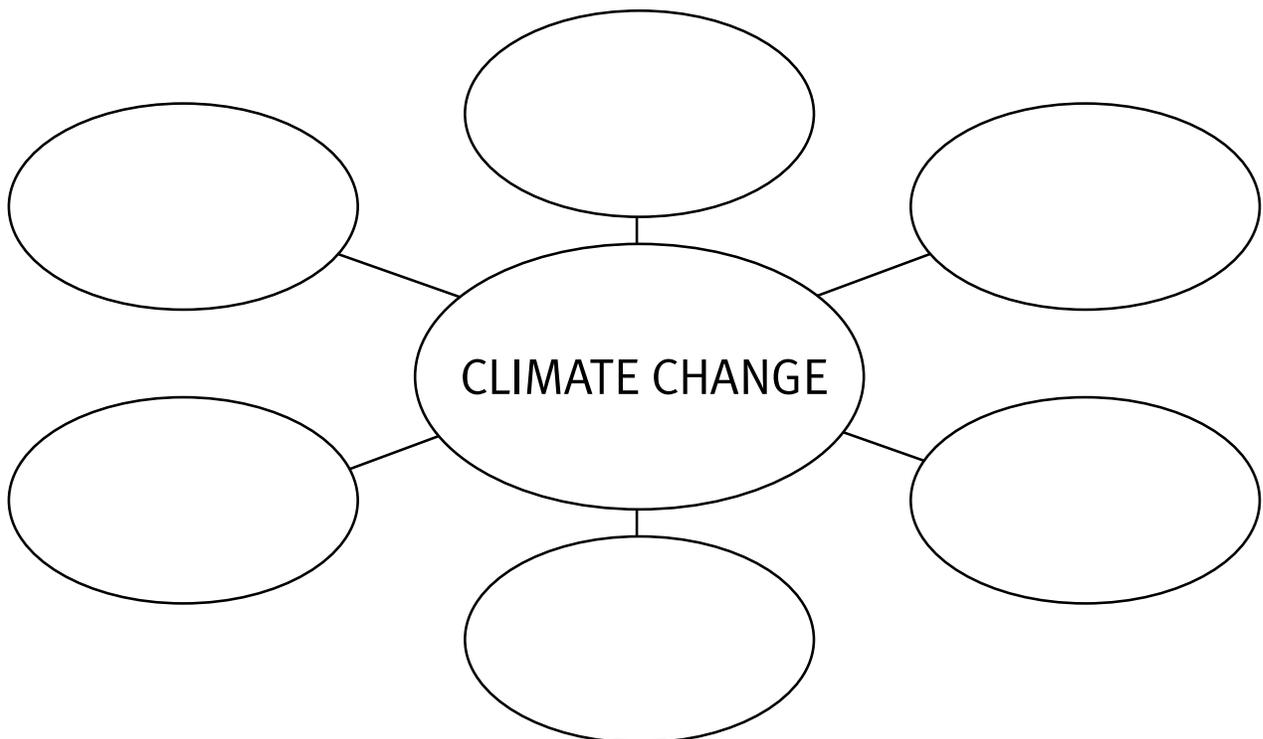
Have students choose one method or policy that they feel offers the most benefit for the least cost. Using what they've learned from the activity, students will write a persuasive letter to their member of Congress to advocate for the one method or policy they have chosen, explaining its costs and benefits and the reasons why the student thinks it should be pursued.

GROUP 1 HANDOUT

Watching the World Change

DIRECTIONS

- 1 In your group, read the questions below, view the program segment, and then discuss the questions, using the responses to help you develop a cost/benefit analysis on the chart below. Use the existing lines and bubbles as a guide.
- 2 Label each bubble as a cost or benefit as you record the content of the bubble.
- 3 Transfer your chart to a large sheet of butcher paper and post it on the wall.
- 4 Designate a spokesperson to present an overview of your group's findings to the class.



VIDEO SEGMENT

This is Chapter One on the Web site. Total Time: 8:36 minutes

Enter after program introduction 3:00 minutes in with scenes of clouds and mountains.

Exit on Dr. Rajendra Pachauri's line, "... And I think the sooner we realize that, the better."

BACKGROUND

Melting Himalayan glaciers bring water to half of the world's people. The Intergovernmental Panel on Climate Change estimates that by 2035, 80 percent of the glaciers in the Himalayas and Tibet will be gone due to climate change. On your chart, record the costs and benefits to people who live on rivers fed by these glaciers and potentially to the world.

DISCUSSION QUESTIONS

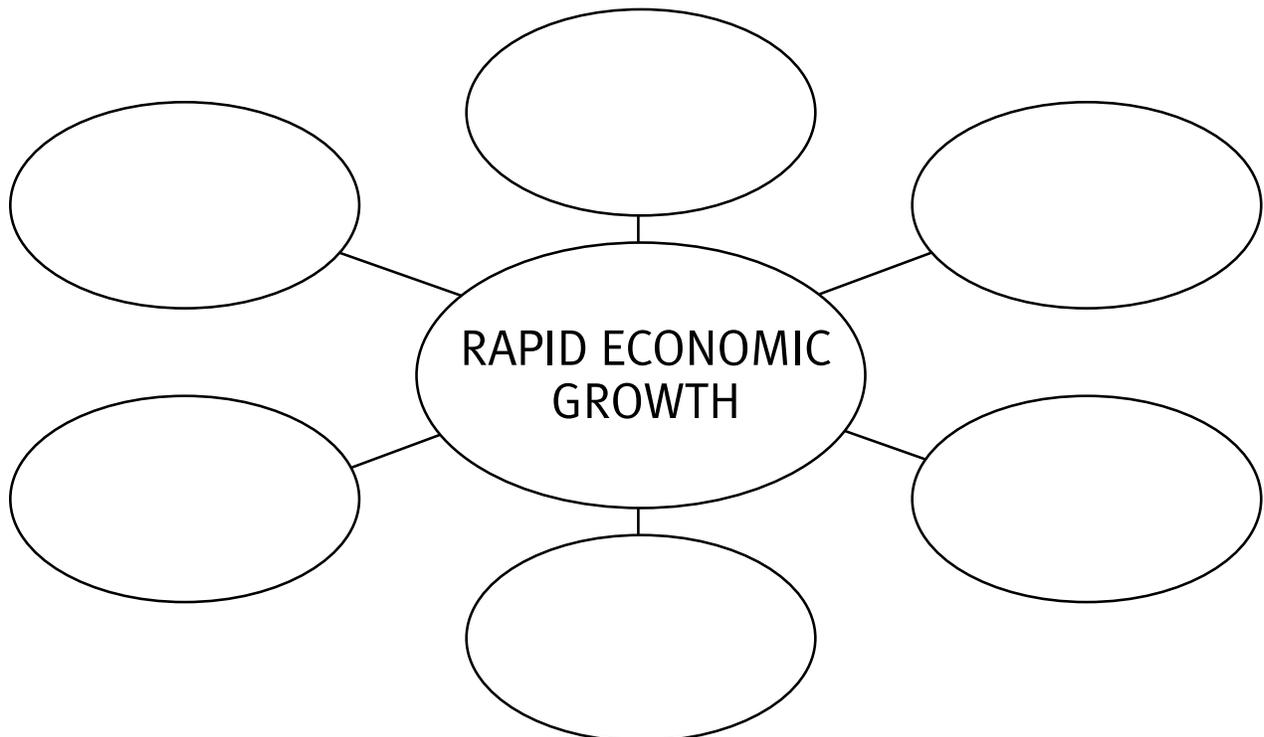
- Who will be affected positively and negatively by this loss of glacial water?
- What are the costs and benefits of rapid glacier melt to the people living downstream of the many rivers that flow from these regions?
- How might China's loss of water affect its relations with other countries also dependent on that water?

GROUP 2 HANDOUT

Fossil Fuels, The Engine Of Our Lives

DIRECTIONS

- 1 In your group, read the questions below, view the program segment, and then discuss the questions, using the responses to help you develop a cost/benefit analysis on the chart below. Use the existing lines and bubbles as a guide.
- 2 Label each bubble as a cost or benefit as you record the content of the bubble.
- 3 Transfer your chart to a large sheet of butcher paper and post it on the wall.
- 4 Designate a spokesperson to present an overview of your group's findings to the class.



VIDEO SEGMENT

This is Chapter Two on the Web site. Total Time: 6:45 minutes

Enter at narrator line, "Meanwhile, developing nations were entering a new era of rapid growth."

Exit with Sunita Narain statement "... then the planet is doomed forever."

BACKGROUND

Both China and India are rapidly developing their economies and producing larger amounts of greenhouse gasses in the process. On your chart, record the costs and benefits of this rapid economic growth

DISCUSSION QUESTIONS

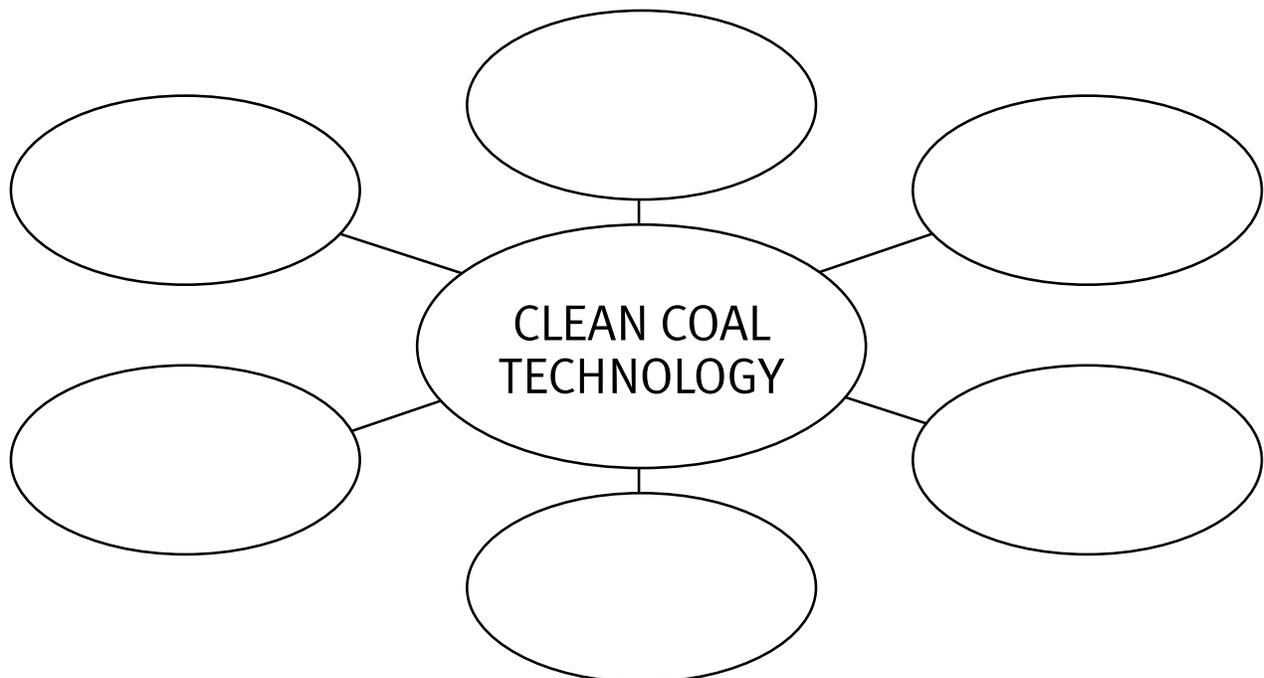
- What are the costs and benefits to China's Shenhua Energy Corporation's in trying to be more aggressive in reducing CO₂ emissions?
- The making of cement is one of the biggest contributors to greenhouse gas emissions. What are the costs and benefits for India in using this building material?
- If developing countries followed the Western model of growth (using a lot of resources and energy and producing a lot of waste) what would be the potential costs and benefits?

GROUP 3 HANDOUT

America's Addiction to Coal

DIRECTIONS

- 1 In your group, read the questions below, view the program segment, and then discuss the questions, using the responses to help you develop a cost/benefit analysis on the chart below. Use the existing lines and bubbles as a guide.
- 2 Label each bubble as a cost or benefit as you record the content of the bubble.
- 3 Transfer your chart to a large sheet of butcher paper and post it on the wall.
- 4 Designate a spokesperson to present an overview of your group's findings to the class.



■ VIDEO SEGMENT

This is Chapter Four on the Web site. Total Time: 9:05 minutes

Enter 8:52 into segment with narration, "In the marshlands of central Florida, there is not much activity for people..."

Exit at end of segment with Eric Pooley statement, "You look at that map and you know why both candidates are very strongly in favor of clean coal."

■ BACKGROUND

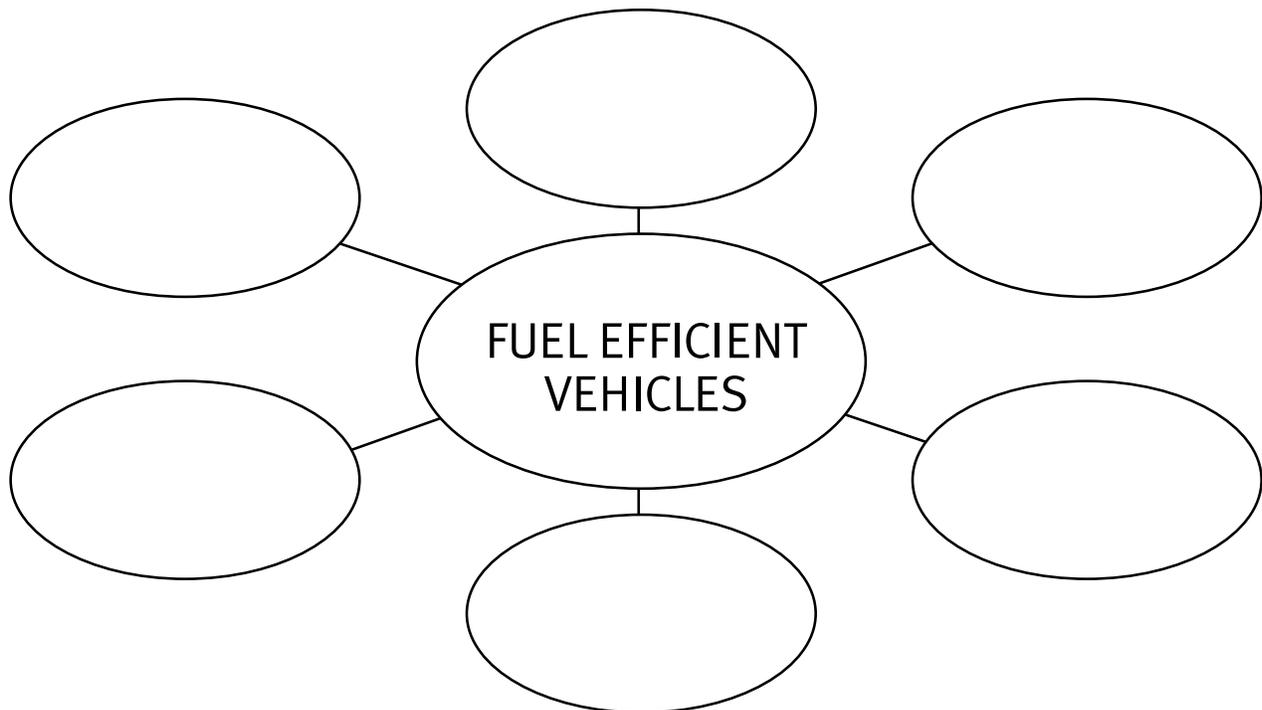
There are 600 coal-fired power plants in the U.S. Fifty-two percent of America's electricity is generated by coal, which is one of the biggest emitters of greenhouse gasses. "Clean Coal", can be produced through more advanced and complicated technology (i.e., the Integrated Gas Combined Cycle (IGCC) process or the alternative, "scrubbing" the coal emissions). Each produces a cleaner-burning fuel and puts the captured carbon deep in the ground, although neither has been tested or shown to be economically viable. On your chart, record the costs and benefit of developing "clean coal" technology for the economy, taxpayers and politicians.

■ DISCUSSION QUESTIONS

- What are the costs and benefits of coal-produced energy for America's manufacturing and service industries and consumers?
- What are the costs and benefits to American utility, manufacturing and service industries if the IGCC process or "scrubbing" emissions is implemented?

GROUP 4 HANDOUT**Cars: Second-Largest Source of Carbon Emissions****DIRECTIONS**

- 1 In your group, read the questions below, view the program segment, and then discuss the questions, using the responses to help you develop a cost/benefit analysis on the chart below. Use the existing lines and bubbles as a guide.
- 2 Label each bubble as a cost or benefit as you record the content of the bubble.
- 3 Transfer your chart to a large sheet of butcher paper and post it on the wall.
- 4 Designate a spokesperson to present an overview of your group's findings to the class.

**VIDEO SEGMENT**

This is Chapter 5 on the Web site. Total Time: 3:50 minutes

Enter at beginning of segment 5 with factories and traffic on highways.

Exit at narrator statement, "And with Dingles' help, Detroit has successfully resisted attempts to raise fuel economy standards for more than 32 years."

BACKGROUND

Because America's cars and trucks emit more greenhouse gasses than the vehicles of Europe, Japan, China, and India combined, most analysts believe that producing more fuel-efficient cars will reduce these emissions. In the 1970s Congress mandated higher fuel-economy standards, known as CAFÉ (Corporate Average Fuel Economy) standards, which raised the fuel consumption for the average American car from 20 to 25 miles per gallon. Congress has had little success in raising those standards ever since. On your chart, record the costs and benefits of developing fuel-efficient vehicles for U.S. automakers and the public

DISCUSSION QUESTIONS

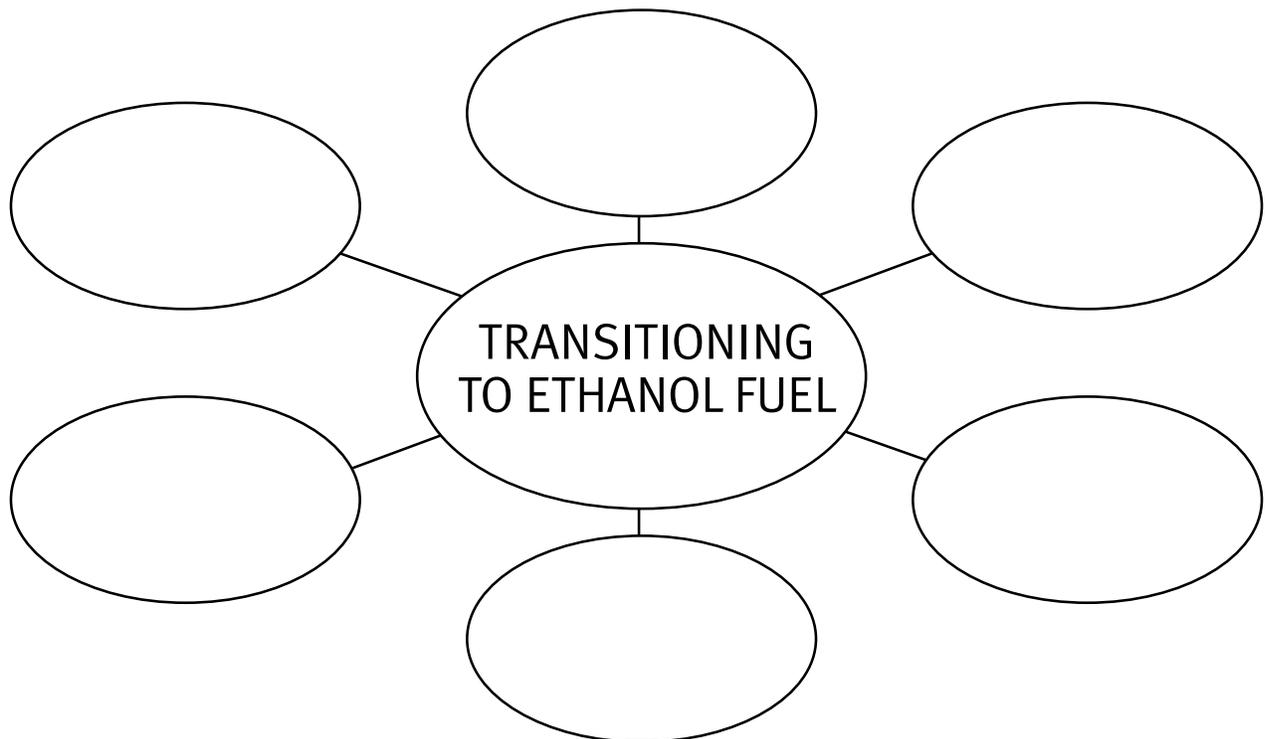
- What are the costs and benefits to the government and the auto industry on using CAFÉ standards to try to reduce emissions and U.S. dependency on foreign oil.
- What are the economic costs and benefits to the U.S. auto industry of building more fuel-efficient vehicles?

GROUP 5 HANDOUT

Two Instructive Lessons from the Past

DIRECTIONS

- 1 In your group, read the questions below, view the program segment, and then discuss the questions, using the responses to help you develop a cost/benefit analysis on the chart below. Use the existing lines and bubbles as a guide.
- 2 Label each bubble as a cost or benefit as you record the content of the bubble.
- 3 Transfer your chart to a large sheet of butcher paper and post it on the wall.
- 4 Designate a spokesperson to present an overview of your group's findings to the class.



■ VIDEO SEGMENT

This is Chapter Seven on the Web site. Total time: 16:48

Enter with a shot of billowing smoke and highway traffic. Narrator's statement, "As I've traveled through America's energy landscape ... tackling climate change is going to require a huge and concerted push from government."

Exit with Amy Myers Jaffe statement, "We need a leader who is going to stand up and say, 'We need to do this together.' And it's doable!"

■ BACKGROUND

Ethanol is a biofuel made from crops such as sugar cane and corn. It is promoted as a green alternative to gasoline. On your chart, record the costs and benefits of changing car fuel from gasoline to ethanol for the auto industry, consumers and the environment

■ DISCUSSION QUESTIONS

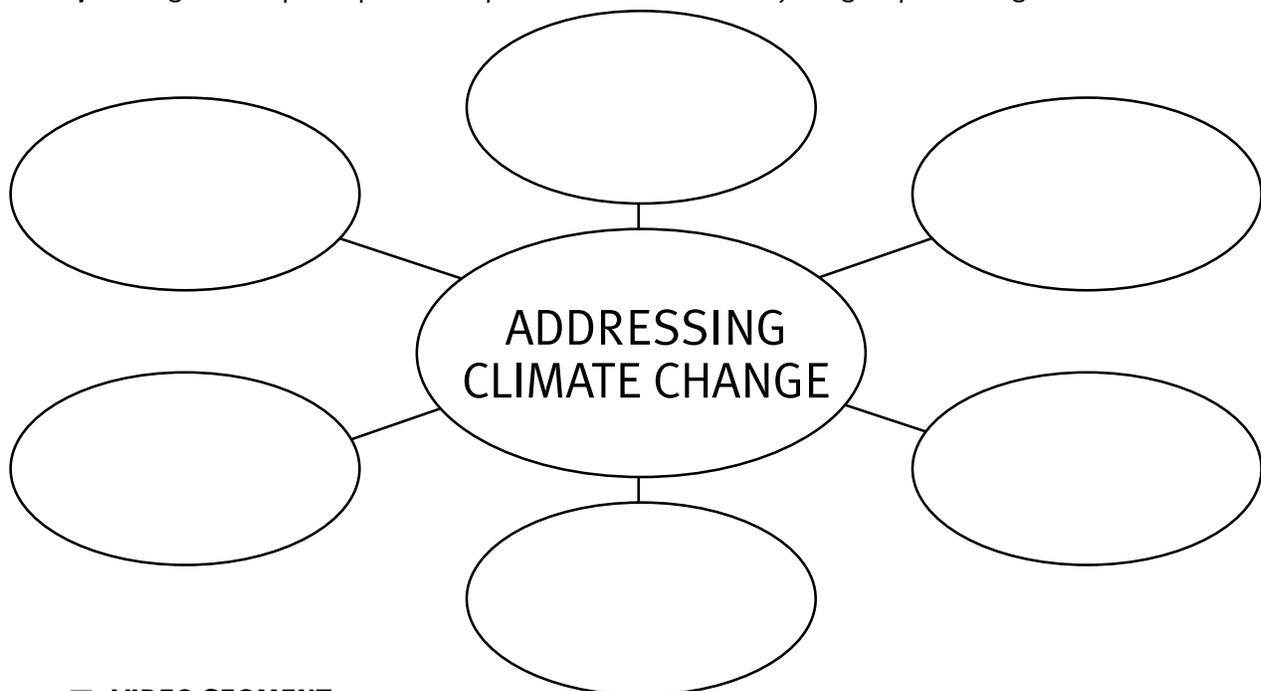
- What are the perceived costs and benefits of ethanol as a viable alternative to gasoline to power automobiles?
- What are the costs and benefits of ethanol production for the corn producers?

GROUP 6 HANDOUT

Will America Summon the Political Will?

DIRECTIONS

- 1 In your group, read the questions below, view the program segment, and then discuss the questions, using the responses to help you develop a cost/benefit analysis on the chart below. Use the existing lines and bubbles as a guide.
- 2 Label each bubble as a cost or benefit as you record the content of the bubble.
- 3 Transfer your chart to a large sheet of butcher paper and post it on the wall.
- 4 Designate a spokesperson to present an overview of your group's findings to the class.



■ VIDEO SEGMENT

This is Chapter 9 on the Web site. Total time: 10:00

Enter with a shot of the American flag. "So, can America summon the political will necessary to address climate change?"

Exit with Calif. Attorney General Jerry Brown, " ...But I would have to say one has to approach this with great humility."

■ BACKGROUND

In 2008, the Senate examined the Lieberman-Warner Climate Security Act, which would provide subsidies to the utility industry, companies involved in renewable energy and the auto industry. At the heart of the bill is a market mechanism known as "cap and trade." The government sets a cap on the amount of allowable pollution emissions produced by industries. If a company goes above its quota, it is forced to buy a permit from companies that don't go over their limit. However, over time the number of these permits is reduced, in theory forcing the industries to invest in new clean technology, thus creating new business opportunities and new jobs. On your chart, record the costs and benefits of addressing climate change.

■ DISCUSSION QUESTIONS

- Why did senators like James Inhofe from Oklahoma feel the Lieberman-Warner Climate Security Act was too costly to the American economy and consumers?
- What are the costs and benefits to government leaders and the American public to make — or not make — the dramatic shifts that Attorney General Jerry Brown says are necessary to address climate change?

ADDITIONAL LESSON PLANS

■ **FRONTLINE'S *Hot Politics***

www.pbs.org/wgbh/pages/frontline/hotpolitics/

FRONTLINE's *Hot Politics* examines the politics behind the U.S. government's failure to act on the biggest environmental problem of our time. The teacher's guide examines the wide range of viewpoints and scientific evidence that surrounds the issue of global warming and climate change.

■ **Energy Companies' Media Messages**

Have students review several energy companies' media messages on global warming, analyze messages these companies are sending to the public, and compare the companies' messages with their policies and expenditures for investing in renewable resources.

■ **The President's Energy Policy**

Research President-elect Barack Obama's energy policy for addressing climate change or go to the FRONTLINE Web site at www.pbs.org/frontline/heat/etc/presenvironment.html. Have students summarize the basic points of this plan, identify its costs and benefits, and evaluate how well they feel this plan addresses the climate change issue.

■ **PBS NOW with David Brancaccio *The Heat over Global Warming Lesson Plan***

www.pbs.org/now/shows/304/index.html

This lesson is based on the 2007 NOW episode *The Heat over Global Warming*. Students will explore the causes and impact of global warming and explore perspectives on the global warming debate.

ADDITIONAL RESOURCES

A Note about Internet Resources

Students need to be aware that Web sites sometimes only present one view of an issue. Encourage them to think about Web sites even as they are reading. Guiding questions as they review Web sites are: What did you learn from this site? What didn't you learn from this site? Who sponsors this site? What bias might the sponsor have? How current is the site?

■ **U.S. Senate Committee on Environment and Public Works**

epw.senate.gov/public/

This government Web site presents statements from the majority and minority political parties in environmental issues specific to climate change. The committee's activities and calendar are listed, as well as contact information for committee members.

■ **United States Climate Action Partnership**

www.us-cap.org/

This site is sponsored by a group of business and leading environmental organizations to call on the federal government to enact strong national legislation to require significant reductions of greenhouse gas emissions. USCAP has issued a set of principles and recommendations on the urgent need for a policy framework on climate change.

■ **U.S. Environmental Protection Agency's Climate Change Web site**

www.epa.gov/climatechange/index.html

This Web site has a wealth of information on the subject of climate change covering the science, economics, environment and health issues, and government policy. The site also features student activities and lessons.

■ **Earth Day Network**

ww2.earthday.net/node/12

Official site of the Earth Day Celebration, this site features more than 300 standard-based lesson plans, school greening tips, grants for teachers, and a network of more than 25,000 teachers to share ideas with.

■ **National Highway Traffic Safety Administration**

www.nhtsa.dot.gov/CARS/rules/CAFE/overview.htm

This Web site includes frequently asked questions on CAFÉ standards, CAFÉ data on American and imported cars, and fuel economy guide for estimating city and highway driving.