

**RESOURCE LIBRARY**

ACTIVITY : 1 HR 50 MINS

## Energy Solutions: Tapping into the Topography of Lake Turkana

Students read an article about a community wind project in Kenya, analyze the article's structure, and develop and categorize a list of factors to be considered when planning the wind project.

**GRADES**

6 - 8

**SUBJECTS***English Language Arts, Geography, Physical Geography***CONTENTS**

16 Images, 1 Video, 2 PDFs, 2 Resources

## OVERVIEW

Students read an article about a community wind project in Kenya, analyze the article's structure, and develop and categorize a list of factors to be considered when planning the wind project.

For the complete activity with media resources, visit:

<http://www.nationalgeographic.org/activity/energy-solutions-tapping-topography-lake-turkana/>

## Program



# DIRECTIONS

## 1. Activate students' prior knowledge by viewing the Energy Resources photo gallery.

As you scroll through the images, have students identify the type of energy resource shown in each image. Briefly discuss some benefits and drawbacks of each type of resource, and explain how diverse resources could be used together to provide power to an area. When you reach photos 14-16, have students discuss them in greater detail, using the following prompt with each photo: What geographic factors do you think made this a good location for this project?

## 2. Watch and discuss the video "Energy Conservation."

Before viewing the video, have students write the following focus questions: *What is the main idea of the video? According to the video, what are some benefits and drawbacks of wind power?* Have students take notes on these questions as they watch the video. Pause the video at the 44-second mark and rewind to the 37-second mark. Replay this segment again, asking students to note the effects the homeowner described (strobe effect and noise level). Continue viewing the video. After viewing the video, discuss the focus questions as a class.

## 3. Present the next task and model analyzing the structure of an article.

Divide students into small groups of two or three students per computer. Distribute two Spider worksheets to each group. Explain that students will read an article about a proposed wind farm near Lake Turkana in Kenya and use the graphic organizer to analyze the article's structure. Project the graphic organizer for the class to see. Have students access the "Weird Waters" article online. Use it to model for students how to identify the article's main idea, sections of the article, and important details supporting each section.

## 4. Have groups read and analyze the article "Wild Winds."

Have students access the "Wild Winds" article online. Have each group read the article and use one copy of the Spider worksheet to analyze the article's structure as modeled. Remind students to include the main idea of the article, the main sections of the article, and

important details supporting each section. Point out that they may not need all four of the sections included on the graphic organizer.

### **5. Discuss the article.**

Have representatives from each small group present what they believe is the main idea of the article. Discuss any similarities and differences among the groups' answers. Then discuss the article's organization. Ask: *How is the article organized? Why do you think the author chose to organize it this way? How does the organization of the article help you to understand the main idea of the article?*

### **6. Have students re-read the Environment and Ecology section of the article.**

Have students discuss this section in their small groups, focusing on how the section supports both the main idea of the article and an understanding of the topic the author is covering. Then have students work in their groups to write a brief paragraph summarizing their discussion on a separate sheet of paper.

### **7. Have students list factors that should be considered when planning the Lake Turkana wind project.**

Have students work in their small groups to create a list of factors based on the article. For example, students might include the impact on local people and effects on the environment. Then have them use a second copy of the Spider worksheet to categorize the factors they listed based on criteria of their choosing. For example, students may choose to list social factors in one section of the Spider Organizer and environmental factors in another area. If necessary, work through an example with students. When all groups have finished, give them time to share their categories and factors with the class. Discuss any similarities and differences among the categories and factors. Then have students compare their graphic organizer that includes the categorized factors to their graphic organizer that analyzes the structure of the article. Ask:

- *How are they similar?*
- *How are they different?*

- *Is there a relationship between the categorized factors and the structure of the article? Explain.*

## **8. Have students discuss the geographic, social, and environmental factors that influence the solution to an energy challenge.**

Have students discuss the following question in small groups: *How do geographic, environmental, and social factors influence the solution to an energy challenge?* Have each group share their response with the class. Discuss students' responses as a class. Ask students to provide specific examples from the Lake Turkana wind project to illustrate their points.

Write the following questions on the board as prompts:

- *What geographic factors make Lake Turkana a good location for this project?*
- *What geographic factors did organizers of the Lake Turkana project have to address?*
- *What environmental factors did they have to address?*
- *What social factors did they have to address?*
- *How did they have to adjust the project to address these factors?*
- *What role will the Lake Turkana wind project play in Kenya's overall set of diverse energy resources?*

## Modification

Provide support for English language learners and struggling readers by allowing them to read the article as a guided reading exercise.

## Informal Assessment

- Use the provided answer key to assess students' completed Spider worksheets for the "Wild Winds" article.
- Check the paragraphs groups wrote to see if they point out the environmental obstacles and solutions facing the wind project and how this section supports the main idea of the article.
- Check students' lists of factors to see if they include the following: geographical conditions, impact on birds, impact on local human populations, logistical difficulties of remote location, need for roads, and need for electrical lines. Students may categorize these as

environmental, economic, geographic, and social factors, or they may use other similar categories.

## Extending the Learning

The “Wild Winds” article describes how the geographic location and physical landscape where the Lake Turkana wind power project is located creates a Venturi effect. Demonstrate the Venturi effect by placing sand in a sand table or shoebox, and creating a trench in the sand with a rock in the center of the trench. Use a small fan to blow the sand and note how the sand blows when the fan is aimed at the rock. Have students explore applications of the Venturi effect, such as Venturi tubes or paint sprayers, and use what they know about the Venturi effect to summarize how the models work.

## OBJECTIVES

## Subjects & Disciplines

- English Language Arts
  - **Geography**
    - Physical Geography

## Learning Objectives

Students will:

- outline a reading selection, identify the main idea, and describe how one section of the selection contributes to an understanding of the main idea
- identify and categorize the factors, including environmental quality, that had to be considered when designing the Lake Turkana wind project

## Teaching Approach

- Interdisciplinary
- Learning-for-use

## Teaching Methods

- Cooperative learning
- Discussions
- Information organization
- Modeling
- Reading
- Writing

## Skills Summary

This activity targets the following skills:

- 21st Century Student Outcomes
  - Information, Media, and Technology Skills
    - Information Literacy
  - Learning and Innovation Skills
    - Communication and Collaboration
    - Critical Thinking and Problem Solving
- Critical Thinking Skills
  - Analyzing
- Geographic Skills
  - Organizing Geographic Information
- Science and Engineering Practices
  - Obtaining, evaluating, and communicating information

## National Standards, Principles, and Practices

### ENERGY LITERACY ESSENTIAL PRINCIPLES AND FUNDAMENTAL CONCEPTS

- **Fundamental Concept 7.3:**

Environmental quality is impacted by energy choices.

### IRA/NCTE STANDARDS FOR THE ENGLISH LANGUAGE ARTS

- **Standard 1:**

Students read a wide range of print and nonprint texts to build an understanding of texts, of themselves, and of the cultures of the United States and the world; to acquire new information; to respond to the needs and demands of society and the workplace; and for personal fulfillment. Among these texts are fiction and nonfiction, classic and contemporary works.

## **NATIONAL SCIENCE EDUCATION STANDARDS**

- **(5-8) Standard F-2:**

Populations, resources, and environments

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

- **Reading Standards for Literacy in Science and Technical Subjects 6-12:**

Craft and Structure, RST.6-8.5

### **Preparation**

### **What You'll Need**

### **MATERIALS YOU PROVIDE**

- Paper
- Pencils

### **REQUIRED TECHNOLOGY**

- Internet Access: Required
- Tech Setup: 1 computer per learner, Projector, Speakers

### **PHYSICAL SPACE**

- Classroom
- Computer lab

### **GROUPING**

- Large-group instruction

# BACKGROUND & VOCABULARY

## Background Information

Wind is a renewable energy resource that can be used to generate electricity. Wind turbines are designed to be easily turned by the wind. As the wind turns the rotors, the rotors turn a series of gears, eventually spinning a magnet inside coils in a generator to convert the mechanical energy to electrical energy. Because wind is highly variable, wind turbines must be placed carefully in areas where high winds are common.

The Lake Turkana windfarm site is an excellent site for wind energy because of a unique geographic condition that creates a wind effect known as the Venturi effect. This effect causes increased wind speeds through the area. However, the remoteness of the area also provides some challenges to the project. As with any successful energy project, the Lake Turkana project has to work out solutions to these challenges that address the specific geographic, environmental, and societal characteristics of the location.

## Prior Knowledge

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## Recommended Prior Activities

- None

## Vocabulary

<b>Term</b>	<b>Part of Speech</b>	<b>Definition</b>
<b>electricity</b>	<i>noun</i>	set of physical phenomena associated with the presence and flow of electric charge.
<b>energy</b>	<i>noun</i>	capacity to do work.
<b>energy conservation</b>	<i>noun</i>	process of using less energy, or using it more efficiently and sustainably.



<b>Term</b>	<b>Part of Speech</b>	<b>Definition</b>
<b>energy resource</b>	<i>noun</i>	source of energy found in nature that has not been subject to any human-induced energy transfers or transformations; for example, oil, coal, gas, wind, or sunlight.
<b>energy source</b>	<i>noun</i>	location in which the energy resource (oil, coal, gas, wind, etc.) is converted into electrical energy.
<b>non-renewable energy</b>	<i>noun</i>	energy resources that are exhaustible relative to the human life span, such as gas, coal, or petroleum.
<b>renewable energy</b>	<i>noun</i>	energy obtained from sources that are virtually inexhaustible and replenish naturally over small time scales relative to the human life span.
<b>topography</b>	<i>noun</i>	the shape of the surface features of an area.
<b>Venturi effect</b>	<i>noun</i>	the decrease in pressure and increase in velocity as a fluid enters a constricted space.
<b>wind farm</b>	<i>noun</i>	area with a large group of wind turbines, used to generate electric power.
<b>wind power</b>	<i>noun</i>	rate of producing, transferring, or using wind energy, usually measured in watts.

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## For Further Exploration

### Articles & Profiles

- [National Geographic Environment: Wind Power](#)

### Websites

- [National Geographic Education: Experiencing Film—An Active Approach](#)
- [Lake Turkana Wind Power Project](#)
- [Energy.gov: Wind Energy](#)
- [Wind Energy Development](#)

FUNDER



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