

RESOURCE LIBRARY  
ACTIVITY : 50 MINS

## Consequences in Environmental Decisions

Students explore the consequences of building a dam in the Lake Turkana region.

### GRADES

9 - 12+

### SUBJECTS

*Biology, Ecology, Earth Science, Geography, Human Geography*

### CONTENTS

1 PDF, 1 Link

## OVERVIEW

Students explore the consequences of building a dam in the Lake Turkana region.

For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/consequences-environmental-decisions/>

## DIRECTIONS

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

Set the stage by connecting back to Activity 2. Remind students that in the previous activity they explored the geographic factors and the various levels of influence of the stakeholders on the decision to build a dam in the Lake Turkana region. Ask: *Which stakeholders did you think had the most influence and why? How did the geographic information inform your thinking about stakeholder influence?* (Answers will vary based on the class discussion at the end of Activity 2.) 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 or resource 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 dam in the Lake Turkana region.

## 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, damming a river will reduce the water flow downriver and affect 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 read the full Case Study: Friends of Lake Turkana they read parts of in Activity 1. Encourage students to reread those sections in addition to sections they have not read yet. It is important at this stage that students have a full understanding of the case study. As they are reading, have them highlight any consequences linked to the decision of placing the Gilgel Gibe III Dam upstream of Lake Turkana. 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 or the people. 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 dam are that it will reduce the freshwater flow into Lake Turkana, increase the salinity level of the lake, affect the fish population, and reduce fishing opportunities for local residents.

### 3. Have students reflect on the consequences of the decision.

Once students have finished their Consequence Webs, ask each student to share their web with a partner. In pairs, have them decide what their final web will look like and ask them to modify their webs. Display one web on the overhead document projector. Ask students if they agree with the example. 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 4 of this lesson.

## Alternative Assessment

Use students' Consequence Webs to assess evidence of student thinking and connections within the case.

## Extending the Learning

This case is very complicated and crosses national borders. Ask students to pick two different stakeholders. Have them identify a body of research; for example, a website or white paper, and identify additional consequences of this decision from the perspective of the stakeholder.

## OBJECTIVES

## Subjects & Disciplines

### Biology

- Ecology

### Earth Science

### Geography

- Human Geography

## Teaching Approach

- Learning-for-use

## Teaching Methods

- Cooperative learning
- Discussions

# Skills Summary

This activity targets the following skills:

- 21st Century Themes
  - Environmental Literacy
  - Financial, Economic, Business, and Entrepreneurial Literacy
  - Global Awareness
- Critical Thinking Skills
  - Understanding
- Geographic Skills
  - Acquiring Geographic Information
  - Analyzing Geographic Information
  - Answering Geographic Questions
  - Asking Geographic Questions
  - Organizing Geographic Information

## National Standards, Principles, and Practices

### COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

- 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.9-10.2
- 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.9-10.1

- **Speaking and Listening Standards 6-12:**

Comprehension and Collaboration, SL.11-12.1

- **Writing Standards 6-12:**

Text Types and Purposes, W.9-10.2

- **Writing Standards 6-12:**

Text Types and Purposes, W.11-12.2

## **Preparation**

## **What You'll Need**

### **MATERIALS YOU PROVIDE**

- Pencils

### **REQUIRED TECHNOLOGY**

- Internet Access: Optional
- Tech Setup: Projector

### **PHYSICAL SPACE**

- Classroom

### **GROUPING**

- Large-group instruction
- Small-group instruction

## **BACKGROUND & VOCABULARY**

# **Background Information**

This work is modified from the decision-making process called Stakeholder Consequences Decision-Making (SCDM) process. This process is generally used when individuals are at the stage of making a decision. The SCDM process consists of four stages: establishing constraints and considerations; identifying consequences; assessing impact on stakeholders; and weighing impacts on stakeholders. The case studies provided have already articulated a decision. The model was modified so it can be used as an analysis tool. The modification includes identifying stakeholders, influences over the decision, and consequences of the decision.

## Prior Knowledge

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## Recommended Prior Activities

- None

## Vocabulary

<b>Term</b>	<b>Part of Speech</b>	<b>Definition</b>
<b>abiotic</b>	<i>adjective</i>	characterized by the absence of life or living organisms
<b>aquatic</b>	<i>adjective</i>	having to do with water.
<b>basin</b>	<i>noun</i>	a dip or depression in the surface of the land or ocean floor.
<b>biotic</b>	<i>adjective</i>	having to do with living or once-living organisms.
<b>collective decisions</b>	<i>noun</i>	decisions made by a group of individuals that account for the needs of many others.
<b>conflict</b>	<i>noun</i>	a disagreement or fight, usually over ideas or procedures.
<b>consequence</b>	<i>noun</i>	result or outcome of an action or situation.
<b>controversy</b>	<i>noun</i>	disagreement or debate.
<b>dam</b>	<i>noun</i>	structure built across a river or other waterway to control the flow of water.
<b>debate</b>	<i>verb</i>	to argue or disagree in a formal setting.
<b>desert lake</b>	<i>noun</i>	large body of water in a desert region, often characterized by high salinity.
<b>ecology</b>	<i>noun</i>	branch of biology that studies the relationship between living organisms and their environment.
<b>environment</b>	<i>noun</i>	conditions that surround and influence an organism or community.

<b>Term</b>	<b>Part of Speech</b>	<b>Definition</b>
<b>environmental impact</b>	<i>noun</i>	incident or activity's total effect on the surrounding environment.
<b>flood-retreat cultivation</b>	<i>noun</i>	agricultural method that relies on silt left on a flood plain (following a flood) to cultivate crops.
<b>geographic</b>	<i>adjective</i>	having to do with places and the relationships between people and their environments.
<b>geo-literacy</b>	<i>noun</i>	the understanding of human and natural systems, geographic reasoning, and systematic decision-making.
<b>hydroelectric power</b>	<i>noun</i>	usable energy generated by moving water converted to electricity.
<b>indigenous people</b>	<i>noun</i>	ethnic group that has lived in the same region for all of their known history.
<b>individual decisions</b>	<i>noun</i>	Decisions that are made by an individual that only account for that individual's needs
<b>intended consequences</b>	<i>noun</i>	results of an action or situation that are deliberately brought about and/or anticipated.
<b>outflow</b>	<i>noun</i>	water, sediment, and chemicals discharged by a river or other flowing body of water.
<b>political</b>	<i>adjective</i>	having to do with public policy, government, administration, or elected office.
<b>region</b>	<i>noun</i>	any area on Earth with one or more common characteristics. Regions are the basic units of geography.
<b>seasonal flooding</b>	<i>noun</i>	overflowing of a body of water from its banks, usually predicted by yearly rains or storms.
<b>stakeholder</b>	<i>noun</i>	person or organization that has an interest or investment in a place, situation, or company.
<b>tourism</b>	<i>noun</i>	the industry (including food, hotels, and entertainment) of traveling for pleasure.
<b>unintended consequences</b>	<i>noun</i>	results of an action or situation that are not deliberately brought about and/or anticipated.
<b>upstream</b>	<i>adjective</i>	toward an elevated part of a flow of fluid, or place where the fluid passed earlier.
<b>waterfowl</b>	<i>noun</i>	birds that live near the water.

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## For Further Exploration

### Articles & Profiles

- [UNESCO: World Heritage—Lake Turkana National Parks](#)
- [National Geographic Education: Wild Winds—Lake Turkana Wind Power Aims to Create Electricity for Kenya](#)

### Maps

- [National Geographic Education: Geography of Lake Turkana](#)

### Websites

- [National Science Teachers Association: Learning to Make Systematic Decisions](#)
- [National Geographic Magazine: Africa's Last Frontier](#)
- [Encyclopedia of Earth: Lake Turkana National Parks, Kenya](#)
- [Friends of Lake Turkana: Impact of the Dam](#)
- [International Rivers: List of Dam-Threatened World Heritage Sites](#)
- [International Rivers: Gibe III Dam Ethiopia](#)

