

The Lorax, Externalities & Hydraulic Fracturing

NCSS Thematic Strand: Production, Distribution & Consumption

Grade Level: 9-12

Time Outline: 1-50 minute period

Purpose, Background and Context:

The Lorax, a popular children's book by Dr. Seuss, is a social commentary about the impacts, or externalities, of unregulated industry. At the time of its publication (1971) the modern environmental movement, in which average Americans sought to improve the environment and limit pollution by consumers and industry, had gained traction. For example, landmark pieces of environmental legislation such as the Clean Air Act (1963) and the Water Quality Act (1965) were passed and the Environmental Protection Agency (1970) and Earth Day (1970) were created.

In this lesson, students will learn the economic concept of externalities by first considering the story of The Lorax and the context in which Dr. Seuss wrote the book. Then students will learn how externalities are commonly dealt with through a contemporary, real-world case. Specifically, students will examine the practice of hydraulic fracturing. As an advisory council, students will explore actionable strategies for addressing externalities and recommend the best strategies for dealing with the potential and known externalities of hydraulic fracturing.

Objectives & Student Outcomes:

Students will:

- ❖ Be able to define the concept of externalities and understand how it relates to the idea that “economic choices that people make have both present and future consequences” (NCSS, p. 51).
- ❖ Learn and apply actionable strategies for addressing externalities as a way of understanding how “economic incentives affect people’s behavior,” as well as “how markets fail” and how the government responds to failures through the example of hydraulic fracturing (NCSS, p. 51).

Materials:

- ❖ The Lorax by Dr. Seuss (For a longer lesson, the teacher could share the entire book. For a shorter lesson, the teacher should select pages and condense the story as was done for this lesson.)
- ❖ Hydraulic fracturing worksheet
- ❖ Hydraulic fracturing assignment
- ❖ EPA Documerica images that align with Dr. Seuss' story
- ❖ Externalities definition

Procedures:

Procedure 1: Getting Started

Ask students if they have ever read Dr. Seuss', The Lorax. Explain that this children's book is a social commentary. Explain what a social commentary is. Then ask students to consider the following during the story:

In what context did Dr. Seuss write the book? What might have been happening?

The Lorax demonstrates an important economic-environment relationship.

What are some of the economic-environment interactions?

Read the story.

Procedure 2: Class discussion

Lead a class discussion. Ask students to identify Dr. Seuss' commentary. Explain the context in which Dr. Seuss wrote The Lorax by discussing the modern environmental movement, by showing environmental pictures collected by the EPA project Documerica (included after lesson plan) and by providing students with a definition of externalities.

Negative externalities are costs imposed upon an individual or group that is outside or external to a transaction.

Have students identify the industrial activity and the consequence in the image. Then have students connect the consequences to the concept of externalities.

Procedure 3: Application

Transition students to the activities to apply the idea of externalities to the contemporary example of hydraulic fracturing. Give students the Hydraulic Fracturing worksheet. Explain the importance of natural gas, how hydraulic fracturing is used to collect natural gas, and some of the potential or known externalities of hydraulic fracturing (this information is included on handout).

Procedure 4: Advisory Council

Explain to students that they will be serving as an advisory council. The council's job is to evaluate common means externalities are dealt with and recommend an actionable plan to minimize the potential or known externalities of hydraulic fracturing. Divide students into small groups. Each group will read the actions and discuss which actions are best suited to addressing the impacts of hydraulic fracturing.

Procedure 5:

Have each group report on their recommended action(s) to address the impacts of hydraulic fracturing to the class. Encourage students with relevant questions.

Procedure 6: Wrap up lesson

Re-emphasize the concept of externalities and how they are commonly dealt with. Assign student homework. Students will write a short reflection. In their reflection students need to address the following:

- ❖ *What action(s) would you recommend to address the known or potential externalities of hydraulic fracturing?*
- ❖ *Economic choices have consequences. What positive or negative consequences of hydraulic fracturing that were most important to your decision? Was it hard for you to decide which consequences were more important?*
- ❖ *Four of the five actions involve government intervention. Why do you think that's the case? Can you think of other actions that would address these externalities without government intervention?*

Assessment of Outcomes:

Student participation will be assessed by collecting handouts and checking notes after reflection is collected.

Students will write a short reflection. In their reflection students need to address the following:

- ❖ *What action(s) would you recommend to address the known or potential externalities of hydraulic fracturing?*
- ❖ *Economic choices have consequences. What positive or negative consequences of hydraulic fracturing that were most important to your decision? Was it hard for you to decide which consequences were more important?*
- ❖ *Four of the five actions involve government intervention. Why do you think that's the case? Can you think of other actions that would address these externalities without government intervention?*

Extensions and Adaptations:

Provide students with or ask them to identify another contemporary example.

Instead of focusing on actionable strategies at the state or national level, have students consider how and if externalities should be addressed at the global level.

Have students identify an externality in their community and an action to address the problem at the local level.

Students may research the U.S. Environmental Protection Agency to learn about its history and current work at regulating polluting activities. Have students create a brochure that highlights the agency, its work on one issue and whether the agency's actions are appropriate and effective.

Have students identify an externality and produce their own creative work as a social commentary.

Resources:

Dr. Seuss, The Lorax, Random House, 1971

U.S. Energy Information Administration <http://www.eia.gov/>.

U.S. Environmental Protection Agency, Hydraulic Fracturing,
<http://www.epa.gov/hydraulicfracture/>.

U.S. Environmental Protection Agency, Pollution Slide Show,
<http://www.epa.gov/aboutepa/history/slideshow.html>.

The National Archives, Documerica Photographs, <http://arcweb.archives.gov/>.

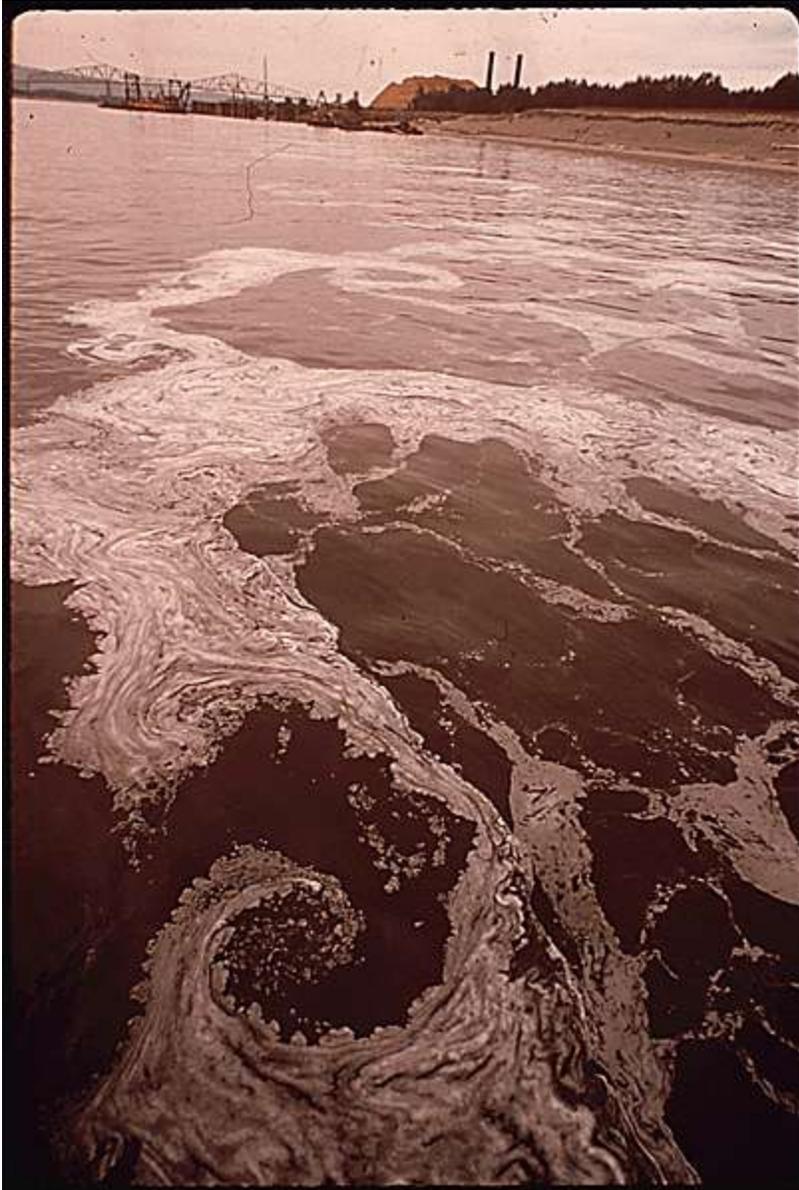
Documerica Images



Logging truck loaded with cedar in a clearcut area of the Quinault Indian Reservation (1972) Photograph by Gene Daniels.



Tossing a Frisbee on a smoke-filled street in North Birmingham, most heavily polluted area of the city (1972) Photograph by LeRoy Woodson



Effluent from pulp mills pollutes Columbia River (1972) Photograph by Gene Daniels.

Hydraulic Fracturing Worksheet

Name:

Natural gas is major source of energy used in the United States. It is used to produce goods, such as steel, glass, paper, clothing, paints, fertilizers, plastics, medicines, explosives, and electricity. Today natural gas is championed by many citizens, businesses, and our government because it creates less air pollution than coal and oil and the United States has large reserves of natural gas to could reduce dependence on foreign sources of energy and increase domestic business.

Hydraulic fracturing is a process used to extract natural gas far below the ground. Wells are drilled into the ground. A mixture of water and chemicals are pumped into the ground at very high pressures. This process fractures rocks. The natural gas released from rocks collect in drilled wells and is removed for further processing. Then the fluids pumped into the ground are collected and treated. This water is either injected underground or into surface water (e.g. streams, lakes & oceans).

Some potential or known impacts to the environment because of hydraulic fracturing:

1. Water stress: hydraulic fracturing uses large volumes of water. At the local level, this means there is less water for other uses. Also, the quality of local water sources may worsen.
2. Water contamination by natural gas or injected chemicals.
3. Air pollution
4. Harm to animal habitats
5. Erosion, landslides & earthquakes
6. Loss of soil productivity

How could the impacts or **externalities** of hydraulic fracturing be reduced? Write notes after each approach on its usefulness in this example.

Approach 1:

Taxes can be used to force businesses to pay for external costs. When a business' action creates a cost, it would be taxed to pay for damages. This approach can be hard to use. How do we prove that a particular business caused harm? How much should damages cost? If the "right" amount is chosen, businesses will find other ways to create or offer goods and services because the taxes are too much. But sometimes the costs decided by legislatures, government agencies, or judges are not enough to stop an externality. Businesses decide it is more profitable to pay the tax than change its actions.

Approach 2:

Business groups and citizens or citizen groups sometimes bargain or negotiate to find a solution that lessens or removes the external cost. This approach can be hard to use. Each side must listen, have a chance to be heard, and be able to bargain. The solution has to be agreed to by everyone and is usually voluntary.

Approach3:

Sometimes the people harmed by businesses go to court for judicial action. Courts can issue injunctions, which tell a business to stop doing whatever actions have harmed the victim. Judges can also make a business pay victims for any damages. This

approach works in two ways. It stops the harm and makes businesses more cautious. The downside of this approach is that the courts can only help after harm has occurred and if the harmed parties are able and willing to go to court.

Approach 4:

Some times governments sell or auction a limited number of “pollution credits.” If it is costly to buy the credits or even buy them at all, a business may choose to find a new way of creating or providing goods or services. Businesses that choose to buy the credits are paying for the damages they cause and the government is limiting polluting activities. This is often used when a good or service the sector provides is very useful even though it causes harm.

Approach 5:

Governments may choose to directly regulate business activities. If a business does not follow government regulations it is fined and sometimes the decision-makers go to jail. This is often used when the harm caused is too great to allow. People and their governments decide there is not choice on the business end.

3. Four of the five actions involve government intervention.
 - (a) Why do you think that is the case?

- (b) Can you think of other actions that would address these externalities without government intervention?