NATIONAL GEOGRAPHIC

RESOURCE LIBRARY I ACTIVITY : 50 MINS

Considering the Influences of Building a Road in the Amazon Rain Forest

Using the Internet, students explore the consequences (both positive and negative) of building the Pucallpa-Cruzeiro do Sul road in the Amazon rain forest.

GRADES

9 - 12+

SUBJECTS

Biology, Geography, Human Geography

OVERVIEW

Using the Internet, students explore the consequences (both positive and negative) of building the Pucallpa-Cruzeiro do Sul road in the Amazon rain forest.

For the complete activity with media resources, visit: http://www.nationalgeographic.org/activity/considering-influences-building-road-amazon-rain-forest/

DIRECTIONS

1. Have students discuss the influence of the stakeholders in an environmental decision.

Set the stage by connecting back to Activity 1. Remind students that in the previous activity they explored the various levels of influence of the stakeholders on the decision to build a road in the Amazon. Ask: *Which stakeholders did you think had the most influence and why? What cultural, environmental, and economic aspects of this decision did you consider?* (Answers will vary based on the class discussion at the end of Activity 1.) Explain to students that throughout this lesson, they have been uncovering the complexity of

environmental decisions. So far, students have identified that when analyzing an environmental decision all stakeholders have to be identified, as well as their level of influence. It is also important to explore the geographic and political climate of the region, as well as the cultural, environmental, and economic aspects connected to the decision. In this activity, students will explore what happens once a decision has been made. They are going to identify and analyze the consequences of the decision to place a road in the Amazon rain forest.

2. Have students identify the consequences of a decision.

Explain to students that a consequence is a relationship between a cause and an effect. The environment is a complex system in which both biotic (living) and abiotic (nonliving) factors are interconnected. Organisms (biotic) rely on land formations and water resources (abiotic) for water, shelter, and nutrients. In some instances, organisms (biotic) help erode rocks, change the flow of rivers and streams, and create new land formations (abiotic). When actionable decisions are made about environmental resources (e.g., water and land rights, natural resource mining), we are altering this environmental system. Alterations within the system have consequences. For example, building a road will remove trees and relocate some wildlife in that region. Sometimes these consequences are intended or known during the decision-making process. Other times, the consequences are unintended and not always known until after the decision and/or time has passed. Ask students to revisit The Amazonian Road Decision they read in Activity 1. As they are rereading, have them highlight any consequences linked to the decision of placing the Pucallpa-Cruzeiro du Sol road in the Amazon rain forest.

3. Have students construct a Consequence Web.

Once students are finished reading, have them visually illustrate the consequences in a Consequence Web. Ask them to draw a square in the middle of a sheet of paper and write in the square the decision made. Then have them write all the consequences around it in circles in a web-like configuration. Have students think about what additional effects the consequences will have on the environment, people, or the economy. If there are additional consequences, have students add them to the web next to the original ones. Students' Consequence Webs should have at least four levels of circles. As the circles move farther away from the square, they should get smaller and smaller. Students should draw arrows as they

make connections between the levels of consequences. Ask students to write the connections above the arrows. Some consequences of building the road are that it will provide loggers access to highly-valued trees, provide a more accessible trade route for merchants and farmers, affect the wildlife and water quality in the area, and possibly cause indigenous populations to relocate. Remind students to consider the cultural, environmental, and economic aspects of each decision.

4. Have students extend their understanding of the case through research.

Once students have finished their Consequence Webs, ask each student to identify at least two stakeholders (one on either side of the decision) that they want to learn more about. In small groups or with partners, students will conduct further research on these stakeholders (resources are included here). They will explore interactive maps that display the effects deforestation has already had to the environment and biodiversity. They will watch videos that discuss indigenous groups, their relationship with the Amazon rain forest, and the impacts on these groups when they are exposed. There are also resources available that extend the discussion around the need to connect rural communities to the larger global economy. Students should select resources that extend their understanding of both sides of the road-building decision. As they are conducting research, students should continue to develop their Consequence Webs and keep in mind the cultural, environmental, and economic aspects involved in this decision.

5. Have students reflect on the consequences of the decision.

In pairs or groups, have students decide what their final web will look like and ask them to modify their webs based on their research. Display one web on the overhead document projector. Ask students if they agree with the example. Reflect on considerations to cultural, environmental, and economic factors. Ask: *Is there anything that has been missed? Which of these consequences are intended and which are unintended? Can you think of any unintended consequences that the author of the case study might not have included?* Ask students to take notes on the back of their Consequence Web during the discussion. Ask students to hold onto their Consequence Web and notes. They will use these in Activity 3 of this lesson.

Modification

For struggling readers, have them annotate the reading by circling new vocabulary and underlining important phrases or sentences. They can also be paired with more confident readers to help process the text.

Modification

This activity works best in small groups. Cooperative learning benefits advanced learners and struggling readers. Assign groups so that advanced students are grouped with struggling readers.

Alternative Assessment

In this activity, students will construct a Consequence Web in small groups and participate in a discussion. Student talk and student work through the Consequence Webs will be used to determine if students are meeting the objectives for this activity.

Extending the Learning

- Have students write a persuasive paper to argue for or against building the road from the point of view of one stakeholder.
- Have students conduct further research on local building practices and create an informative campaign (brochure, multimedia presentation, etc.) for or against a local building project.
- Have students use MapMaker Interactive to explore the geography of the Amazon rain forest.

OBJECTIVES

Subjects & Disciplines

Biology

Geography

- Human Geography

Learning Objectives

Students will:

- analyze various consequences from a decision and determine their impact on stakeholders
- analyze the role that stakeholders play in determining the outcome of a complex decision
- explain the complex nature of environmental issues and recognize the solutions to these issues are usually multi-layered and complex

Teaching Approach

- Learning-for-use

Teaching Methods

- Cooperative learning
- Discussions
- Reading
- Writing

Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Information, Media, and Technology Skills
    - Information Literacy
    - Media Literacy
  - Learning and Innovation Skills
    - Communication and Collaboration
    - Critical Thinking and Problem Solving
- 21st Century Themes
  - Environmental Literacy
- Critical Thinking Skills
  - Analyzing
  - Understanding
- Geographic Skills
  - Acquiring Geographic Information
  - Analyzing Geographic Information

- Science and Engineering Practices
  - Analyzing and interpreting data
  - Asking questions (for science) and defining problems (for engineering)
  - Engaging in argument from evidence
  - Obtaining, evaluating, and communicating information

National Standards, Principles, and Practices

NATIONAL COUNCIL FOR SOCIAL STUDIES CURRICULUM STANDARDS

• **Theme 11: The Patterns and Networks of Economic Interdependence on Earth's Surface:**
• **Theme 14: How human actions modify the physical environment:**
• **Theme 16: The changes that occur in the meaning, use, distribution, and importance of resources:**

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• **Reading Standards for Informational Text 6-12:**
Key Ideas and Details, RI.9-10.2
• **Reading Standards for Informational Text 6-12:**
Key Ideas and Details, RI.9-10.1
• **Reading Standards for Informational Text 6-12:**
Key Ideas and Details, RI.9-10.3
• **Reading Standards for Informational Text 6-12:**
Key Ideas and Details, RI.11-12.1
• **Reading Standards for Informational Text 6-12:**
Key Ideas and Details, RI.11-12.2
• **Reading Standards for Informational Text 6-12:**
Key Ideas and Details, RI.11-12.3
• **Speaking and Listening Standards 6-12:**
Comprehension and Collaboration, SL.11-12.1
• **Speaking and Listening Standards 6-12:**
Comprehension and Collaboration, SL.9-10.1
• **Writing Standards 6-12:**
Text Types and Purposes, W.11-12.2

NEXT GENERATION SCIENCE STANDARDS

• **HS. Earth's Systems:**
HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.
• **HS. Ecosystems: Interactions, Energy, and Dynamics:**
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity.

Preparation

What You'll Need

MATERIALS YOU PROVIDE

- Blank paper for students to draw Consequence Webs
- Copies of Handout – The Amazonian Road Decision
- Copies of student worksheet (one per group of students) – Stakeholders Table
- Pencils (1 per student)

REQUIRED TECHNOLOGY

- Internet Access: Required
- Tech Setup: 1 computer per small group, Interactive whiteboard, Presentation software

PHYSICAL SPACE

- Classroom
- Computer lab
- Media Center/Library

SETUP

In Activity 2, students will need to be in participant structures that allow for whole class discussion as well as small group work. A space that allows students to move freely between these structures is needed. Students will also need access to computers where they can talk with a small group.

GROUPING

- Heterogeneous grouping
- Large-group instruction

BACKGROUND & VOCABULARY

Background Information

- The Amazon rain forest is a carbon sink. The Amazon rain forest plays a crucial role in keeping carbon out of our atmosphere, as it naturally sequesters about 20% of the atmospheric carbon emitted by the burning of fossil fuels elsewhere. But, it can only remain a carbon sink as long as it absorbs more carbon dioxide than it releases. The diminishing rain forest would greatly affect global warming.

- The Amazon is one of the most biodiverse ecosystems in the world. Yet, there are species that live there that are endangered or threatened, including primates such as the spider monkey and red howler monkey. When large trees, like mahogany, are removed, the large canopy that provided shelter, food, or nesting for some of these species disappears, resulting in relocation and possible fragmentation of some populations. Changes made to the ecosystem affect all life that lives there, but for the endangered or threatened populations, these changes could challenge their survival.

- Indigenous communities are scattered throughout the Amazon rain forest. The Ashéninka are one indigenous group whose territory lies at the Peru-Brazil border. They are the second largest indigenous group in the Amazon rain forest (behind the Quechua). Most of the Ashéninka population lives on the Peruvian side of the border, where they hunt, fish, and grow crops for sustenance. Ashéninka territories have been diminishing as loggers, drug traffickers, oil companies, and miners have encroached on their land. As a result, they have retreated deeper into the jungle, where they choose to live in isolation to preserve their cultural traditions and spiritual connections to the rain forest.

- Mahogany, a strong, reddish-brown wood, is found throughout the tropical Amazon rain forest, with dense populations near the Peru-Brazil border. It is valued for its color (hence the nickname, “red gold”) and durability and often used in paneling, furniture-making, and for musical instruments. The United States and Britain are the two largest importers of mahogany. In 2001, Brazil put a moratorium on mahogany exports making Peru the leading exporter. A 2012 World Bank report estimated that 80% of Peruvian timber export stemmed from illegal logging. A conservative estimate in 2000 stated nearly 57,000 mahogany trees were provided to the United States alone.

- Tensions are high between environmental activists who want to protect the rain forest and illegal loggers, miners, and other developers who want to make money to provide a better standard of living for their families and communities. In the past 10 years, over 900 environmental activists have been killed around the world. Peru has had around 60 deaths since 2002, making it one of the top five most dangerous places in the world for people who defend the environment. (Brazil alone has accounted for nearly 450 deaths in this same timespan).

- South America includes thousands of rural communities. Due to poor infrastructure throughout many South American countries, these communities remain weakly connected, if connected at all, to the larger global economy. As a result, these countries have fallen behind other countries that have made decisions to invest in upgrading their highway infrastructure in the global trade market. More roads, or other means of connecting these communities, are needed throughout the continent.

Prior Knowledge

["Knowledge of the conflict around the decision to build a road in the Amazon rain forest","Identification of stakeholders that could be influenced by the decision to build a road in the Amazon rain forest","Identification of potential cultural, environmental, and economic aspects of this decision"]

Recommended Prior Activities

- A Proposal to Build a Road in the Amazon

Vocabulary

Term	Part of Speech	Definition
biodiversity	*noun*	all the different kinds of living organisms within a given area.
carbon sink	*noun*	area or ecosystem that absorbs more carbon dioxide than it releases.
climate	*noun*	all weather conditions for a given location over a period of time.
consequence	*noun*	result or outcome of an action or situation.
deforestation	*noun*	destruction or removal of forests and their undergrowth.
economy	*noun*	system of production, distribution, and consumption of goods and services.

Term	Part of Speech	Definition
ecosystem	*noun*	community and interactions of living and nonliving things in an area.
greenhouse gas	*noun*	gas in the atmosphere, such as carbon dioxide, methane, water vapor, and ozone, that absorbs solar heat reflected by the surface of the Earth, warming the atmosphere.
indigenous	*adjective*	characteristic to or of a specific place.
infrastructure	*noun*	structures and facilities necessary for the functioning of a society, such as roads.
logging	*noun*	industry engaged in cutting down trees and moving the wood to sawmills.
rainforest	*noun*	area of tall, mostly evergreen trees and a high amount of rainfall.
rural	*adjective*	having to do with country life, or areas with few residents.
stakeholder	*noun*	person or organization that has an interest or investment in a place, situation or company.
watershed	*noun*	entire river system or an area drained by a river and its tributaries.

For Further Exploration

Websites

- National Geographic Magazine: Red Gold Rush
- National Geographic Magazine: Mahogany's Last Stand Photo Gallery
- National Geographic Magazine: The Last of the Amazon
- National Geographic: Deforestation
- ICAA – The Initiative for the Conservation of the Andean Amazon and the World Wildlife Foundation: Purus-Manu Conservation Corridor

FUNDER

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