NATIONAL GEOGRAPHIC

RESOURCE LIBRARY
LESSON

Making Informed Environmental Decisions

Students use a decision-making process to explore the complex nature of real-world environmental conflicts and how they get resolved. Students will examine the geographical, cultural, and political context of the social issue within this case study, identify the stakeholders and their roles and impact, and map out the intended and unintended consequences of the decision that was made.

GRADES

9 - 12+

SUBJECTS

Biology, Ecology, Earth Science, Geography, Human Geography

CONTENTS

4 Activities

ACTIVITY 1: ENVIRONMENTAL DECISION-MAKING | 50 MINS

DIRECTIONS

1. Connect to students' prior knowledge about decision-making processes.

Set the stage by activating students' prior understanding about the decision-making process by asking them to think about a decision they had to make recently. Ask: *What was the decision about? How did you go about making your decision? What steps did you take? Who was involved in the process of making the decision? Did you seek any outside information to influence the decision you made?* Ask a couple of students to share their thinking with the class. At this point, the focus of this discussion is to get a few examples and to get students thinking about the processes they use when making decisions.

2. Provide information about the environmental controversy around the Lake Turkana dam case study.

Explain to students that there are decisions other than just those that individuals make for themselves. In many instances, people from multiple nations or communities are faced with having to collectively make decisions about shared natural resources. Give students the Case Study: Friends of Lake Turkana handout and ask them to read for understanding. Ask students to write any questions they might have. After reading the case study, have a brief discussion with the class to check for understanding. Ask:

- *What is the reason for building the dam?* (to generate electricity for the surrounding areas through a hydropower station within the dam)
- *Who does the dam benefit?* (It will benefit the surrounding areas, particularly rural Ethiopia, Kenya, Sudan, and Djibouti.)
- *What would happen to the environment in the area if the dam were built?* (The dam affects water flow into the Lake Turkana region. It would lower the lake level, and it could change the salinity of the lake and affect its inhabitants.)
- *What would happen to the people and other living things in the area if the dam were built?* (The indigenous people practice flood-retreat agriculture. The dam would alter the outflow and would reduce seasonal flooding. The lack of the rich silt would destroy flood-retreat agriculture.)

3. Have students portray one of the stakeholders from the Lake Turkana dam case study.

Ask students to brainstorm all the individuals that might be involved in the decision about the construction of the Gilgel Gibe III Dam. Explain that the individuals they have identified are called *stakeholders*. A stakeholder is a person, organization, living organism, or physical environment that is affected by the decision that is made. Some stakeholders, such as people and organizations, have a strong voice in the decision and generally are a part of the decision-making process. Other stakeholders, such as plants, animals, and the physical environment, are silent and do not have a voice in the decision or the process for making a decision. Remind students that the Friends of Lake Turkana case study is a real-world environmental conflict and, therefore, has identified stakeholders. Write the list of stakeholders identified in the case study on the board. (Ethiopian government, Salini Construttori [Italian construction company], Chinese government, Kenyan government,

indigenous communities, Lake Turkana aquatic life, migratory waterfowl, tourism industry) Explain to students that they will take on the role of one of these stakeholders and will write a decision statement based on their knowledge and viewpoint of that stakeholder. Divide students into small groups of three, and assign each group one of the stakeholders. Ask students to read about their stakeholder in the Case Study: Friends of Lake Turkana handout and work as a group to write a decision statement from their stakeholder's perspective on a sheet of paper.

4. Have stakeholder groups share their decision statement.

Ask each group to share its decision statement with the rest of the class. Record the decision statements on the board for all students to see. After all groups have presented, have a class discussion about the similarities and differences among the various stakeholder statements. To promote discussion, categorize the stakeholders that are in favor of building the dam and the stakeholders that are not in favor of the dam. Compare and contrast the reasoning of each of the stakeholders groups. Have a discussion about what students discover. Ask one of the students in each group to hold on to the decision statement from their stakeholders' perspective. Students will refer to this document in Activity 4 of this lesson.

5. Have students reflect on the decision-making process.

Explain to students that in this activity, they were asked to make a decision from one perspective. Ask: *What do you think it would be like if you had to negotiate the multiple perspectives and needs of all stakeholders? Do you think you could come to a decision in which all involved would be happy? If yes, why? What would the process be?* Next, have students individually reflect upon the process by writing their thoughts on a piece of paper. Use the following questions to guide their reflections:

- *What were some of the roadblocks you experienced in making your decision?*
- *Was there anything you considered but was not necessary in your discussions during your decision-making process? Explain.*
- *How did your group weigh the different consequences when making your decision statement?*
- *Did you feel that all stakeholders got a fair voice in the process? Why or why not?*

Informal Assessment

As students are still formulating their ideas, informally assess students based on their participation in the discussion and their reflection statements.

OBJECTIVES

Subjects & Disciplines

Biology

- Ecology

Earth Science

Geography

- Human Geography

Learning Objectives

Students will:

- identify and analyze the role that stakeholders play in determining the outcome of a complex environmental decision

Teaching Approach

- Learning-for-use

Teaching Methods

- Discussions
- Reading
- Role playing

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
• **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

Preparation

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 used in this activity and others you can find in the National Geographic Education website have already articulated a decision. The SCDM model was modified to be used as an analysis tool. The modification includes identifying stakeholders, influences over the decision, and consequences of the decision.

Prior Knowledge

[]

Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
aquatic	*adjective*	having to do with water.
basin	*noun*	a dip or depression in the surface of the land or ocean floor.
collective decisions	*noun*	decisions made by a group of individuals that account for the needs of many others.
conflict	*noun*	a disagreement or fight, usually over ideas or procedures.
controversy	*noun*	disagreement or debate.
dam	*noun*	structure built across a river or other waterway to control the flow of water.
debate	*verb*	to argue or disagree in a formal setting.
desert lake	*noun*	large body of water in a desert region, often characterized by high salinity.
ecology	*noun*	branch of biology that studies the relationship between living organisms and their environment.
environment	*noun*	conditions that surround and influence an organism or community.
environmental impact	*noun*	incident or activity's total effect on the surrounding environment.

Term	Part of Speech	Definition
flood-retreat cultivation	*noun*	agricultural method that relies on silt left on a flood plain (following a flood) to cultivate crops.
geo-literacy	*noun*	the understanding of human and natural systems, geographic reasoning, and systematic decision-making.
hydroelectric power	*noun*	usable energy generated by moving water converted to electricity.
indigenous people	*noun*	ethnic group that has lived in the same region for all of their known history.
individual decisions	*noun*	Decisions that are made by an individual that only account for that individual's needs
outflow	*noun*	water, sediment, and chemicals discharged by a river or other flowing body of water.
seasonal flooding	*noun*	overflowing of a body of water from its banks, usually predicted by yearly rains or storms.
stakeholder	*noun*	person or organization that has an interest or investment in a place, situation, or company.
upstream	*adjective*	toward an elevated part of a flow of fluid, or place where the fluid passed earlier.
upstream	*adjective*	toward an elevated part of a flow of fluid, or place where the fluid passed earlier.
waterfowl	*noun*	birds that live near the water.

Before Moving on to the Next Activity

In Activity 1, students explored a real-world social issue of building a dam along the Omo River in Africa. In the next activity, students will continue to build their background knowledge about the geography and political climate within the Omo watershed.

ACTIVITY 2: INFLUENCES OF AN ENVIRONMENTAL DECISION | 50 MINS

DIRECTIONS

1. Have students discuss their prior decision-making experience from the standpoint of a stakeholder.

Set the stage by connecting back to the previous activity. Remind students that in Activity 1, they explored parts of the Friends of Lake Turkana case study and then were asked to develop a decision statement from only one stakeholder's perspective. Ask: *How did that experience feel? As a stakeholder, did you feel like you were making a balanced decision? Why or why not? What influenced your decision? Was there any additional information you learned from other stakeholders that might have influenced your decision?* Invite a few volunteers to share their thinking with the class. Explain to students that in Activity 1, they experienced a taste of the complexity that surrounds environmental decisions. Environmental decisions are complex because they tend to involve a resource that is shared and highly valued among different stakeholders. For example, in the Friends of Lake Turkana case study, one group of stakeholders values Lake Turkana as it stands. This group sees the lake as a vital resource that supports an economy of fishing and agriculture. For these stakeholders, keeping their particular way of life is important. Another group of stakeholders see the tributaries that flow into the lake as a potential energy-generating resource that could supply electricity to local and regional citizens of both Ethiopia and Kenya. These conflicting visions on how to use the resource create a complex decision with no straightforward answer. Explain to students that in this activity, they will explore the geographic location of the case, examining each of the stakeholders' perspectives, and identifying the level of influence they might have in the decision.

2. Have students explore the geography of the Lake Turkana basin.

Explain to students that part of being a responsible decision-maker is understanding the relationships between all the stakeholders and the resource. Using maps and various kinds of data can help better inform them as decision-makers. Open and project NG Education's MapMaker Interactive and do the following:

- Use the search box at top right, type "Lake Turkana" and hit enter. If the map is zoomed in closely to the lake, use the zoom tool on the left side of the map to zoom out so you can see the whole lake. Using the line tool, draw the Omo River on the interactive map, referring to the provided Omo River map as needed. (It starts near Jima, Ethiopia, and wanders through the land until it empties into Lake Turkana. Reference the Omo map to assist you in this task.) Zoom in and out of the region on the map, as needed, to see the meandering river. Ask: *Why is it important for us to understand where the Omo River is located on the map?* (It helps us to see the relationship between the dam and the affected area of Lake Turkana.) *Why is the river not straight; why does it meander? What evidence*

does the map provide to support that the Omo River feeds into Lake Turkana? (If you select surface elevation, you will see that this area is mountainous. The Omo River loses about 1,800 meters (5,905 feet) from its origins in the Ethiopian Highlands to its ending point in Lake Turkana. Water in watersheds runs from higher elevation to lower elevation.)

- Using your best guess and information from the Omo River map, place an X marker where the Gibe III dam will be located. The markers can be accessed by clicking on the marker icon on the left side of the map, selecting the marker you wish to use, and clicking on the map to place it. Ask: How will the dam affect Lake Turkana? (The Omo River feeds into Lake Turkana. A dam will decrease the amount of water feeding into the lake.)
- Explore the area by adding additional layers of information onto your map. In the Layers tab, click Add Layer and you will see a number of data sets you can add onto your map. For each of these Layers ask students to compare upstream where the dam is located with the region of Lake Turkana. Turn on the Precipitation/Rainfall layer and the Population Density layer. Use the transparency slider tool under the layer name to change the visibility of the layers—this allows you to look at patterns across the data sets. Now try this with other combinations of the layers: Population Density and Land Cover; Land Cover and Surface Elevation; Human Footprint and Population Density; and others. Ask: Are there any patterns across the data sets? (Upstream—where the dam is located—is more populated, has greater rainfall, and has a larger human footprint than where Lake Turkana is located.)

3. Have students explore stakeholders' influence.

Explain to students that now that they have a deeper understanding of the geographic area, they will begin to explore each of the stakeholders and their influence on the decision to build the Gilgel Gibe III dam. Remind students about the conversation they had in Activity 1 between stakeholders that have a voice (e.g., people) and those whose voices are silent (e.g., living organisms and physical environment). Distribute the Stakeholder Table worksheet, and model how to complete the first row. Ask students to work in small groups of three to finish the table; grouping in odd numbers supports a more productive discussion. Encourage students to revisit the map as they explore each of the stakeholders involved in this decision. There are no right or wrong answers to the table.

4. Have the class reflect on the level of influence each of the stakeholders has in the decision.

After students have completed their charts, ask each of the groups to share aloud which stakeholder(s) they think have the most influence in the decision-making process. Ask: *Which of the stakeholders have the least influence and why? Which stakeholders will be the most affected by the decision to build a dam? Is there a relationship between the stakeholders that have the least influence and the ones that are the most affected?* (There is no right answer to these questions. Use these questions to support a lively discussion. When appropriate, reference the map.) Ask students to take notes on the back of the Stakeholder Table worksheet. Ask students to hold onto their notes and Stakeholder Table worksheet. They will use this table and their notes in Activity 4 of this lesson.

Informal Assessment

The class reflection is an informal assessment to see if students are providing solid reasoning for the level of stakeholder influence. To make this a more formal assessment, have students individually write their thinking instead of participating in the class discussion.

Extending the Learning

In addition to asking students to explore the geographic region and the stakeholders, have them do further research on one of the stakeholders, using the following questions: How are those stakeholders benefiting or not benefiting from this decision? What is the political climate around this decision?

OBJECTIVES

Subjects & Disciplines

Biology

- Ecology

Earth Science

Geography

- Human Geography

Learning Objectives

Students will:

- identify various geographic and political factors that may influence the decision for the social issue they are exploring

Teaching Approach

- Learning-for-use

Teaching Methods

- Cooperative learning
- Discussions
- Modeling

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

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 has been modified to be used as an analysis tool. The modification includes identifying stakeholders, influences over the decision, and consequences of the decision.

Prior Knowledge

[]

Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
aquatic	*adjective*	having to do with water.
basin	*noun*	a dip or depression in the surface of the land or ocean floor.
collective decisions	*noun*	decisions made by a group of individuals that account for the needs of many others.
conflict	*noun*	a disagreement or fight, usually over ideas or procedures.
controversy	*noun*	disagreement or debate.
dam	*noun*	structure built across a river or other waterway to control the flow of water.
debate	*verb*	to argue or disagree in a formal setting.
desert lake	*noun*	large body of water in a desert region, often characterized by high salinity.
ecology	*noun*	branch of biology that studies the relationship between living organisms and their environment.
environment	*noun*	conditions that surround and influence an organism or community.
environmental impact	*noun*	incident or activity's total effect on the surrounding environment.
flood-retreat cultivation	*noun*	agricultural method that relies on silt left on a flood plain (following a flood) to cultivate crops.
geographic	*adjective*	having to do with places and the relationships between people and their environments.
geo-literacy	*noun*	the understanding of human and natural systems, geographic reasoning, and systematic decision-making.
human footprint	*noun*	single person's lifetime use of natural resources.

Term	Part of Speech	Definition
human footprint	*noun*	single person's lifetime use of natural resources.
hydroelectric power	*noun*	usable energy generated by moving water converted to electricity.
indigenous people	*noun*	ethnic group that has lived in the same region for all of their known history.
individual decisions	*noun*	Decisions that are made by an individual that only account for that individual's needs
outflow	*noun*	water, sediment, and chemicals discharged by a river or other flowing body of water.
political	*adjective*	having to do with public policy, government, administration, or elected office.
region	*noun*	any area on Earth with one or more common characteristics. Regions are the basic units of geography.
seasonal flooding	*noun*	overflowing of a body of water from its banks, usually predicted by yearly rains or storms.
stakeholder	*noun*	person or organization that has an interest or investment in a place, situation, or company.
tourism	*noun*	the industry (including food, hotels, and entertainment) of traveling for pleasure.
upstream	*adjective*	toward an elevated part of a flow of fluid, or place where the fluid passed earlier.
waterfowl	*noun*	birds that live near the water.

Before Moving on to the Next Activity

In Activity 2, students analyzed a map of the Omo watershed to build their background knowledge and to help them understand the current environmental conflict. In the next activity, students explore the consequences of building the dam to the land, animals, and people that live within the Omo watershed.

ACTIVITY 3: CONSEQUENCES IN ENVIRONMENTAL DECISIONS | 50 MINS

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

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

[]

Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
abiotic	*adjective*	characterized by the absence of life or living organisms
aquatic	*adjective*	having to do with water.
basin	*noun*	a dip or depression in the surface of the land or ocean floor.
biotic	*adjective*	having to do with living or once-living organisms.
collective decisions	*noun*	decisions made by a group of individuals that account for the needs of many others.
conflict	*noun*	a disagreement or fight, usually over ideas or procedures.
consequence	*noun*	result or outcome of an action or situation.
controversy	*noun*	disagreement or debate.
dam	*noun*	structure built across a river or other waterway to control the flow of water.
debate	*verb*	to argue or disagree in a formal setting.
desert lake	*noun*	large body of water in a desert region, often characterized by high salinity.
ecology	*noun*	branch of biology that studies the relationship between living organisms and their environment.
environment	*noun*	conditions that surround and influence an organism or community.
environmental impact	*noun*	incident or activity's total effect on the surrounding environment.
flood-retreat cultivation	*noun*	agricultural method that relies on silt left on a flood plain (following a flood) to cultivate crops.
geographic	*adjective*	having to do with places and the relationships between people and their environments.
geo-literacy	*noun*	the understanding of human and natural systems, geographic reasoning, and systematic decision-making.
hydroelectric power	*noun*	usable energy generated by moving water converted to electricity.

Term	Part of Speech	Definition
indigenous people	*noun*	ethnic group that has lived in the same region for all of their known history.
individual decisions	*noun*	Decisions that are made by an individual that only account for that individual's needs
intended consequences	*noun*	results of an action or situation that are deliberately brought about and/or anticipated.
outflow	*noun*	water, sediment, and chemicals discharged by a river or other flowing body of water.
political	*adjective*	having to do with public policy, government, administration, or elected office.
region	*noun*	any area on Earth with one or more common characteristics. Regions are the basic units of geography.
seasonal flooding	*noun*	overflowing of a body of water from its banks, usually predicted by yearly rains or storms.
stakeholder	*noun*	person or organization that has an interest or investment in a place, situation, or company.
tourism	*noun*	the industry (including food, hotels, and entertainment) of traveling for pleasure.
unintended consequences	*noun*	results of an action or situation that are not deliberately brought about and/or anticipated.
upstream	*adjective*	toward an elevated part of a flow of fluid, or place where the fluid passed earlier.
waterfowl	*noun*	birds that live near the water.

Before Moving on to the Next Activity

In Activity 3, students identified the consequences associated with building a dam on the Omo River. In the next activity, students synthesize all the information they gathered in the previous activities and develop a decision statement.

ACTIVITY 4: BUILDING A DECISION STATEMENT | 50 MINS

DIRECTIONS

1. Have students discuss what they learned in Activities 1, 2, and 3.
Set the stage by reviewing the sequence of activities within this lesson. Remind students that at the beginning of this lesson, they explored a decision through one stakeholder's viewpoint. They then learned more about the area both geographically and politically, analyzed each stakeholder's influence and connection to the decision, and then identified consequences of the decision to place a dam upstream from Lake Turkana. Explain to students that they have been learning components of analyzing the environmental decision process. In this activity, they will pull together what they have learned in the previous activities to complete the analysis of the decision about the Gilgel Gibe III dam in the Lake Turkana region. Place students in small groups of three, and assist them through the following process as a group. Each group of three will hand in a decision statement at the end of this lesson. Ask students to pull out their Stakeholder Table and Consequences Web they developed in Activities 2 and 3. They can use their individual documents as evidence to support the group-level conversations.

2. Have students revisit the information gathered on the influence of stakeholders.
Ask students to have available their Stakeholder Table from Activity 2. Distribute one copy of the Your Decision Statement worksheet to each group and have students complete Part 1: Stakeholders. Using the information they gathered in Activities 1 and 2, ask students to rate each of the stakeholders' level of influence within the decision. Remind them that not every stakeholder has a voice or equal influence in the decision. Ask students to reflect on the role these particular stakeholders have played in the decision-making process of building the Gilgel Gibe III dam.

3. Have students revisit the information gathered in identification of consequences.
Remind students that in this case the decision to build the Gilgel Gibe III dam has been made, and that all decisions and actions have consequences. Ask students to refer to their Consequences Web from Activity 3. Have them complete Part 2: Consequences in the worksheet by identifying the impact of the consequences upon each of the known stakeholders.

4. Have students create a decision statement.
Explain to students that the product of the decision-making process is a decision statement. A decision statement contains three things: (1) a statement of the decision; (2) evidence that supports the decision; and (3) a statement of who will positively and negatively benefit from the decision. Ask students to complete Part 3: Your Decision Statement. Remind students that the case they have been exploring already has a decision statement. If they like, they can use

that decision or generate their own with the knowledge they have about the situation. Collect completed Your Decision Statement worksheets as a formal evaluation of all four activities.

5. Have students reflect upon the decision-making process.
Ask students to refer to the decision statement they created in Activity 1. Ask them to reflect upon everything they have learned in Activities 2, 3, and 4. Have them compare what they wrote in Activity 1 with their final decision statement in Activity 4. Ask: *Did your decision statement stay the same or change? If it changed, what influenced your decision? What additional information affected your thinking? If it did not change, are you surprised? Why or why not?* Ask each student to complete an individual reflection answering the prompt: How did the process of analyzing the decision-making process help you or hinder you in your final thinking? Collect the completed responses.

Formal Assessment

Students' Your Decision Statement worksheet is to be used for formal assessment. It shows both knowledge of the decision-making process and application of reasoning to the case study. The decision statement created by students should include: (1) a statement of the decision; (2) evidence that supports the decision; and (3) a statement of who will positively and negatively benefit from the decision.

Extending the Learning

Ask students to use the process of analyzing a decision statement on another case study, such as the following:

- Case Study: Big Cats in the Ruaha Landscape
- Case Study: The Greater Southern Bypass
- Case Study: Big Cats in the Maasai Steppe
- Case Study: Koobi Fora Research Project

OBJECTIVES

Subjects & Disciplines

Biology

- Ecology

Earth Science

Geography

- Human Geography

Teaching Approach

- Learning-for-use

Teaching Methods

- Discussions
- Writing

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

ENERGY LITERACY ESSENTIAL PRINCIPLES AND FUNDAMENTAL CONCEPTS

• **Fundamental Concept 1.1:**
Energy is a quantity that is transferred from system to system.

COMMON CORE STATE STANDARDS FOR ENGLISH LANGUAGE ARTS & LITERACY

• **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
• **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.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.9-10.1
• **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.11-12.2
• **Writing Standards 6-12:**
Text Types and Purposes, W.9-10.2

Preparation

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 to be used as an analysis tool. The modification includes identifying stakeholders, influences over the decision, and consequences of the decision.

Prior Knowledge

[]

Recommended Prior Activities

- None

Vocabulary

Term	Part of Speech	Definition
abiotic	*adjective*	characterized by the absence of life or living organisms
aquatic	*adjective*	having to do with water.
basin	*noun*	a dip or depression in the surface of the land or ocean floor.
biotic	*adjective*	having to do with living or once-living organisms.
collective decisions	*noun*	decisions made by a group of individuals that account for the needs of many others.
conflict	*noun*	a disagreement or fight, usually over ideas or procedures.
consequence	*noun*	result or outcome of an action or situation.
controversy	*noun*	disagreement or debate.
dam	*noun*	structure built across a river or other waterway to control the flow of water.
debate	*verb*	to argue or disagree in a formal setting.
desert lake	*noun*	large body of water in a desert region, often characterized by high salinity.
ecology	*noun*	branch of biology that studies the relationship between living organisms and their environment.
environment	*noun*	conditions that surround and influence an organism or community.
environmental impact	*noun*	incident or activity's total effect on the surrounding environment.
flood-retreat cultivation	*noun*	agricultural method that relies on silt left on a flood plain (following a flood) to cultivate crops.

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