Honors Sustainability of Earth's Natural Resources Study Guide **KEY**

Complete the following problems to help you get ready for the test:

Objective 1: **SWBAT:** Define sustainability and explain why it is important in regards to Earth's natural resources.

1. What is sustainability?
   - **involving methods that do not completely use up or destroy natural resources**
   - **able to last or continue for a long time**
   - **meeting the needs of the present without compromising the ability of future generations to meet their own needs**

2. What is a sustainable action?
   - **A method for sustaining resources**

3. Give two examples of sustainable actions.
   - **reduce, reuse, recycle materials**
   - **unplug electronic devices when not in use**
   - **use reusable water bottles**
   - **take shorter showers**
   - **use alternative energy**
   - **recycled water**
   - **turn water off while brushing teeth**

4. Label each of the following with **Economics, Environment,** or **Social Equity**.
   a. A school volunteered to adopt a highway and clean it up on a monthly basis. **Environment**
   b. A city provides good schools, affordable housing, and the basic services that allow any income-level family to live comfortably. **Social Equity**
   c. Scientists have found high levels of lead in the blood of Chinese residents from electronic waste sites. **Environment**
   d. Technological advances in business, health, education, and the environment provide new opportunities for communities. **Economics**

5. List three topics that fit in each of the 3 E categories: Economics, Environment, and Equity (not examples from above).

Economics	Environment	Equity
• Education • Jobs • Technology • Transportation • Sanitation • Medical advancement • Government	• Clean Air/Atmosphere • Ozone Layer • Clean Oceans • Trees/Plants • Bees • Poaching/Overhunting • Natural Resources (Fossil Fuels) • Clean Oceans/Water • Effects of Weather	• Clean Water to Drink • Food to Eat • Plumbing • Quality of Life • Usable Land • Healthcare

6. How does the following excerpt relate to the 3 E's of sustainability:
   Economics: Government is spending money to build walls and dams to prevent flooding, storms can destroy businesses which can affect the local economy
   Equity: Tsunami and nuclear plants – everyone should receive medical help; Katrina – equal assistance with the rebuilding of parts of New Orleans, financial help
   Environment: Katrina destroyed the land, erosion

Natural disasters are a fact of life. *(National Geographic News)*
There's no controlling Mother Nature, and her wrath can, at times, be staggering. Last year, natural disasters—from droughts in Africa and Russia to typhoons and massive flooding in Thailand—caused a record $378 billion worth of damage.

Often, the great works of civil engineering that we built as insurance against disaster had the opposite effect. Hurricane Katrina is a great example. Over the past century, the levees built to protect low-lying New Orleans choked off the natural wetlands that once served as a buffer between the Big Easy and the Gulf of Mexico. Erosion has wiped out 1,900 square miles of wetlands since the 1930s.

Researchers estimate that every 2.7 square miles of wetlands reduces storm surge by a foot. So when the hurricane hit—with the area's natural buffers mostly gone—the resulting flooding overwhelmed the city's elaborate man-made defenses, leading to the worst natural disaster to hit the U.S. in decades.

In Katrina's case, environmental degradation played a direct role in turning a bad storm into a total catastrophe. But in other places, it's the sheer complexity of the human-built environment that makes it more prone to catastrophic failure. Take last year's tsunami on the northern coast of Japan. It was bad enough by itself, but it was made worse when it set off a chain reaction that caused a meltdown at the Fukushima nuclear power plant.

"The natural infrastructure provided by ecosystems is often more locally accessible and less expensive to maintain than human-made, or 'gray' infrastructure," UN Environmental Program (UNEP) Director Ibrahim Thiaw said recently. "Healthy ecosystems are the best 'insurance cover' for those who depend on natural resources for their livelihoods and ultimately provide multiple social, economic, and environmental benefits regardless of whether a disaster occurs or not."

7. State whether each of following are considered a sustainable action:
   a. Take longer showers but only showers every other day - **No**
   b. Refill your own reusable water bottle from the faucet - **Yes**
   c. Print notes from the science website and tape them into your science notebook because you do not want to copy them during class. - **No**
   d. Turn lights off when you leave a room - **Yes**
   e. Shut off computers but do not unplug the power cords – **Yes, but would be better to unplug if not using them**
   f. Wash clothes in cold water – **Yes**

8. Pick two examples of sustainable actions from #7 and explain how they connect to the 3 E's, (Economics, Equity, and Environment).
   - Refill your own reusable water bottle from the faucet – **Environemnt – rreducing the misuse of resources,**
   - Turn lights off when you leave a room – Economics **– redcing the use of electricity, Environment – reducing the over use of resoruces**
   - Wash clothes in cold water – **Environment – reducing the fuel resources to heat water**

9. Give an example for and explain how the following categories overlap:
   a) Environmental and Economic (Eco-Economy)
      - **The efficient use of resources.**
      - **The conservation of energy, fossil fuels, etc.**

   b) Social Equity and Environmental (Socio-Environmental)
      - **Implementation of Laws and Government monitoring of the laws**
      - **Safety – fire, police, hospitals**

   c) Social Equity and Economic (Socio-Economic)
      - **Opportunities for education/training**
      - **Job Availability**

Objective 2: **SWBAT:** Explain evidence on how natural disasters and human interaction with the earth play a role in the depletion of natural resources.

1. Give a possible reason for the depletion of the following natural resources: **ANSWERS MAY VARY!**

Natural Resource	Possible Reason for the Depletion due to Natural Disaster	Possible Reason for the Depletion due to Human Interaction
Fossil Fuels (Natural Gas/Oil/Coal)	**Earthquakes, Fire, Hurricanes, Volcanic Eruptions**	**Oil Spills, Vehicles with low gas mileage (SUVs), Overuse, Over mining**
Trees/Vegetation/Crops	**Wildfires, Drought, Hurricanes, Tornadoes, Earthquakes**	**Deforestation; Overusing**
Water	**Flooding, Drought, Hurricanes, Tsunamis**	**Poor disposal of chemical waste, use of pesticides and fertilizers, pollution**
Minerals (metals, gold, copper)	**Flooding, Erosion, Mudslides**	**Over mining, Acid Rain**
Animals	**Wildfires destroying habitats, Droughts**	**Overbuilding, poaching**
Clean/Breathable Air	**Dust Storms, Volcanic Eruptions, Wildfires, Debris from Storms, Hurricanes and Tornadoes bringing pollutants into the air**	**Emissions, Greenhouse Gasses, Release of waste from factories, Acid Rain**
Fertile Soil	**Flooding, Landslides**	**Not alternating crops, use of fertilizer**
Land	**Landslides, Wildfires, Hurricanes, Tornadoes, Erosion, Drought, Flooding**	**Overbuilding, pollution (littering), waste disposal, use of chemicals, pesticides and fertilizers**

Read the scenario and answer the question below.

Fog and pollution descended on the northern mainland yesterday, leading to flight cancellations and road closures at a time when millions of people were headed home as the week-long national holiday neared its end.

In Beijing, heavy smog lasted into a second day and visibility was under one kilometer. Traffic police authorities closed down six interprovincial expressways, including roads linking the capital with Harbin in Heilongjiang province, Shanghai, as well as Tianjin and Hebei province.

Meanwhile, authorities in Tianjin said they had closed down all 14 expressways in the northern municipality amid heavy fog. In neighboring Hebei, 13 expressways were closed until visibility improves.

Foggy weather has also affected most parts of Liaoning province. As of yesterday morning, 15 expressways were closed down. In the industrial city of Anshan , visibility was under 50 meters in some areas and many travelers were forced to postpone their trips.

Beijing Capital International Airport said four international flights had been cancelled, including to Mongolia and Russia, while three others had been delayed. Two domestic flights were cancelled and 20 delayed.

2. What **resource** would be ***most affected*** if the following happened, and *explain* how you know?
   Resource: **Clean Breathable Air**
   Explanation: **Fog and pollution (Smog – heavy particles in the air) which is reducing the visibility. In addition to people having reduction of visibility they are breathing in these heavy particles in the air.**

3. Fill in the table with information on how you can improve the sustainability of resources:

Natural Resource	What role do you play in the depletion of this Natural Resource?	How can you work to sustain this resource?
Clean Water	Answers May Vary	Reduce the amount of water you use (household, hygiene); use gray water for flushing toilets etc., collect rain water for irrigation
Clean Air		Avoid spraying aerosol cans, reduce the use of chemicals that stay in the air, reduce car emissions by carpooling or using alternative transportation
Land		Stop pollution, proper disposal and limited use of chemicals,
Fossil Fuels		Reduce the use of fossil fuels, use alternative energy sources when possible
Clean Oceans		Stop pollution/littering
Clean Oceans		Stop pollution/littering

4. List at least 3 of **Shakopee's** natural resources that are being depleted, how is it being depleted and what do you think could be done to prevent further depletion?

Natural Resource	Why is it being depleted?	Ideas for preservation
Clean Water	Increase in phosphates and nitrates in the water due to the increase in agricultural land use	Stricter regulations/guidelines Enforced laws
Land	Land is being used to build industry which is useful for a better economy but decreasing the amount of available land and open space	Stricter regulations/guidelines Enforced laws
Air	Waste from factories being released into the air.	Stricter regulations/guidelines Enforced laws

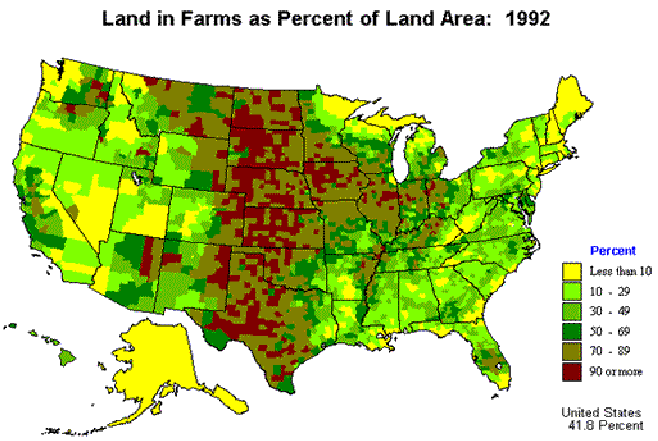
Objective 3: **SWBAT:** Understand that resources are not equitably distributed amongst all people on Earth and will be able to explain the factors that cause this.

1. What percentage of people live in developed countries? **20%**
2. What percentage of people live in developing countries? **80%**
3. What percentage of the world's goods do people in developed countries consume? **83.3%**
4. What percentage of the world's goods do people in developing countries consume? **16.7%**

5. Here is a map of the agricultural land use in the United States. Based on the map, where in the United States do you think we are facing the greatest water shortage and why?

Central section of the United States – Midwest region south to Texas.

- **Agricultural Land Use – irrigation of crops**
- **Ranching Livestock**
- **Increase use of pesticides**
- **Overuse, not conserving**



Read the scenario below and answer question 6.

Water scarcity is a global concern, and that means there's even a problem in our own backyard. While it may be difficult to put yourself in the shoes of an African child struggling to find fresh water, it's important to understand that water scarcity affects everyone, even here in the United States.

It seems impossible that a powerful river, like the Colorado River, is beginning to run dry in places. It seems farfetched that a huge body of water like Lake Mead in Arizona might become obsolete, but these and other dramatic changes are facing the United States. Some researchers claim that Lake Mead, which currently supplies water to 22 million people, may be dry by 2021. Some of our local neighbors are quickly finding it easier to understand the problems facing the driest and poorest geographic areas of the third world.

Water scarcity within the U.S. is not just an environmental problem. Our current daily demand for water also affects its future availability. Wasteful flush toilets, non-insulated pipes and generous showerheads are all culprits to the water crisis. The Southwestern United States is already this emerging reality. A crisis may soon spread into other areas of the U.S. when local waterways can no longer replenish their resources to meet our growing demand. Many may "thirst" for more.

The Ogallala Aquifer is a vast, shallow water table aquifer located beneath the Great Plains in the United States. About 27 percent of the irrigated land in the United States overlies the aquifer, which yields about 30 percent of the ground water used for irrigation in the United States. Since 1950, agricultural irrigation has reduced the saturated volume of the aquifer by an estimated 9%. Depletion is accelerating, with 3% lost between 2001 and 2008 alone. Certain aquifer zones are now empty; these areas will take over 100,000 years to replenish naturally through rainfall.

The aquifer system supplies drinking water to 82 percent of the 2.3 million people who live within the boundaries of the High Plains area. Some estimates indicate a remaining volume of water sufficient for as little as 25 years. Recharge in the aquifer ranges from 0.024 inches per year in parts of Texas and New Mexico to up to 6 inches per year in south-central Kansas.

The regions overlying the Ogallala aquifer are some of the most productive regions in the United States for ranching livestock, and growing corn, wheat, and soybeans.

Snyder, S (n.d.). Water Scarcity - The U.S. Connection. Retrieved November 10, 2013, from

http://thewaterproject.org/water_scarcity_in_us.asp

No Author (n.d.). Ogallala Aquifer. Retrieved November 10, 2013, from

http://en.wikipedia.org/wiki/Ogallala_Aquifer

6. List three consequences of the water shortage in parts of the United States.
   - **Loss of crops – not enough water for irrigation purposes**
   - **Water pollution - people drinking less clean water due to increase use of fertilizers and pesticides**
   - **Lack of water for livestock**

7. What factors make developing countries most at risk for contamination/pollution?
   - **Not enough money**
   - **Limited or no laws or regulations**
   - **Limited or no education on these issues**
   - **Limited plumbing**

8. Why should these (your answer from #7) be considered a global problem, and not just a problem of the directly affected country/people?
    - **Empathy**
    - **Water shortage is starting to affect everyone**
    - **Share solutions to problems**
    - **Could and will likely become a problem for more people**

9. List three negative environmental consequences that are common in developing countries.
    - **Poor water quality**
    - **Poor sanitation**
    - **Poor Air quality**
    - **Land not ideal for agriculture due to the geography and/or the pollution**

10. What are the causes of the negative environmental consequences from the question above?
    - **Lack of laws/regulations/methods for cleaning water**
    - **Lack of education (knowledge of the problem and methods for solving the problem**
    - **Limited resources to solve problems and create alternatives**

11. What are some ideas for preventing or reducing the rate at which these negative environmental consequences occur?
    - **Educate on possible techniques for filtering water, cleaning polluted areas, etc.**
    - **Regulations on proper disposal of contaminants**
    - **Share solutions**
    - **Fundraising/Getting Involved**
    - **"Doing your part"**