Planet Zorcon

Suggested Grade Level: 6-8

Time: two 50-minute classes

Subject: Science, Earth and Human Activity, Renewable vs. Nonrenewable Resources, English Language Arts, Social Studies, Physical Systems, Human Impact on the Earth, Kansas and a Modern World, Agriculture, Agriculture and the Environment…

Overview: In this two-day simulation, students take on jobs collecting resources on a fictional planet and see the impact of resource use over time. They identify renewable, nonrenewable, and inexhaustible resources, reflect on human behaviors, and explore real-world strategies for sustainably managing natural resources.

Objectives:

1. Label renewable, nonrenewable, and inexhaustible resources.
2. Simulate an occupation in natural resource management.
3. Compare the value and importance of natural resources.
4. Identify methods for replacing certain natural resources.
5. Describe human behaviors that can impact the management of natural resources.

Background Information:

Natural resources are materials found in the environment in their original, unaltered form. As the global population continues to grow rapidly, the need for effective resource management becomes increasingly urgent. Industrialization rises in tandem with population growth, placing even greater pressure on natural resources. Resources are considered renewable if they can replenish faster than they are used. Nonrenewable resources, on the other hand, form slowly and are consumed more quickly than they can be replaced. Inexhaustible resources—such as wind and sunlight—are limitless and play a crucial role in securing our future. The ten most valuable natural resources are: 1. Water, 2. Clean air, 3. Coal, 4. Oil, 5. Natural gas, 6. Phosphorus, 7. Bauxite, 8. Copper, 9. Helium, and 10. Iron. Other essential resources include soil, salt, and forests. Unfortunately, many of these resources are nonrenewable and are being depleted at an alarming rate.

According to the World Resources Institute, 25 countries experience high levels of water stress each year, and more than half the world's population faces water stress for at least one month annually. Water is vital to sustaining life and powering energy systems.

A shortage of water endangers people, livestock, crops, and energy production. Global water demand is projected to rise by 20–25% by 2050 (Kuzma). Energy demand presents another growing challenge. ICF reports that the rise of cloud computing, artificial intelligence, industrial growth, and the shift toward electric buildings and vehicles has significantly strained the U.S. power grid, resulting in a projected 78% increase in electricity demand and a 54% increase in peak demand by 2050 (Batra). High demand also affects the availability of key metals used in construction, transportation, and manufacturing. Primary metals—including nickel, lead, zinc, copper, aluminum, iron, and steel—are essential for building vehicles, infrastructure, and machinery. A study by Watari et al. projects that demand for all major metals (except lead) will continue to rise throughout the 21st century. Specifically, demand for aluminum is expected to grow by 215%, while demand for copper and nickel is projected to increase by 140% each, for iron by 86%, and for zinc by 81%. Additionally, demand for lead is anticipated to rise by 46%. Overall, this suggests that global demand for major metals could increase by two to six times over the course of this century (Watari).

A lack of access to essential resources can lead to serious consequences, including malnutrition. In 2023, 733 million people—roughly one in every eleven—faced hunger worldwide. This issue disproportionately affects low-income countries and was further intensified by the COVID-19 pandemic (McKinnon). These growing challenges make it more important than ever to reduce our dependence on nonrenewable resources. By investing in renewable energy, improving efficiency, protecting natural ecosystems, and promoting sustainable development, we can work toward a future that meets the needs of both people and the planet.

Kansas Industry Information:

Water is indispensable not only for human survival but also for sustaining Kansas's leading industry: agriculture. Over 500 square miles of the state are covered by water (U.S.). A significant portion of the western third of Kansas depends on irrigation sourced from the Ogallala Aquifer, a vast but overused groundwater reserve. This aquifer is crucial not only for agriculture but also for providing drinking water and supporting the region's economy. However, it faces challenges due to over-extraction and limited replenishment in an area characterized by low rainfall.

Vast native grasslands, streams, wetlands, and iconic prairie views define Kansas's landscape. Ranking 12th nationally in pasture and rangeland, the state maintains around 15.8 million acres of native grasslands and rangeland, 2.5 million acres of pasture, and between 3 and 5 million acres of annual forages. These ecosystems support a substantial livestock industry: in 2009, cattle production generated $5.55 billion, representing around 6 million head (Kansas).

By implementing conservation practices, Kansas has achieved measurable improvements in soil and water quality. Between 1982 and 2017, sheet and rill erosion on cropland declined from 2.57 to 2.13 tons/acre/year, a reduction of roughly 17%, while wind erosion fell from 3.05 to 2.68 tons/acre/year, a 12% decrease (Natural). These

improvements are due to the adoption of ponds, grassed waterways, contour farming, terracing, cover crops, land retirement through the Conservation Reserve Program (CRP), and pressure irrigation systems.

In addition to open prairie, Kansas features significant forested areas. According to the Kansas Forest Service, 5.2 million acres of the state are covered in trees, including 2.2 million acres of rural forests, 2 million acres of agroforestry—such as windbreaks, shelterbelts, streamside forests, and fence rows—and 1 million acres of community forests (Kansas). This mosaic of prairie and woodland contributes to soil stability, biodiversity, and the ecological balance critical to conservation efforts.

Recreational activities, such as hunting and fishing, play a significant role in conservation funding across Kansas. These pursuits significantly contribute to the state's recreational income, helping to finance habitat restoration, wildlife management, and the maintenance of public access. In addition to its land, the state has a variety of mineral deposits that are important to industry. Some of these deposits are petroleum, natural gas, clay, gypsum, helium, natural gas liquids, salt, sand, gravel, and stone.

Kansas has also positioned itself as a leader in renewable energy. By 2019, wind energy supplied 41% of the state's electricity, making it the primary source and ranking Kansas second nationally in wind energy share. The growing presence of wind turbines supports rural economies, reduces emissions, and provides competitively priced energy for corporate purchasers. Simultaneously, Kansas ranks fourth nationally in biomass production, with 12 biofuel facilities in operation and more under development. Complementing these efforts, colleges such as Johnson County Community College offer solar training labs and certifications to build workforce capacity in renewable energy. Kansas also supports renewable energy adoption through tax credits and exemptions for producers and consumers (Powered).

Materials:

Day 1: Planet Zorcon

- "Plant Zorcon" Google Slides presentation https://docs.google.com/presentation/u/0/d/1v7KnmztGKWWn2gp5u4MN0yANvvRHbcpiNTLUmPbZSIA/edit
- Plastic storage bin with lid
- Gallon-sized Ziploc bags, one per group, plus extras to hold resources
- 1–1½ cups of each of the following "resources":* wheat seeds, cotton balls, corn, toothpicks, soybeans, pinto or brown beans, shell macaroni, spiral macaroni, elbow macaroni, paper clips, black beans, amber pebbles, sequins, 1" roofing nails, silver balls (foil or other material), white beans, and 2" pieces of spaghetti
- Duct tape
- 8' x 10' tarp
- Plastic spoons, 5 per group
- Plastic cups, 2 per group
- ID Badge Sets (print one per group; each set in different colors for sorting later)
- Resource Inventory Activity Sheet (one per group)

Day 2: Discussion

- Sticky notes
- Natural Resource Activity Questions

Day 1: Planet Zorcon
Instructional Format:

1. Review background information.
2. Conduct engagement activities.
3. Complete the activities.

Engagement: Place the tarp on the floor with a circle (at least 4 feet in diameter) drawn or duct-taped in the middle, and have the desks pushed aside as students enter the room. Have all resources dumped and mixed a bit in the center of the tarp.

Procedures:

1. Review the Google Slides presentation (listed in Materials) before beginning this lesson.
2. Hand each student an ID badge as they enter the classroom.
3. Instruct students to find and group up with others who share the same color badge. Each color represents a team of five. Assign the remaining students as government inspectors.
4. Tell the class it is the year 2094. Earth's resources are gone, and humans must now gather resources from a newly discovered planet called Zorcon.
5. Open the Google Slides presentation.
6. As you read off the job descriptions on Slide 2, have students raise their hands and complete a small action related to their role.
7. Guide students through the activity using the Slides, moving through four trials. Allow time between each trial for regrouping and data tracking.
8. Monitor the class for pacing and preview the upcoming slides so you're ready for transitions and cleanup at the end.

Day 2: Discussion
Engagement:
Post the following questions around the room. Have students move around the room to read the questions before beginning the discussion.

- Which resource did you collect first, and why?
- Did your group change the way you excavated the following resource? If so, how?
- How would this compare to collecting resources in the 'real world' on Earth?
- What changes were made in collecting the rest of the resources?
- What role did the government officials play? Did we need a security person?
- What did Planet Zorcon look like after the last trial? Did anyone protect the planet? Why or why not?
- How are the fines in this simulation similar to those in the 'real world'?

- Which resources were the most valuable and why?
- Can Planet Zorcon be restored to its original condition? Could the Earth be returned to its original condition if resources had been removed, such as in the simulation?
- What are some careers related to natural resource management?

Procedures

1. Have students rejoin the same groups from yesterday and form a circle with their desks.
2. Give the Government Officials the forms and question lists from yesterday's activity to pass out to each group. Provide each group with sticky notes.
3. Instruct students to answer each question as a group and write their responses on separate sticky notes.
4. Have groups post their sticky note answers beneath the correct questions on the board or wall.
5. Once all responses are posted, read through them with the class and lead a discussion comparing group decisions.
6. Help students connect their answers to how we use and manage natural resources in the real world.
7. Keep the Natural Resource Activity Questions visible for reference during the discussion.

Vocabulary:

- **Inexhaustible resource:** a natural resource that can last forever regardless of human activities
- **Nonrenewable resource:** a limited natural resource that cannot be replaced or reproduced within a generation and cannot be managed for renewal. Examples: oil, soil, mineral resources (lead, iron, cobalt, zinc, etc.)
- **Renewable resource:** a natural resource that can be replenished naturally or by human efforts at a sustainable rate; examples include forests, fish, wildlife, agriculture, plants, and animals
- **Sustainable:** a way of producing food while protecting the natural resources
- **Fossil Fuel:** the primary source of energy today (gas, coal, natural gas) formed millions of years ago from plants and animals
- **Economy:** the wealth of a country, shown by the production and use of goods and services

Supporting Resources:

Careers in Agriculture
https://cdn.agclassroom.org/ks/resource/guides/naturalresources/11careers.pdf

Energy Kids, U.S. Energy Information Administration
https://www.eia.gov/kids/energy-sources/

Exploring Kansas Natural Resources Educator's Guide
https://ksagclassroom.org/resource/guides/

YouTube: UtahAgClassroom Careers in Agriculture videos
https://www.youtube.com/playlist?list=PL7B61381EE0438243

Career Information
UtahAgClassroom: Careers With the National Resource Conservation Service
https://www.youtube.com/watch?v=1H0ssaACsHg&list=PL7B61381EE0438243&index=25

The Natural Resource Conservation Service (NRCS) is a part of the U.S. Government. The job of the NRCS is to work with landowners and producers to protect their land and make informed decisions that maximize profitability. This is a voluntary program for the landowners who want to improve their soil, improve water quality, and protect wildlife. They also find ways to keep the air clean and conserve energy. They research the issues on the land, create a plan, and help find funding and methods to improve the landscape.

Careers mentioned: Wildlife Biologist, Soil Conservationist, Geographic Information Specialist, Data Collection Officer, Rangeland Management Specialist, Agronomist, District Conservationist, Civil Engineer, and Administrative Assistant.

Assessment:
Ask students: How does the increase in human population and the use of natural resources impact the Earth? Or ask students to respond to some of the following questions:

1. List a nonrenewable resource and explain how you could use it less.
2. List a renewable resource that you could use more of and explain how you would use it.
3. List an inexhaustible resource and describe how it could be used more on Earth.
4. Explain one career related to using natural resources thoughtfully.

Kansas Standards:

Next Generation Science Standards
Earth and Human Activity
MS-ESS3-1.Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience process.
MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
Engineering Design
MS-ESS3-4. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

English Language Arts

6th Grade

Writing

Text Types and Purposes

W.6.1 Write arguments to support claims with clear reasons and relevant evidence.

Language in Writing

W.6.11 Demonstrate command of the conventions of standard English capitalization, punctuation and spelling when writing.

Speaking and Listening

Comprehension and Collaboration

SL.6.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups and teacher-led) with diverse partners on sixth grade topics, texts and issues, building on others' ideas and expressing their own clearly.

SL.6.2 Interpret information presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how it contributes to a topic, text or issue under study.

Language in Speaking and Listening

SL.6.7 Demonstrate command of the conventions of standard English grammar and usage when speaking.

7th Grade

Writing

Text Types and Purposes

W.7.1 Write arguments to support claims with clear reasons and relevant evidence.

Language in Writing

W.7.11 Demonstrate command of the conventions of standard English capitalization, punctuation and spelling when writing.

Speaking and Listening

Comprehension and Collaboration

SL.7.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups and teacher-led) with diverse partners on seventh grade topics, texts and issues, building on others' ideas and expressing their own clearly.

SL.7.2 Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text or issue under study.

Language in Speaking and Listening

SL.7.7 Demonstrate command of the conventions of standard English grammar and usage when speaking.

8th Grade

Writing

Text Types and Purposes

W.8.1 Write arguments to support claims with clear reasons and relevant evidence.

Language in Writing

W.8.10 Demonstrate command of the conventions of standard English grammar and usage when writing.

Speaking and Listening

Comprehension and Collaboration

SL.8.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups and teacher-led) with diverse partners on eighth grade topics, texts and issues, building on others' ideas and expressing their own clearly.

Language in Speaking and Listening

SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning and well-chosen details; use appropriate eye contact, adequate volume and clear pronunciation.

History, Government, and Social Studies
Standard 1: Choices have consequences.
1.1 The student will recognize and evaluate significant choices and consequences that have impacted our lives and futures.
1.2 The student will analyze the context and draw conclusions about choices and consequences.
1.3 The student will investigate and connect examples of choices and consequences with contemporary issues.
1.4 The student will use their understanding of choices and consequences to make a claim or advance a thesis using evidence and argument.
Standard 5: Relationships among people, places, ideas, and environments are dynamic.
5.1 The student will recognize and evaluate dynamic relationships that impact lives in communities, states, and nations.
5.2 The student will analyze the context and draw conclusions about dynamic relationships.
5.3 The student will investigate and connect dynamic relationships to contemporary issues.
5.4 The student will use their understanding of dynamic relationships to make a claim or advance a thesis using evidence and argument.

National Agricultural Literacy Standards:
Agriculture and Environment
- Compare and contrast the advantages and disadvantages involved when converting natural ecosystems to agricultural ecosystems (T1.6-8 a.)
- Describe benefits and challenges of using conservation practices for natural resources (e.g., soil, water, and forests), in agricultural systems which impact water, air, and soil quality (T1.6-8 b.)
- Discover how natural resources are used and conserved in agriculture (e.g., soil conservation, water conservation) (T1.6-8 c.)
- Discuss (from multiple perspectives) land and water use by various groups (i.e., ranchers, farmers, hunters, miners, recreational users, government, etc.), and how each use carries a specific set of benefits and consequences that affect people and the environment (T1.6-8 d.)
- Discuss the comparative environmental pros and cons of populations relying on their local and regional resources versus tapping into a global marketplace (T1.6-8 e.)
- Explain and discuss why people migrate and change environments to meet their basic needs (T1.6-8 f.)
- Recognize how climate and natural resources determine the types of crops and livestock that can be grown and raised for consumption (T1.6-8 g.)
- Recognize the factors of an agricultural system which determine its sustainability (T1.6-8 h.)

Plants and Animals for Food, Fiber, and Energy
- Explain the role of ethics in the production and management of food, fiber (fabric or clothing), and energy sources (T2.6-8 b.)
- Identify farm practices for plant protection (e.g., using a pesticide, integrated pest management, cultural practices) and the harvest of safe products for consumers (T2.6-8 c.)
- Identify renewable and nonrenewable energy sources (T2.6-8 d.)

Author: Adapted by Amy Benz, retired middle school technology teacher, St. Marys, KS, from a lesson by Debra Spielmaker, Geoff Smith, and Andrea Gardner, Utah Agriculture in the Classroom and National Center for Agricultural Literacy, and edited by Marissa Cook, Secondary Art Education Major at KSU, KFAC intern.

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ZORCON RESEARCH STAFF ID BADGES

Copy one page for each group on a different color of paper. You may choose to put the name badges into holders or make them into necklaces.

PLANET ZORCON

Security

PLANET ZORCON

Data Collector

PLANET ZORCON

Government Inspector

PLANET ZORCON

Project Director

PLANET ZORCON

Surveyor

PLANET ZORCON

Resource Specialist

Resource Inventory

Name or Color of Group: _____

Project Director (leads group/oversees inventory): _____

Surveyor (travels/collects resources): _____

Data Collector (tallies/records data): _____

Resource Specialist (instructs as to which resources to collect): _____

Security (guards collected resources): _____

TRIP TO ZORCON

Item	Resource Represented by Item	Renewable/ Nonrenewable/ Inexhaustible (R/N/I)	Trip #1	Trip #2	Trip #3	Trip #4	Totals
Wheat	Wheat						
Corn	Corn						
Cotton Balls	Cotton						
Toothpicks	Trees						
Soybeans	Edible Oil						
Pinto or Brown Beans	Domestic Animals						
Shell Macaroni	Seafood						
Spiral Macaroni	Lead						
Elbow Macaroni	Iron						
Paper Clips	Zinc						
Black Beans	Crude Oil						
Amber Pebbles	Copper						
Sequins	Gold						
Nails	Silver						
Silver Balls	Aluminum						
White Beans	Water						
Spaghetti	UNKNOWN						

What RESOURCE did you collect the most of? _____

What RESOURCE did you collect the least of? _____

If you could do it all again, what things would you have done differently?

Natural Resource Activity Questions

1. Which resource did you collect first and why?
2. Did your group change the way you excavated the next resource? If so, how?
3. How would this compare to collecting resources in the 'real world' on Earth?
4. What were the changes made in collecting the rest of the resources?
5. What role did the government officials play? Did we need a security person?
6. What did Planet Zorcon look like after the last trial? Did anyone protect the planet? Why or why not?
7. How are the fines in this simulation similar to those in the 'real world'?
8. Which resources were the most valuable and why?
9. Can Planet Zorcon be restored to its original condition? Could the Earth be restored to its original condition if resources had been removed (such as in the simulation)?
10. What are some careers related to natural resource management?