

Focused Learning Lesson
Science and the Environment
Grades 9-12
SE-H-C4

Overview:

This lesson is designed to allow practice in analyzing the risk-benefit for certain common environmental situations. The students are given one of several suggested situations and allowed to study the risks-benefits of the situation and then reach a decision for the proposed question for that situation. Student worksheets are included along with a list of suggested situations/questions for consideration.

Approximate Duration: 45 minutes.

Benchmark:

SE-H-C4 demonstrating that environmental decisions include analyses that incorporate ecological, health, social, and economic factors

SE GLE: 22. Analyze the risk-benefit ratio for selected environmental situations.

Benchmark:

SI-H-A2 designing and conducting scientific investigations

SI GLE: 2. Describe how investigations can be observation, description, literature survey, classification, or experimentation.

Objectives:

1. The student will identify common ecological, health, social, and economical factors involved in environmental decision-making.
2. The student will analyze the risk-benefits ratio for a given environmental situation and make a decision.

Teacher Preparation:

1. Read Attachment 2 (Answer sheets) before beginning.
2. Make a copy of the student worksheets in Attachment 1 (Handouts) for each student prior to class.

Materials/Equipment/Resources:

Student worksheet copies
Pencil/pen
Scissors
Glue or transparent tape

Lesson Procedures

Set or Opener:

Ask, “ What would be the effects on building a power plant behind the school?” as an example of a decision that would effect the local environment. An alternative would be to bring a newspaper article concerning a large local building announcement and ask students its effect on the environment.

Body of the Lesson:

1. Explain that any environmental decision includes the four analysis areas of ecological, health, social, and economical factors. List the four areas on the board or a transparency.
2. Give out page 1 of Attachment 1 (Handouts) to illustrate examples of factors for each area of consideration for environmental decisions. Have students suggest three additional examples for each factor.
3. Divide students into small groups of two to four students and assign a selected environmental situation to each group (See suggested list of situations in Attachment 3, Situations.). Read directions on the worksheet to students before beginning the exercise.
4. Allow 20 minutes for each group to complete page 2 of Attachment 1 (Handouts).

Closure:

Have one person from each group present the decision for the group's situation. Allow about 2-3 minutes per group report. If time allows, let classmates offer alternatives to the group reports.

Attachments:

- Attachment 1: Handouts (2 pages)
- Attachment 2: Sample Scenarios
- Attachment 3: Key to Handouts
- Attachment 4: Sample Quiz

Sample Assessment Items:

1. The students' page 2 of their handouts from group-work may serve as assessment tools.
2. See Attachment 4, Sample Quiz, for a sample of summative assessment questions.

Reference Links and Technology Connections: *N/A*

Attachment 1: Environmental Decision-making Factors Handout 1

DIRECTIONS: Making environmental decisions involves analyzing ecological, health, social, and economic factors as risky or beneficial. Following are examples of risky and beneficial effects on a community's environment.

For each group of factors,

1. Label each factor as R for risk and B for benefit.
2. Write three more examples, either a risk or a benefit.

<p style="text-align: center;">Ecological factors</p> <p>___ loss of habitat</p> <p>___ loss of wildlife</p> <p>___ interference with drainage</p> <p>___ improvement of habitat</p> <p>___ provides new wildlife habitat</p> <p>___ limited appeal to people</p> <p>___ _____</p> <p>___ _____</p> <p>___ _____</p>	<p style="text-align: center;">Health factors</p> <p>___ reduction of noise levels</p> <p>___ increase in radiation levels</p> <p>___ reduction in available clean water</p> <p>___ improvement in water quality</p> <p>___ release of chemical toxins</p> <p>___ increase in garbage amounts</p> <p>___ _____</p> <p>___ _____</p> <p>___ _____</p>
<p style="text-align: center;"><i>Social factors</i></p> <p>___ increases traffic flow</p> <p>___ causes an increase in population</p> <p>___ displaces people from their homes</p> <p>___ reduces the variety of jobs</p> <p>___ attracts foreign people</p> <p>___ _____</p> <p>___ _____</p> <p>___ _____</p>	<p style="text-align: center;"><i>Economic factors</i></p> <p>___ creates new jobs</p> <p>___ high cost of construction</p> <p>___ high cost of clean-up</p> <p>___ requires few employees</p> <p>___ low cost of operation</p> <p>___ _____</p> <p>___ _____</p> <p>___ _____</p>

Handout 2 Decision-Making Exercise

DIRECTIONS: Use the handout, “Environmental Decision-making Factors,” as a guide to analyze the risk-benefits for the environmental situation assigned to your group. List the risks and benefits in the appropriate columns, then write the groups decision in the appropriate blank.

Description of situation: _____

Benefits	Risks
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Decision: _____

Attachment 2
SUGGESTED SCENARIOS
FOR
ENVIRONMENTAL SITUATIONS

The following situations may be used “as is” or as guidelines in constructing other situations to give to students.

1. The ABC Company has just applied for permission to build a new 30-store mall on the north side of town next to the City Park along the riverside. You are to determine whether to grant the request.
2. A new nuclear-powered plant is in the planning stage. The proposal is to build the power plant alongside the riverbank approximately 10 miles upriver from the city. You are on the committee to decide if permission will be granted. What is your decision?
3. J and J Contractors are approaching the parish’s zoning committee to allow them to drain 200 acres of swampland five miles to the east of town to build a new subdivision of homes. You are on the committee. Do you grant permission?
4. A large group of businessmen are requesting permission to build an international airport eight miles to the west of town. The potential site sits next to 10,000 acres of prime forestland where local citizens have traditionally hunted for the last 200 years. The businessmen claim that the land is partly swamp and that the airport will attract new businesses to the area. Your committee is the last to hear their request. Do you grant permission?
5. Ace Lumber Company have requested to harvest trees for lumber on an area of land 20 miles to the north of town. This area is the watershed to slow the drainage of rainwater through the town. Your committee is to decide if permission is to be granted. What is your decision?
6. Glitter Pharmaceutical Company want to build a research and manufacturing plant on 10 acres of land inside town. The plant will specialize in growing deadly viruses/diseases and developing antidotes for these. They are requesting a building permit for the project and plan to use the local sewer system for drainage. They state that the plant will create 200 new high-tech jobs in the area. What is your committee’s decision on whether to grant permission?

Attachment 3

Environmental Decision-Making Factors

Handout 1: Key

DIRECTIONS: Making environmental decisions involves analyzing ecological, health, social, and economic factors as risky or beneficial. Following are examples of risky and beneficial effects on a community's environment.

For each group of factors,

- label each factor as *R* for Risk and *B* for Benefit and
- write three more examples of either a risk or a benefit.

<p><i>Ecological factors</i></p> <p><u>R</u> loss of habitat</p> <p><u>R</u> loss of wildlife</p> <p><u>R</u> interference with drainage</p> <p><u>B</u> improvement of habitat</p> <p><u>B</u> provides new wildlife habitat</p> <p><u>R</u> reduction of undeveloped land</p> <p>___ <u>VARIES</u></p> <p>___ <u>Accept all reasonable responses.</u></p> <p>___ _____</p>	<p><i>Health factors</i></p> <p><u>B</u> reduction of noise levels</p> <p><u>R</u> increase in radiation levels</p> <p><u>R</u> reduction in available clean water</p> <p><u>B</u> improvement in water quality</p> <p><u>R</u> release of chemical toxins</p> <p><u>R</u> increase in garbage amounts</p> <p>___ <u>VARIES</u></p> <p>___ <u>Accept all reasonable responses.</u></p> <p>___ _____</p>
<p><i>Social factors</i></p> <p><u>R</u> increases traffic flow</p> <p><u>R</u> causes an increase in population</p> <p><u>R</u> displaces people from their homes</p> <p><u>R</u> reduces the variety of jobs</p> <p><u>R</u> limited appeal to people</p> <p>___ <u>VARIES</u></p> <p>___ <u>Accept all reasonable responses.</u></p> <p>___ _____</p>	<p><i>Economic factors</i></p> <p><u>B</u> creates new jobs</p> <p><u>R</u> high cost of construction</p> <p><u>R</u> high cost of clean-up</p> <p><u>R</u> requires few employees</p> <p><u>B</u> low cost of operation</p> <p>___ <u>VARIES</u></p> <p>___ <u>Accept all reasonable responses.</u></p> <p>___ _____</p>

Decision-Making Exercise Handout 2: Key

DIRECTIONS: Use the handout “Environmental Decision-making Factors” as a guide to analyze the risk-benefits for the environmental situation assigned to your group. List the risks and benefits in the appropriate columns, and then write the group’s decision in the appropriate blank.

Description of situation: _____

Benefits	Risks
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Answers will vary according to student decisions and choices.

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Decision: _____

Attachment 4 Sample Quiz

Below is a sample of questions that may be used on a quiz.

1. Which of the following decision-making factors would “many new jobs” be classified as?
 - A. Social
 - B. Ecological
 - C. Health
 - D. Economic
2. Explain why “economic factors” are considered in the analysis of an environmental decision?
3. Name three health benefits that may come about by the location of a garbage dump to the outskirts of a town instead of in town?
4. The city plans to fill in a swamp in the middle of town, which has been a drainage area for the town. Give two benefits for draining the area and two risks of draining the area.

KEY

1. *D*
2. *Any environmental decision will cost to implement and could mean the lost of economic revenue to a locality. Someone must pay and someone might suffer economic loss.*
3. *A - less irritating odors and other chemical leakage
B - fewer insects and animals (who live around dumps) being in town and spreading diseases
C - fewer chances of people entering the dump and getting hurt.*
4. *Benefits: 1) fewer insects especially mosquitoes 2) more land for developing
Risks: 1) more area flooding 2) insects, animals move out into neighborhood*