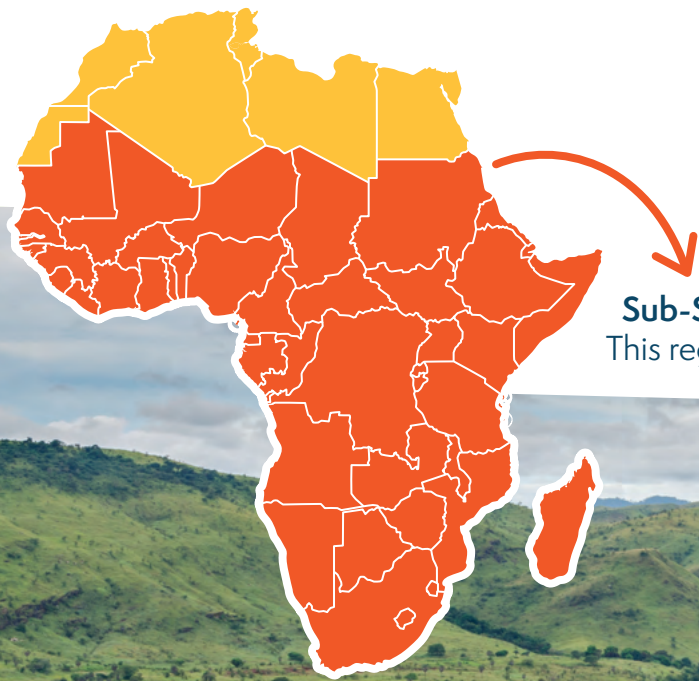


AROUND THE WORLD



Meet Niyah

This is Niyah. She is eleven years old and lives in a small village in the Congo region of central Africa. She is very similar to kids who live in America. Niyah loves her mom and dad, and her two brothers. She loves to play soccer with her friends, and Niyah loves eating dessert. Her favorite is called mikate, a Congolese donut dipped in peanut butter and sprinkled with sugar. Unfortunately for Niyah, her mom only makes these delicious donuts on very special days. Niyah's mom would like to make mikate more often, but in the village where they live, cooking donuts is very difficult. Niyah is very similar to kids who live in America, but her life is very different. Like two-thirds of Africans who live in Sub-Saharan Africa, Niyah does not have access to electricity, and this makes her life very difficult.



Sub-Saharan Africa: all of Africa that is south of the Sahara Desert. This region is home to many of the world's poorest countries.





A Day in the Life

Each morning, Niyah wakes up at sunrise and walks thirty minutes in each direction to collect water. After returning with buckets filled with the family's daily supply of water, she often has a small breakfast of mango and fufu (sticky dough made from cassava). After eating, she goes with her brothers to the forest. They go there to collect wood that will be burned inside their home. There is little time for fun and games. The wood will be used to boil water, cook food, and provide heat on cool mountain nights. Millions of Africans cook on open fires inside their homes, because in tropical humid climate, it is very hard to start a fire outside. Once the kids deliver the wood to their mom, Niyah and her brothers enjoy a lunch of rice, beans, and peppers, and then spend their afternoons helping their dad on the family's small peanut farm.



Cassava: a root vegetable that is eaten widely in Africa and Asia. It is a main source of carbohydrates for millions of people. It is similar to potatoes.

Education

Education is very important to Niyah's parents. They would love for their children to go to school, but without access to electrical power, the family's survival depends on the work that the kids do. This is the same for all the families in the village, so there isn't a school. Thanks to evening lessons from her mom and dad, Niyah knows how to read. She loves reading about faraway places, and secretly dreams of one day wearing fancy work clothes and being a businesswoman in the capital city. However, because she doesn't have the ability to go to school, Niyah knows it will be very difficult for her dream to ever come true.

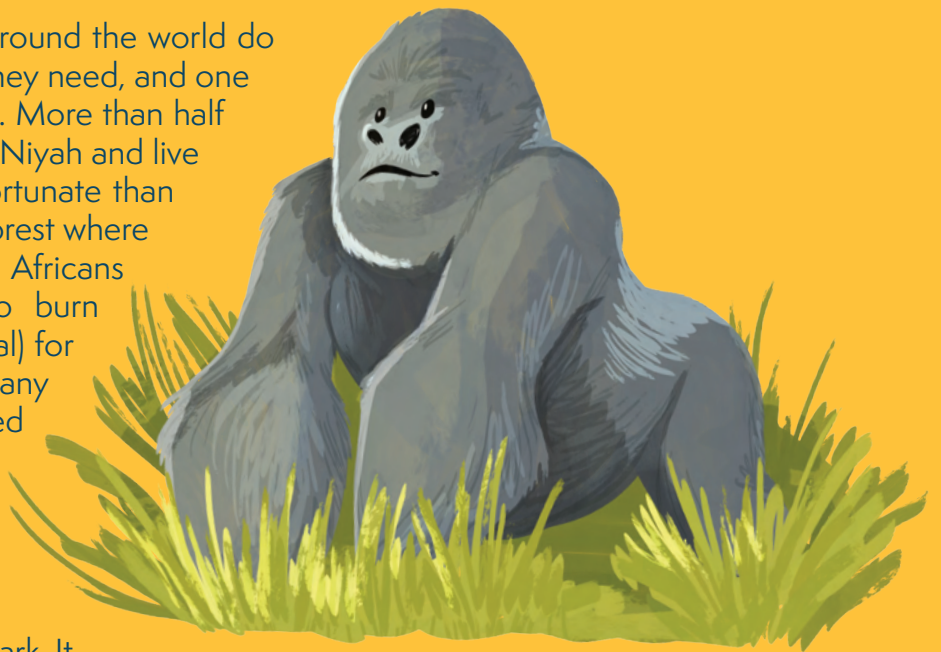


Close Your Eyes

Look at this map of Africa at night. Very few places have electricity. Now close your eyes and imagine what your life would be like without electricity.

Deforestation, Pollution, and Health

As of 2020, three billion people around the world do not have access to all the energy they need, and one billion do not have electricity at all. More than half of those with no electricity are like Niyah and live in Africa. Niyah's family is more fortunate than some because they live next to a forest where they can collect wood to burn. Africans without access to trees have to burn animal dung (the feces of an animal) for energy. Because there are so many people without electricity, the need for wood is very high, so trees are cut down and now some of Africa's most important wildlife areas are in danger.



Niyah lives near Virunga National Park. It is world famous for being one of the few places where Eastern Mountain Gorillas (the biggest primates in the world) live in the wild. Virunga Park is protected by the government. People are not supposed to go into the park and chop down trees. Niyah and her brothers are careful to not go into the forest to gather wood, but they often go right to the edge. Sometimes, during her morning hunts for wood, Niyah will see gorillas moving through the forest. She thinks the gorillas are beautiful and is proud to be their neighbor. It makes her sad that many of the villagers go inside the national park to get wood, but she understands why they do it. There are fewer and fewer trees outside the park, and people need to burn wood for energy. Without the energy that comes from the wood, they will not have fire to cook or heat their homes. Niyah worries that she and her brothers will someday have to break the park law. She also wishes there would be an easier and safer way to get energy.

For now there is enough wood for Niyah's family, and they are grateful for it, but burning wood is causing them harm that they are not aware of. According to the World Health Organization, cooking on an open fire inside the home is like burning 400 cigarettes an hour. It is estimated that 439,000 Africans die each year because they have to cook in their homes with wood.





Meet Cousin Zuri



Once a year, Niyah travels to visit her cousin Zuri who lives a few hours away in a city. These visits are Niyah's favorite time of year, because not only does she love playing games with her cousin, but some years Zuri's house has electricity! Niyah loves to help her aunt cook. With electricity, they can cook dinner on the stove while cookies bake in the oven, and there's no coughing from smoke. Zuri likes to tease Niyah for getting so excited about electricity.

Some years, Zuri's family doesn't have electricity because it is too expensive. Sub-Saharan Africa has more poverty than anywhere on earth, and the area where Niyah and Zuri live is the poorest region in Africa. In the town where Zuri lives, the average worker makes \$600 a year. It costs that worker \$60 to power a refrigerator and \$300 to get connected to energy in the first place. The high costs for residential energy across central Africa make it very hard for people to pay for electricity.

When Zuri's family doesn't have enough money for electricity, they do what almost all of their neighbors do, and make their own energy using diesel-powered generators. In cities across Africa, because of the loud and constant roar from generators, it is impossible to hear birds chirping, and it's difficult to have conversations. These generators are very noisy, and the diesel fuel they burn causes dirty clouds of pollution that are almost as harmful as wood fires like the one Niyah's mom has to use.



Meet Cousin Joseph

Niyah has another cousin named Joseph. He is Zuri's older brother, and he is a college student. He studies environmental engineering at a university. Joseph understands that without access to reliable energy, Africa's problems will continue, and the lives of its people will not improve. He knows that his little cousin Niyah is not free to follow her dreams because too much of her time has to be spent collecting wood for fires that cook her food but hurt her lungs.

Energy can be created in many ways. In Joseph's classes, he learns about different ways that are possible to power Africa. When he graduates, his goal is to work in a power plant that will bring energy to Niyah's village. Each power source has strengths and weaknesses. Review the different ways for creating energy, and predict which power source Joseph thinks is best for Sub-Saharan Africa.



Picture Scavenger Hunt

Find and take a selfie with things powered by energy that you can't live without.



Find two energy-powered essentials in each of the following places:

1. Living room
2. Kitchen
3. Your bedroom
4. Bathroom
5. Outside your house

Power Sources

Power Source	Strengths	Weaknesses
Hydro Description: electricity is created by moving water. Dams are built to control the flow of water, and the motion is used to turn machines called turbines. The spinning turbines generate electricity.	<ul style="list-style-type: none"> • Creates low level of pollution • Can be generated 24 hours per day 	<ul style="list-style-type: none"> • Limited supply of available rivers (Hydroelectricity is already one of Africa's main power sources, and many of its major rivers, such as the Congo, have already been dammed). • Disrupts the natural environment—especially for fish and water plants.
Solar Description: electricity is created using radiation from the sun. Solar panels capture sunlight and store energy in batteries.	<ul style="list-style-type: none"> • Creates low level of pollution 	<ul style="list-style-type: none"> • Only reliable on clear, sunny days, and can't be used at night. No sun means no power! • Panels and batteries contain hazardous materials. • Disrupts natural environment by using large amounts of land to lay out all the solar panels needed.
Wind Description: electricity is created by wind. Gigantic windmills are made out of steel, iron, and plastic. Wind moves the blades, and their spinning creates electricity.	<ul style="list-style-type: none"> • Creates low level of pollution 	<ul style="list-style-type: none"> • Only reliable on windy days—most windmills spin under 30% of the time. • Makes a lot of noise and visual pollution. • Many birds get killed when flying by windmills. • Disrupts natural environment by using large amounts of land. • Hard to dispose of broken windmills.
Nuclear	<ul style="list-style-type: none"> • Creates low quantity of pollution • Can be generated 24 hours per day • Low amount of uranium needed • Very safe 	<ul style="list-style-type: none"> • Very expensive to build and operate power plants. • Although people think nuclear power is dangerous, modern technology has made it very safe.

Power Source	Strengths	Weaknesses
Coal Description: electricity is created by moving steam. Coal is mined from the earth, and then used to heat water that becomes steam. The steam rises and causes turbines to spin.	<ul style="list-style-type: none"> • Easy to find • Low costs • Can be generated 24 hours per day • Easy to transport and store 	<ul style="list-style-type: none"> • Creates high levels of air pollution. • Disrupts natural environment by using large amounts of land for mining.
Clean Coal with “scrubbing” technologies Description: the same process for creating energy as Coal, but with an added process for cleaning pollution.	<ul style="list-style-type: none"> • Easy to find • Low costs • Can be generated 24 hours per day • Easy to transport and store • Creates low level of pollution 	<ul style="list-style-type: none"> • Disrupts the natural environment by using large amounts of land for mining.
Natural Gas with “fracking” technologies Description: electricity is created by moving steam. Natural gas is drilled out of the earth using high pressure and water. Then it is used to heat water that becomes steam. The steam rises and causes turbines to spin.	<ul style="list-style-type: none"> • High amounts recently discovered in Congo region • Low costs • Can be generated 24 hours per day • Easy to transport and store 	<ul style="list-style-type: none"> • Found in areas close to protected forests. • Disrupts the natural environment during drilling.

Joseph has studied the different power sources and knows that there is no perfect solution to Africa’s energy problems. He knows that all power sources have different strengths and weaknesses. He sees countries like the United States safely burn fossil fuels like coal and natural gas, have nuclear and hydroelectric power plants, and use renewable energy sources like wind and solar, giving the Americans better access to energy at lower costs. Joseph believes that if this happens in Africa, kids like Niyah will also have access to energy and a better future.

Make a battery

You will need:

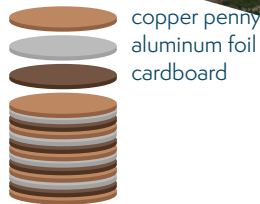
- LED
- 1 sheet cardboard
- 6 copper pennies
- 1 sheet aluminum foil
- 1 cup water
- 1/2 teaspoon vinegar
- 1 tablespoon salt
- small cup
- scissors



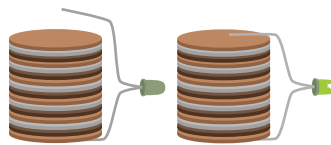
Directions:

1. Using one penny as a template, draw and cut out 5 circles of the cardboard and aluminum foil.
2. Pour water, salt and vinegar in the small cup.
3. Soak the 5 cardboard circles in the liquid mixture.
4. Stack the pennies, aluminum foil, and cardboard as shown in graphic 1.1
5. Now you have a battery! Test it out by taking the two wires of the LED and placing one wire on the bottom penny and the other on the top penny. The LED should light up. (see graphic 1.2)

graphic 1.1



graphic 1.2



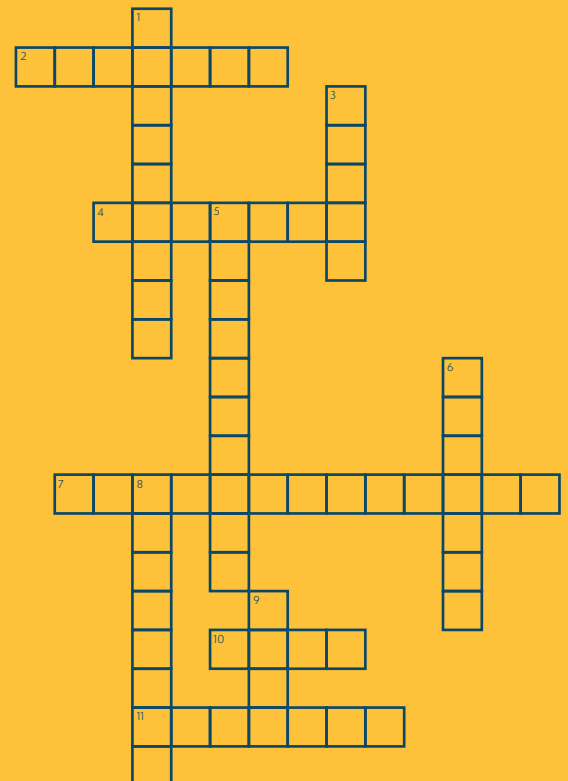
Create a Vlog



Spend one day living without energy. Give up everything powered by energy (refrigerator, phone, lights, etc.) for 24 hours and then make a vlog about it.

Crossword

1. diesel-powered machine families in the city use when they don't have money for electricity
2. the state of being very poor
3. energy source powered by the sun
4. a root vegetable similar to potatoes
5. area in Africa south of the Sahara Desert
6. biggest primate in the world, found in the forest near Niyah's village
7. cutting down of forests
8. drilling and then injecting high pressure fluid deep in the earth to extract oil or gas
9. combustible rock mined and used to heat water to create steam that spins turbines to create energy
10. what Niyah and her brothers collect for their mom to cook their food
11. electricity created when uranium atoms split up and heat water, causing steam to spin turbines



Traditional Recipe for Mikate (Congolese Donut)

Ingredients

- 4 cups of self-rising flour
- 1 cup of granulated sugar
- 1 ½ cups of lukewarm water
- 1 Tbsp of vanilla extract

Instructions

1. Pour the flour into a mixing bowl and make a hole in the middle.
2. Pour the sugar into the hole.
3. Pour the vanilla over the sugar.
4. Gradually add the water while mixing with a large spoon. Mix fast to eliminate lumps.
5. Mix until you have air bubbles forming and popping. This can take up to 5 minutes, so you are going to get a workout.
6. Heat vegetable oil in a pot or pan to 375 degrees.
(Warning: oil will be hot and can severely burn you)
7. With clean hands, spoon, or ice cream scoop, make balls of dough that are about the size of a golf ball.
8. Carefully place dough into the hot oil. Do not overcrowd the oil or the temperature will drop and your mikate will be oily.
(Warning: oil will splash and burn you if not done carefully)
9. When the dough has turned golden brown, use a slotted spoon to turn your mikate over so that they are golden brown all over.
10. Carefully remove your mikate from the oil with a slotted spoon and place them on a paper towel-covered plate.
11. Eat warm or at room temperature. You might dip them in peanut butter and and sprinkle them with sugar just like Niyah!





Vocabulary

Cassava: a root vegetable that is eaten widely in Africa and Asia. It is a main source of carbohydrates for millions of people. It is similar to potatoes.

Deforestation: the action of cutting down all the trees in a wide area.

Fossil Fuel: a natural fuel, such as coal or natural gas that is found in the earth.

Fracking: drilling and then injecting high pressure fluid deep in the earth to extract oil or gas.

Poverty: when people are very poor.

Primate: mammals in the zoological group that contain apes, monkeys, lemurs, and humans.

Scrubbing: the process of removing sulfur dioxide (a pollutant) from gas made from coal.

Sub-Saharan Africa: all of Africa that is south of the Sahara Desert. This region is home to many of the world's poorest countries.



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Images: Getty Images

Activity Answer Key

