Renewable and Nonrenewable Energy Sources and their Impacts

Fourth Grade – Unit PowerPoint

Sustainability for Young Learners Courses

Lessons 1-5

SUSTAINABILITY FOR YOUNG LEARNERS COURSES

Primary Standards Covered

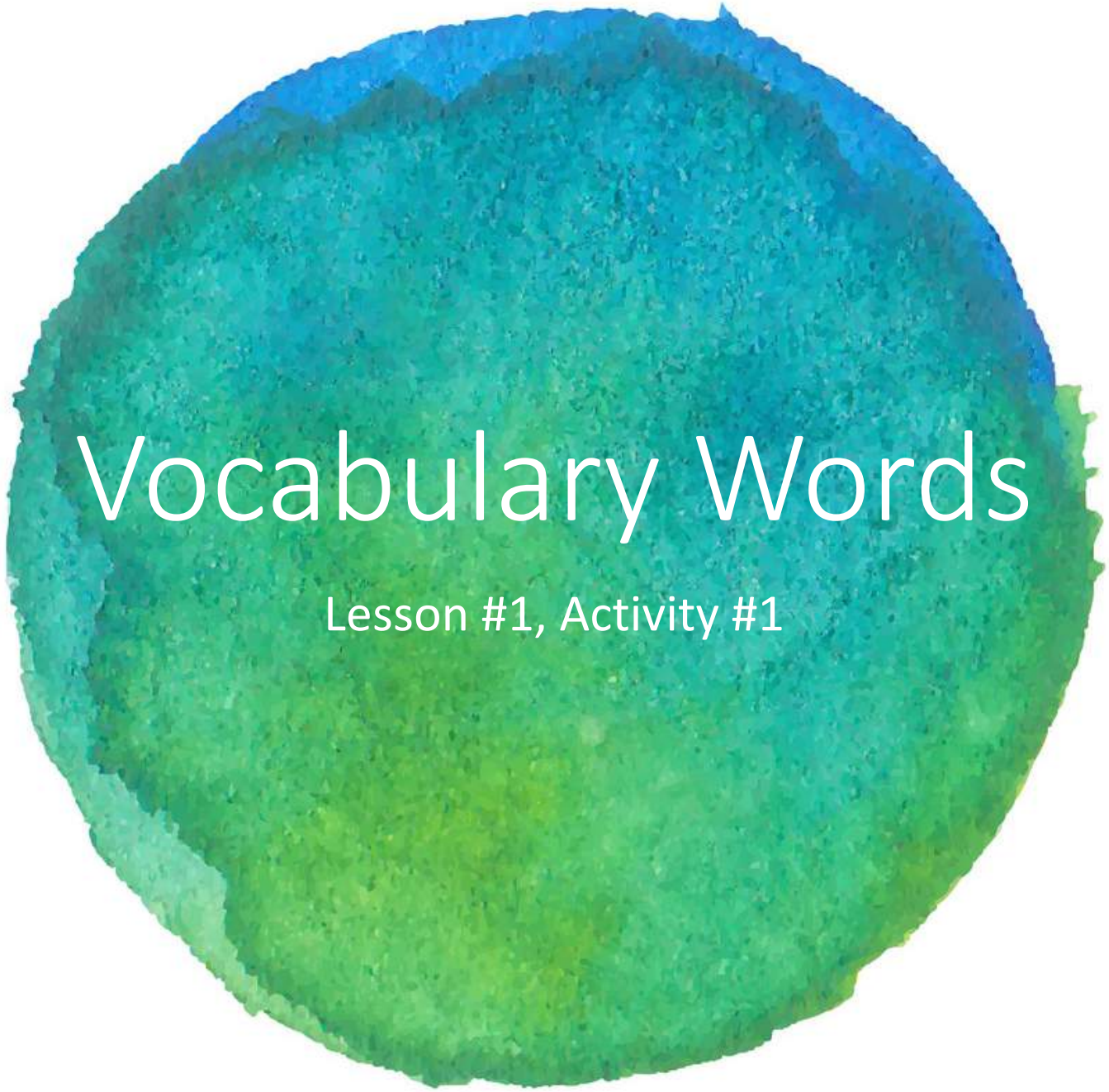
- 4-ESS3-1: Earth and Human Activity - Obtain and combine information to describe that energy and fuels are derived from natural resources and that their uses affect the environment. [Clarification Statement: Examples of renewable energy resources could include wind energy, water behind dams, and sunlight; non-renewable energy resources are fossil fuels and fissile materials. Examples of environmental effects could include loss of habitat due to dams, loss of habitat due to surface mining, and air pollution from burning of fossil fuels.]
- SS3.A (4-ESS3-1): Disciplinary Core Ideas: Natural Resources - Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not.

Standard Connections Covered

- 4-ESS3-2: Constructing Explanations and Designing Solutions - Generate and compare multiple solutions to a problem based on how well they meet the criteria and constraints of the design solution.
- Literacy Common Core Standards Connections: RI.4.1 Refer to details and examples in a text when explaining what the text says explicitly and when drawing inferences from the text. (4-ESS3-2)

Vocabulary words and The Story of a Spoon

Lesson #1



Vocabulary Words

Lesson #1, Activity #1

Energy

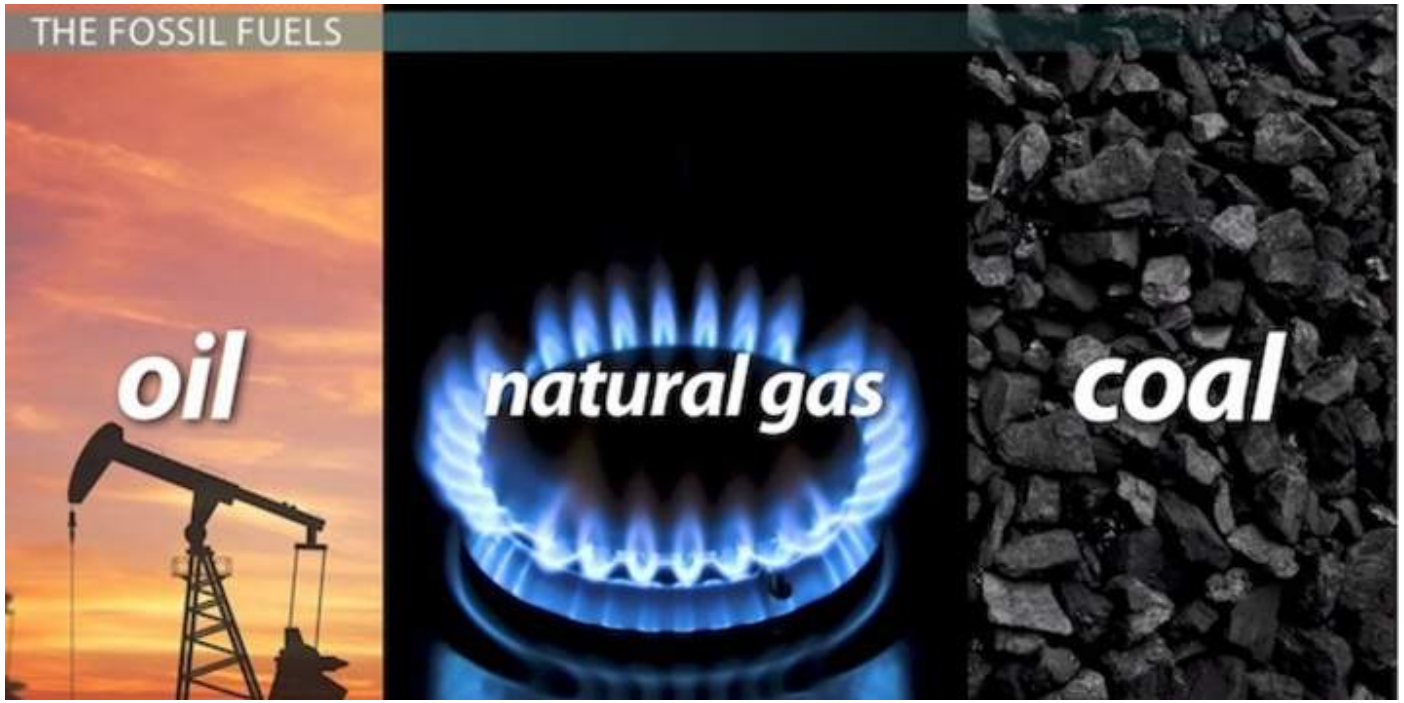
- The power or ability to make something work, move, or be active.

Fossil Fuels

- Any carbon-containing fuel formed from the remains of prehistoric plants and animals. Ex: coal, petroleum, and natural gas

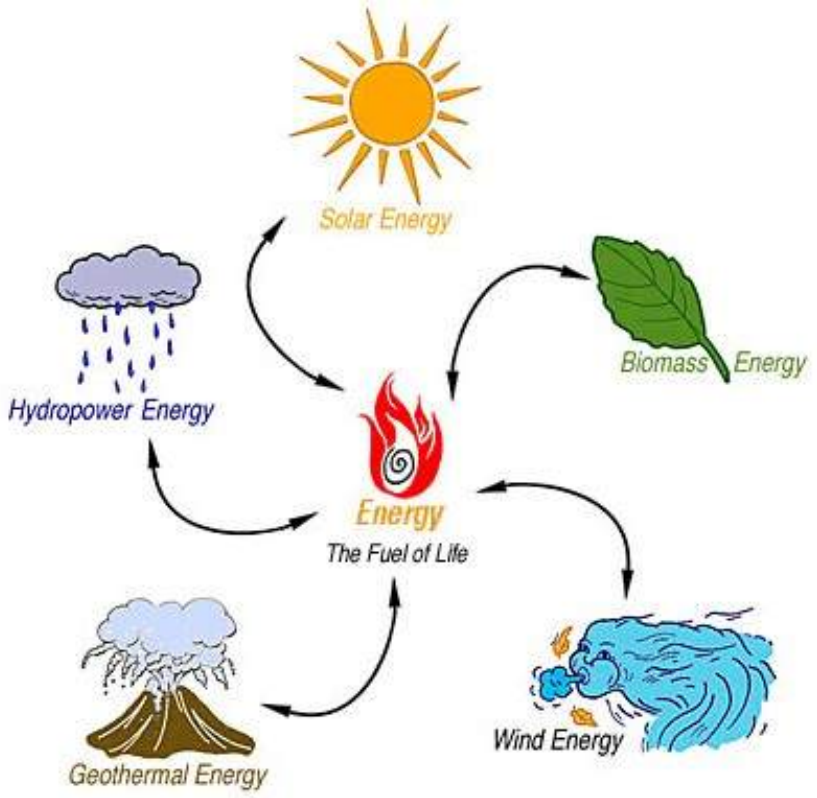
Non-renewable resources

- Resources that have a limited supply and cannot be replaced by natural means at a pace that meets its consumption.



Renewable Resources

- Any source that can or will be replenished naturally over a short amount of time to meet consumption needs. Ex: wood or solar (sun)



Climate Change

- A change in global and regional climate patterns attributed to an increase in atmospheric carbon dioxide from the burning of fossil fuels.

Pollution

- Pollution happens when the environment is contaminated, or dirtied, by waste, chemicals, and other harmful substances. There are three main forms of pollution: air, water, and land.

Sustainable

- Ability to be maintained at a certain rate or level.

Coal

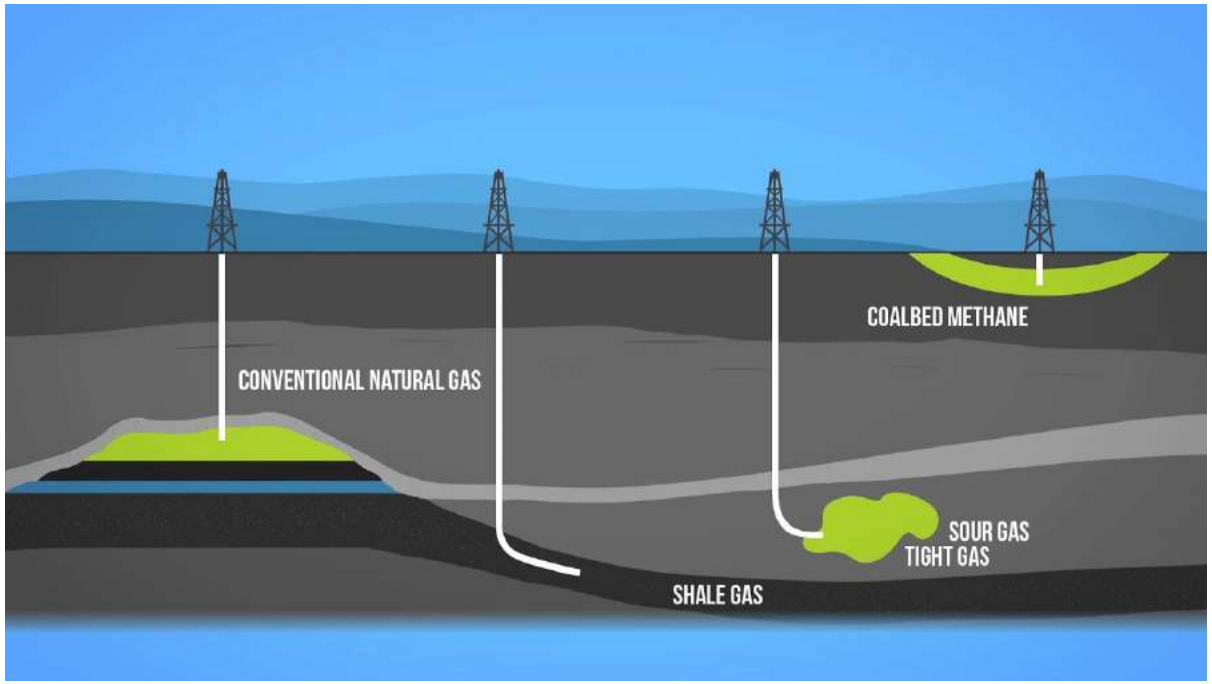
- A hard black or dark brown substance that is found in the earth and burned as fuel.

Oil

- Liquid found beneath the earth’s surface used for fuel to power cars.

Natural Gas

- A mixture of gases found in the earth's crust and extracted by fracking to be used for cooking and heating.



Solar Energy

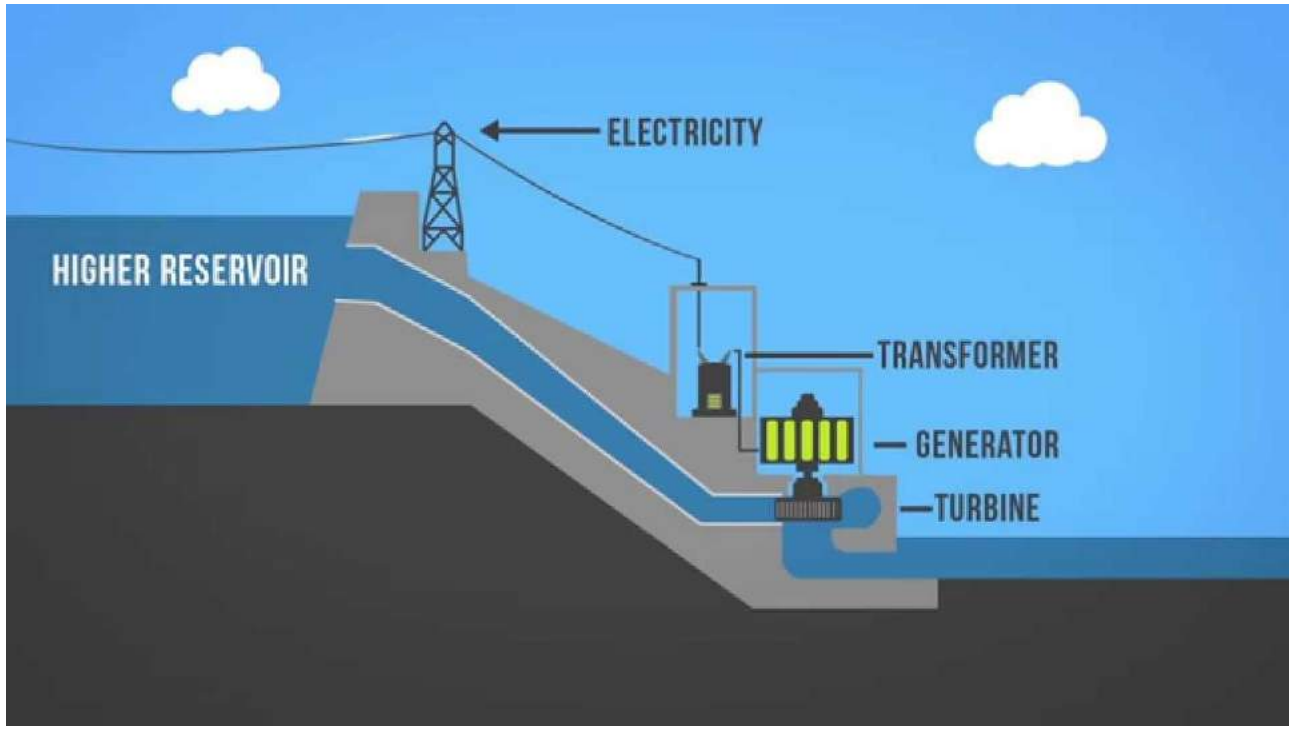
- Radiant energy from the sun that is captured to create energy.

Wind Energy

- Wind is used to create energy via turbines. The wind turns the turbines, which creates energy and electricity.

Hydropower

- Producing electricity by converting the power of waves and water into energy.

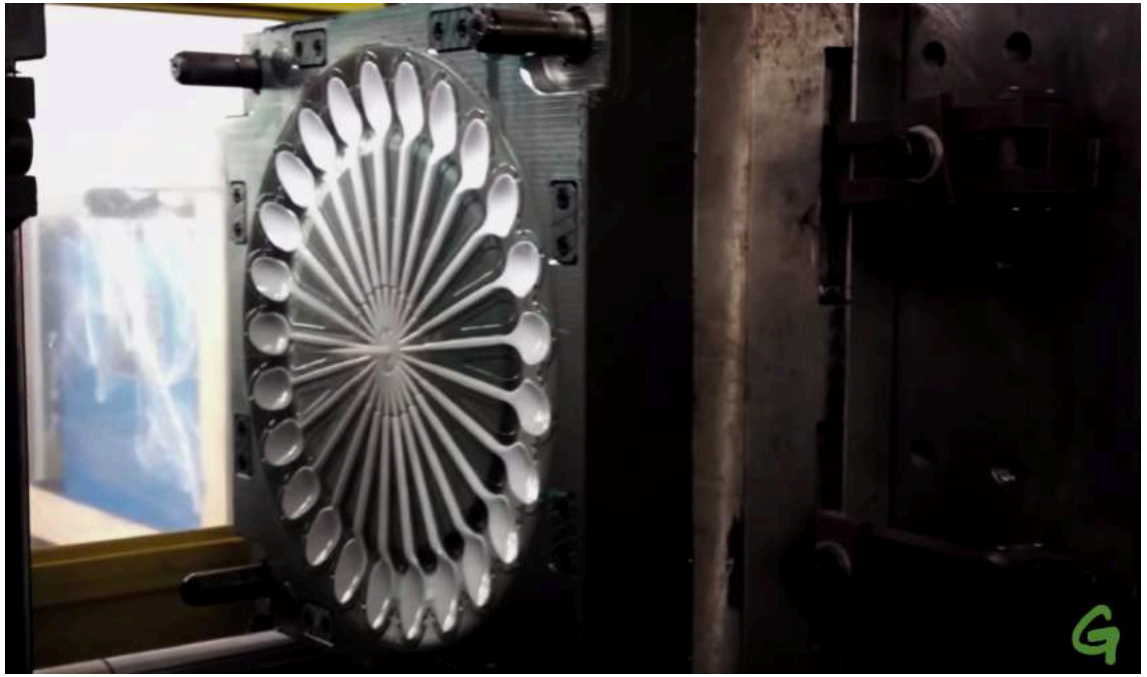


The Story of a Spoon Video and Discussion

Lesson #1, Activity #2

The Story of a Spoon - Video

- Click here to watch the video
- Link to the video: https://www.youtube.com/watch?v=eg-E1FtjaxY



The Story of a Spoon - Discussion

Coal and Oil

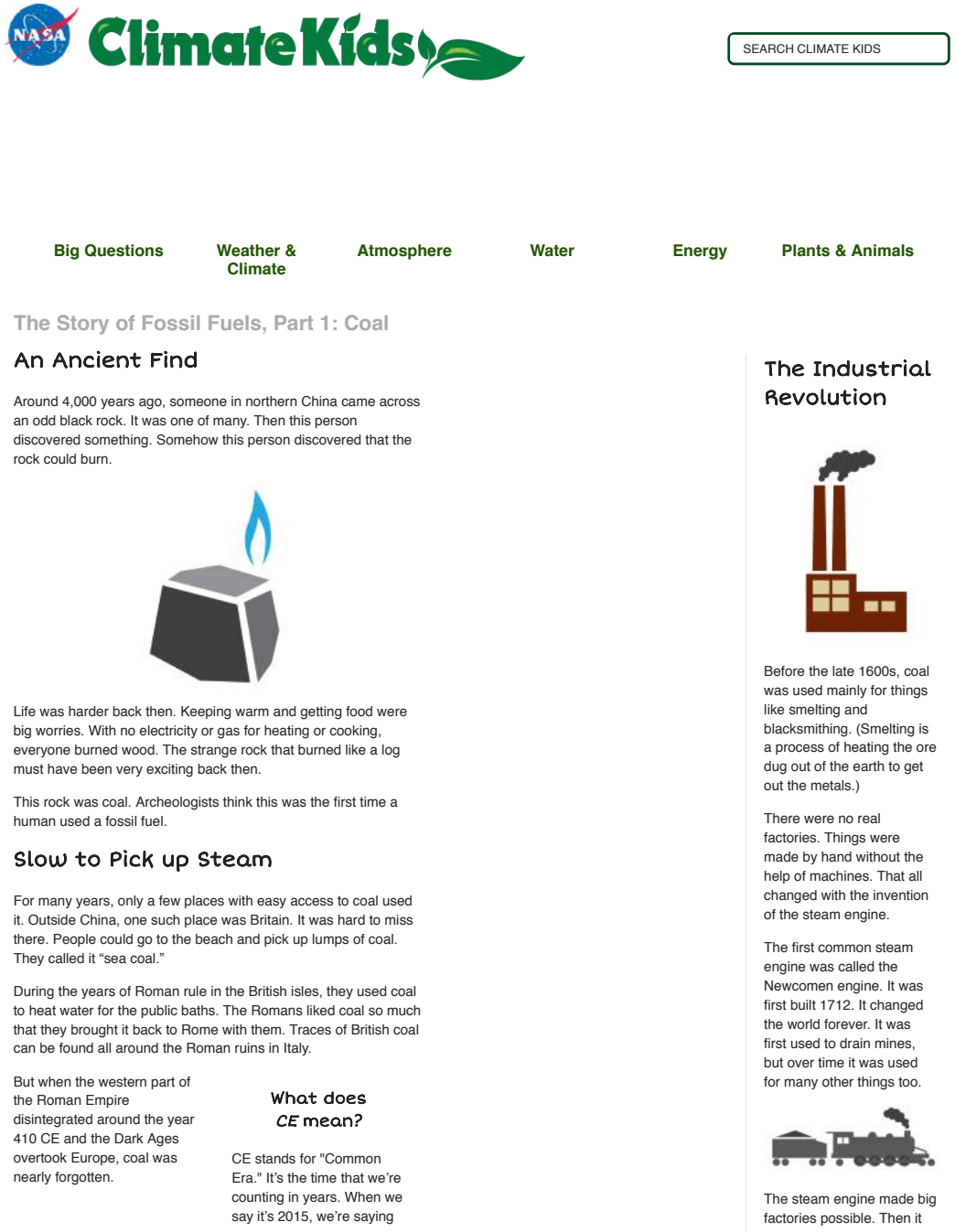
Lesson #2

Coal Reading and Handout

Lesson #2, Activity #1

Coal Reading

- *The Story of Fossil Fuels* by NASA Climate kids.
- The article for this activity can be found at this link: https://climatekids.nasa.gov/fossil-fuels-coal/



ClimateKids

SEARCH CLIMATE KIDS

Big Questions | Weather & Climate | Atmosphere | Water | Energy | Plants & Animals

The Story of Fossil Fuels, Part 1: Coal

An Ancient Find

Around 4,000 years ago, someone in northern China came across an odd black rock. It was one of many. Then this person discovered something. Somehow this person discovered that the rock could burn.

Life was harder back then. Keeping warm and getting food were big worries. With no electricity or gas for heating or cooking, everyone burned wood. The strange rock that burned like a log must have been very exciting back then.

This rock was coal. Archeologists think this was the first time a human used a fossil fuel.

Slow to Pick up Steam

For many years, only a few places with easy access to coal used it. Outside China, one such place was Britain. It was hard to miss there. People could go to the beach and pick up lumps of coal. They called it "sea coal."

During the years of Roman rule in the British isles, they used coal to heat water for the public baths. The Romans liked coal so much that they brought it back to Rome with them. Traces of British coal can be found all around the Roman ruins in Italy.

But when the western part of the Roman Empire disintegrated around the year 410 CE and the Dark Ages overtook Europe, coal was nearly forgotten.

What does *CE* mean?

CE stands for "Common Era." It's the time that we're counting in years. When we say it's 2015, we're saying

The Industrial Revolution

Before the late 1600s, coal was used mainly for things like smelting and blacksmithing. (Smelting is a process of heating the ore dug out of the earth to get out the metals.)

There were no real factories. Things were made by hand without the help of machines. That all changed with the invention of the steam engine.

The first common steam engine was called the Newcomen engine. It was first built 1712. It changed the world forever. It was first used to drain mines, but over time it was used for many other things too.

The steam engine made big factories possible. Then it

Coal Activity

- Students will fill out the following section of the activity

STUDENT WORKSHEET - PAGE 1 OF 2

RENEWABLE AND NONRENEWABLE ENERGY SOURCES

Name: _____ Date: _____

Coal	
Coal is (Circle one): Renewable Nonrenewable	
Where does coal come from?	Draw a photo of coal:

Oil	
Oil is (Circle one): Renewable Nonrenewable	
Where does oil come from?	Draw a photo of oil:

Gas	
Gas is (Circle one): Renewable Nonrenewable	
Where does gas come from?	Draw a photo of gas:

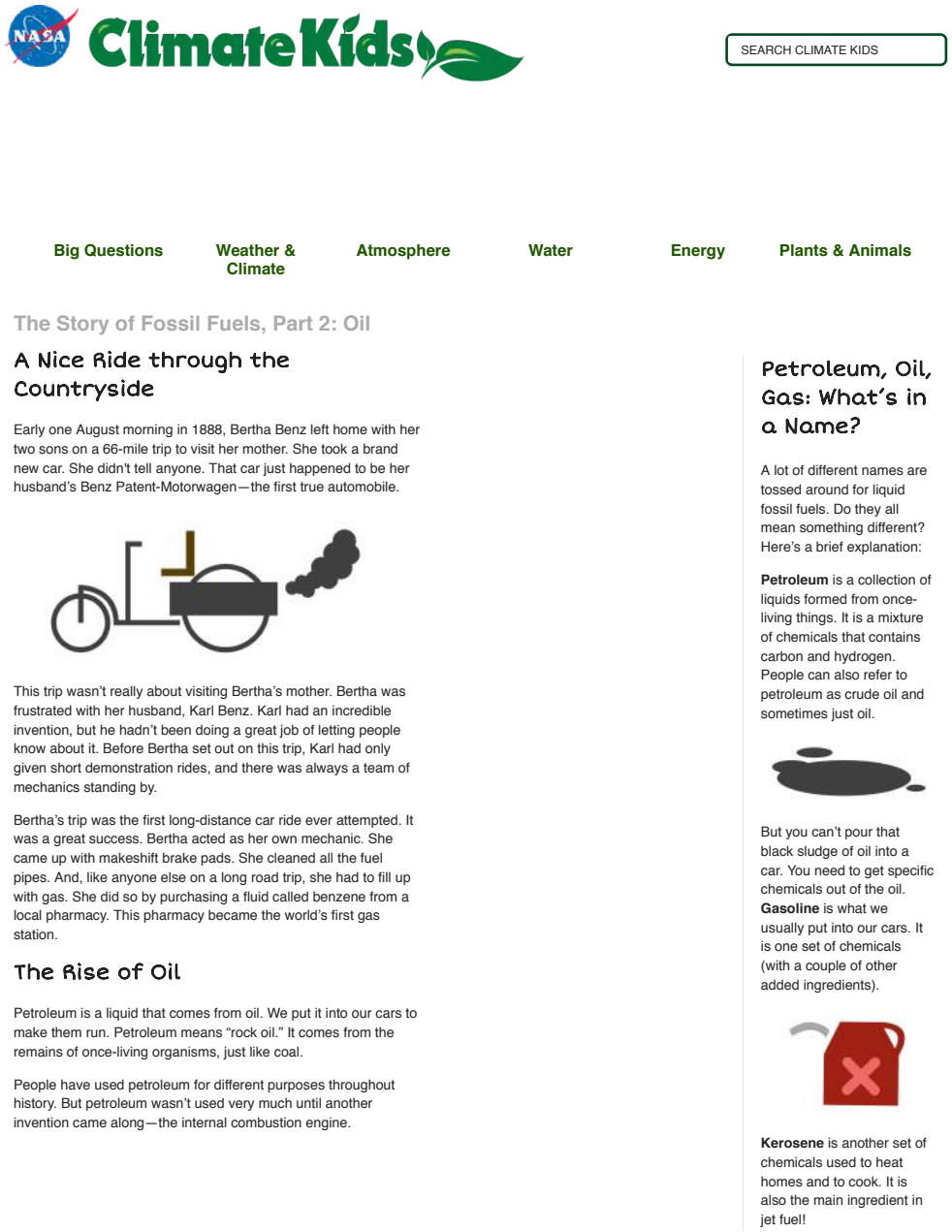
SUSTAINABILITY FOR YOUNG LEARNERS COURSES

Oil Reading and Handout

Lesson #2, Activity #2

Oil Reading

- *The Story of Fossil Fuels* by NASA Climate kids.
- The article for this activity can be found at this link: https://climatekids.nasa.gov/fossil-fuels-oil/



ClimateKids

SEARCH CLIMATE KIDS

Big Questions | Weather & Climate | Atmosphere | Water | Energy | Plants & Animals

The Story of Fossil Fuels, Part 2: Oil

A Nice Ride through the Countryside

Early one August morning in 1888, Bertha Benz left home with her two sons on a 66-mile trip to visit her mother. She took a brand new car. She didn't tell anyone. That car just happened to be her husband's Benz Patent-Motorwagen—the first true automobile.

This trip wasn't really about visiting Bertha's mother. Bertha was frustrated with her husband, Karl Benz. Karl had an incredible invention, but he hadn't been doing a great job of letting people know about it. Before Bertha set out on this trip, Karl had only given short demonstration rides, and there was always a team of mechanics standing by.

Bertha's trip was the first long-distance car ride ever attempted. It was a great success. Bertha acted as her own mechanic. She came up with makeshift brake pads. She cleaned all the fuel pipes. And, like anyone else on a long road trip, she had to fill up with gas. She did so by purchasing a fluid called benzene from a local pharmacy. This pharmacy became the world's first gas station.

The Rise of Oil

Petroleum is a liquid that comes from oil. We put it into our cars to make them run. Petroleum means "rock oil." It comes from the remains of once-living organisms, just like coal.

People have used petroleum for different purposes throughout history. But petroleum wasn't used very much until another invention came along—the internal combustion engine.

Petroleum, Oil, Gas: What's in a Name?

A lot of different names are tossed around for liquid fossil fuels. Do they all mean something different? Here's a brief explanation:

Petroleum is a collection of liquids formed from once-living things. It is a mixture of chemicals that contains carbon and hydrogen. People can also refer to petroleum as crude oil and sometimes just oil.

But you can't pour that black sludge of oil into a car. You need to get specific chemicals out of the oil. **Gasoline** is what we usually put into our cars. It is one set of chemicals (with a couple of other added ingredients).

Kerosene is another set of chemicals used to heat homes and to cook. It is also the main ingredient in jet fuel!

Oil Activity

- Students will fill out the following section of the activity

STUDENT WORKSHEET - PAGE 1 OF 2

RENEWABLE AND NONRENEWABLE ENERGY SOURCES

Name: _____ Date: _____

Coal	
Coal is (Circle one): Renewable Nonrenewable	
Where does coal come from?	Draw a photo of coal:

Oil	
Oil is (Circle one): Renewable Nonrenewable	
Where does oil come from?	Draw a photo of oil:

Gas	
Gas is (Circle one): Renewable Nonrenewable	
Where does gas come from?	Draw a photo of gas:

SUSTAINABILITY FOR YOUNG LEARNERS COURSES

Oil and Coal Discussion

Lesson #2, Activity #3

Coal and Oil Class Discussion

Gas and the Environmental Cost of Using Nonrenewable Resources

Lesson #3

Gas Reading and Handout

Lesson #3, Activity #1

Gas Reading

- *The Story of Fossil Fuels* by NASA Climate kids.
- The article for this activity can be found at this link: https://climatekids.nasa.gov/fossil-fuels-gas/

ClimateKids

SEARCH CLIMATE KIDS

Big Questions | Weather & Climate | Atmosphere | Water | Energy | Plants & Animals

The Story of Fossil Fuels, Part 3: Gas

A Fuel of Many Uses

You can find natural gas near oil, coal, and other rocks. It comes from the same natural processes that make coal and oil. It, too, comes from once-living things.

Humans have known about natural gas for a long time. Around 500 BCE, people in China used bamboo shoots to transport natural gas. They used it to boil water.

A famous historian wrote about natural gas between 100 and 124 CE. That's 1,900 years ago. This person wrote about flames burning from the ground of present-day Iraq. But even though people knew about it, it didn't catch on as a major fuel source for some time.

Today, natural gas is often used for cooking and heating homes. It is one of the most important sources of energy in the world.

A Complicated Future

People once considered natural gas a problem. It was explosive and dangerous. Most oil and coal operations just burned it.

Now it is valuable. Natural gas is cleaner burning than either coal or oil. That means it causes less pollution. Many places have switched from burning coal to burning natural gas. That means many places want more of it.

Nonrenewable Resource?

Fossil fuels form all the time, but that doesn't mean that we won't run out someday. It takes millions of years for coal, oil, and natural gas to form, and we are removing them much faster than that.

Think about it this way: The fossil fuels we have used over the past **200 years** formed over the past **500 million years**. It's like we're emptying a bathtub with a huge drain while refilling it with a tiny, slow drip. Even with the drip, the tub will still empty completely.

Some scientists think we are getting close to being halfway through all that fuel. It's hard to know exactly how much remains because the technology we use to get these fuels from the ground is always changing.

Still, no new inventions will get around the fact that, at some point, there will be no more fossil fuels left.

Gas Activity

- Students will fill out the following section of the activity

STUDENT WORKSHEET - PAGE 1 OF 2

RENEWABLE AND NONRENEWABLE ENERGY SOURCES

Name: _____ Date: _____

Coal	
Coal is (Circle one): Renewable Nonrenewable	
Where does coal come from?	Draw a photo of coal:

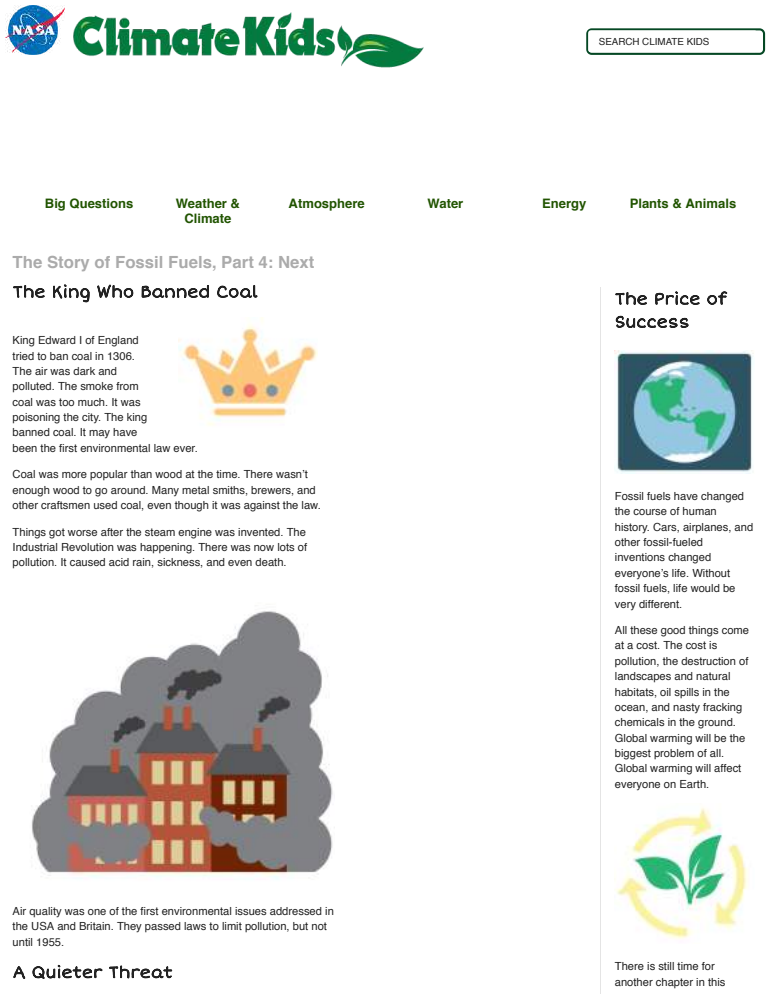
Oil	
Oil is (Circle one): Renewable Nonrenewable	
Where does oil come from?	Draw a photo of oil:

Gas	
Gas is (Circle one): Renewable Nonrenewable	
Where does gas come from?	Draw a photo of gas:

SUSTAINABILITY FOR YOUNG LEARNERS COURSES

The King Who Banned Coal - Reading

- *The Story of Fossil Fuels* by NASA Climate kids.
- The article for this activity can be found at this link: https://climatekids.nasa.gov/fossil-fuels-next/



ClimateKids

SEARCH CLIMATE KIDS

Big Questions | Weather & Climate | Atmosphere | Water | Energy | Plants & Animals

The Story of Fossil Fuels, Part 4: Next

The King Who Banned Coal

King Edward I of England tried to ban coal in 1306. The air was dark and polluted. The smoke from coal was too much. It was poisoning the city. The king banned coal. It may have been the first environmental law ever.

Coal was more popular than wood at the time. There wasn't enough wood to go around. Many metal smiths, brewers, and other craftsmen used coal, even though it was against the law.

Things got worse after the steam engine was invented. The Industrial Revolution was happening. There was now lots of pollution. It caused acid rain, sickness, and even death.

Air quality was one of the first environmental issues addressed in the USA and Britain. They passed laws to limit pollution, but not until 1955.

A Quieter Threat

The Price of Success

Fossil fuels have changed the course of human history. Cars, airplanes, and other fossil-fueled inventions changed everyone's life. Without fossil fuels, life would be very different.

All these good things come at a cost. The cost is pollution, the destruction of landscapes and natural habitats, oil spills in the ocean, and nasty fracking chemicals in the ground. Global warming will be the biggest problem of all. Global warming will affect everyone on Earth.

There is still time for another chapter in this

The King Who Banned Coal – Discussion

Renewable and Nonrenewable Energy Video and Discussion

Lesson #3, Activity #3

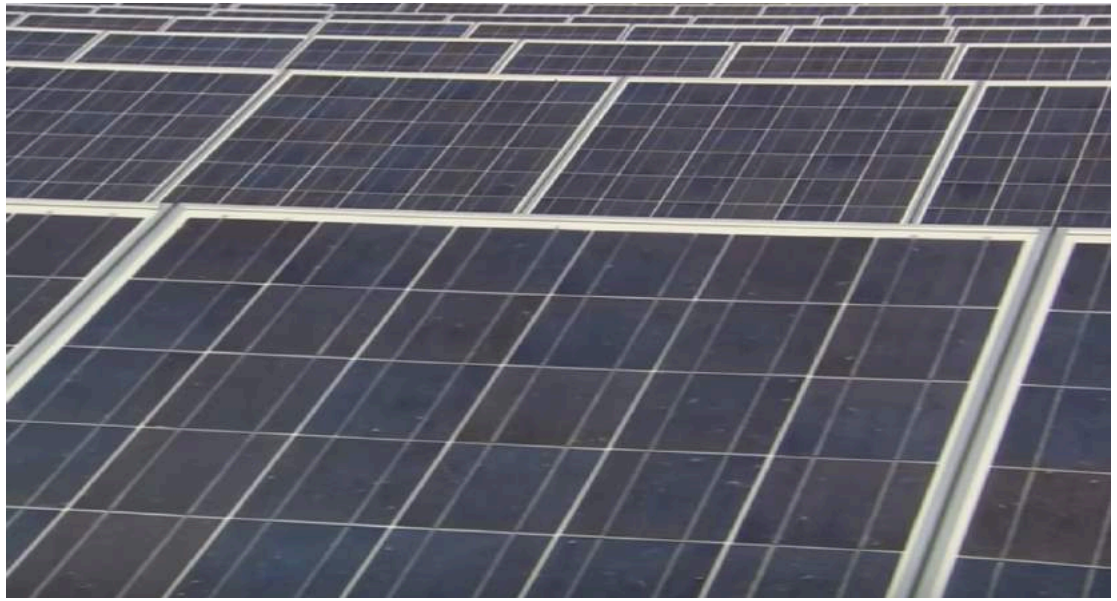
Video - *Difference Between Renewable and Nonrenewable Resources*

- *Difference Between Renewable and Nonrenewable Resources*
- Click here to watch the video

Video - *Safety Smart® Science with Bill Nye the Science Guy®: Renewable Energy*

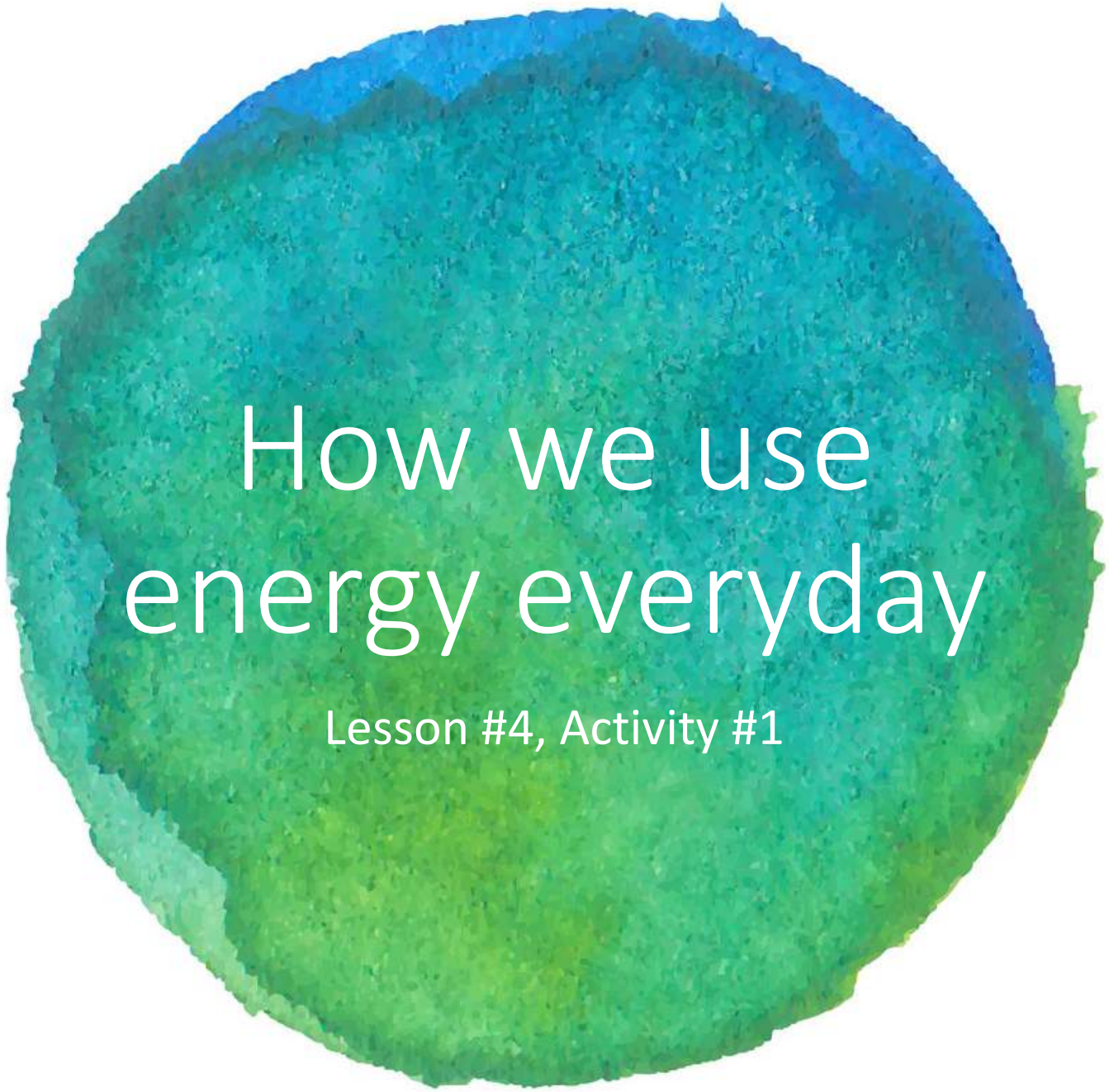
- Safety Smart® Science with Bill Nye the Science Guy®: Renewable Energy – PREVIEW
- Click here to watch the video

Conversation on Renewable & Nonrenewable Energy



Climate effects of burning fossil fuels – Introduction to solar, wind, and hydropower

Lesson #4

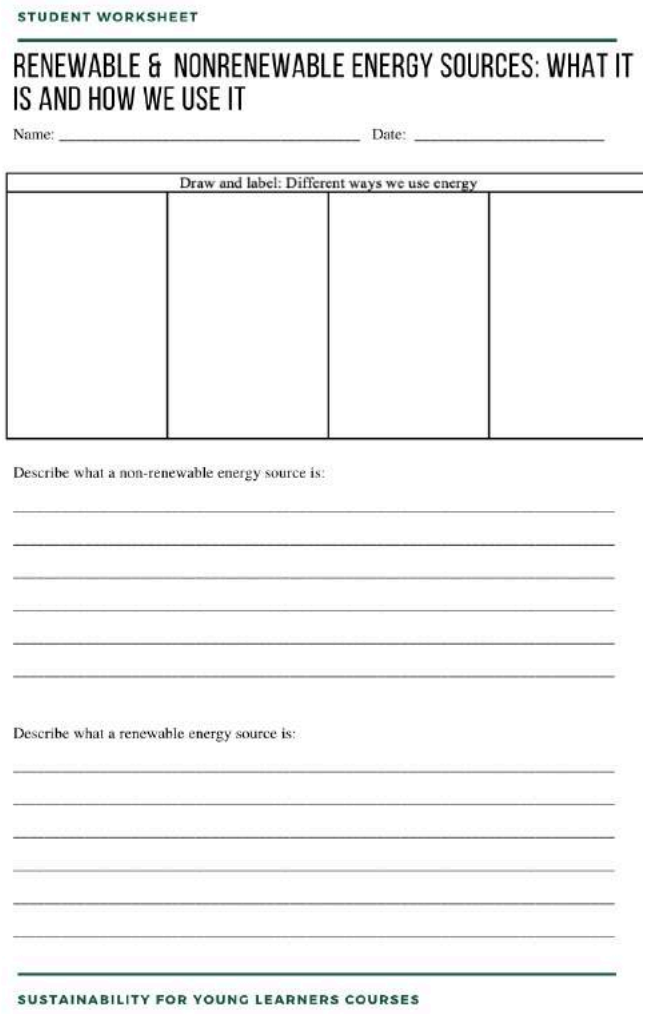


How we use energy everyday

Lesson #4, Activity #1

Renewable and Nonrenewable Energy Sources: What it is and how we use it – Worksheet

- Students will complete the following worksheet



STUDENT WORKSHEET

RENEWABLE & NONRENEWABLE ENERGY SOURCES: WHAT IT IS AND HOW WE USE IT

Name: _____ Date: _____

Draw and label: Different ways we use energy			

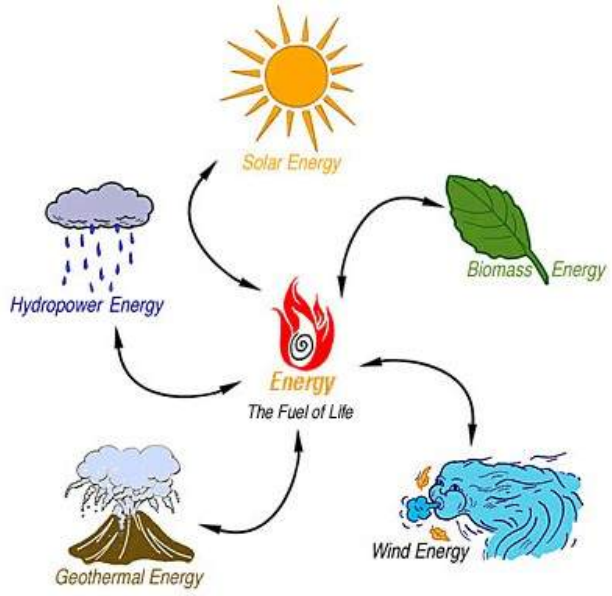
Describe what a non-renewable energy source is:

Describe what a renewable energy source is:

SUSTAINABILITY FOR YOUNG LEARNERS COURSES

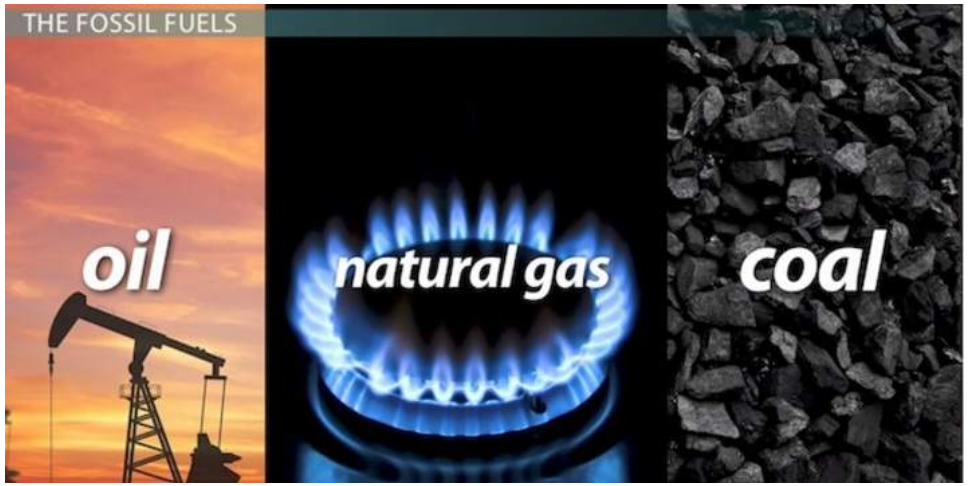
Renewable Resources

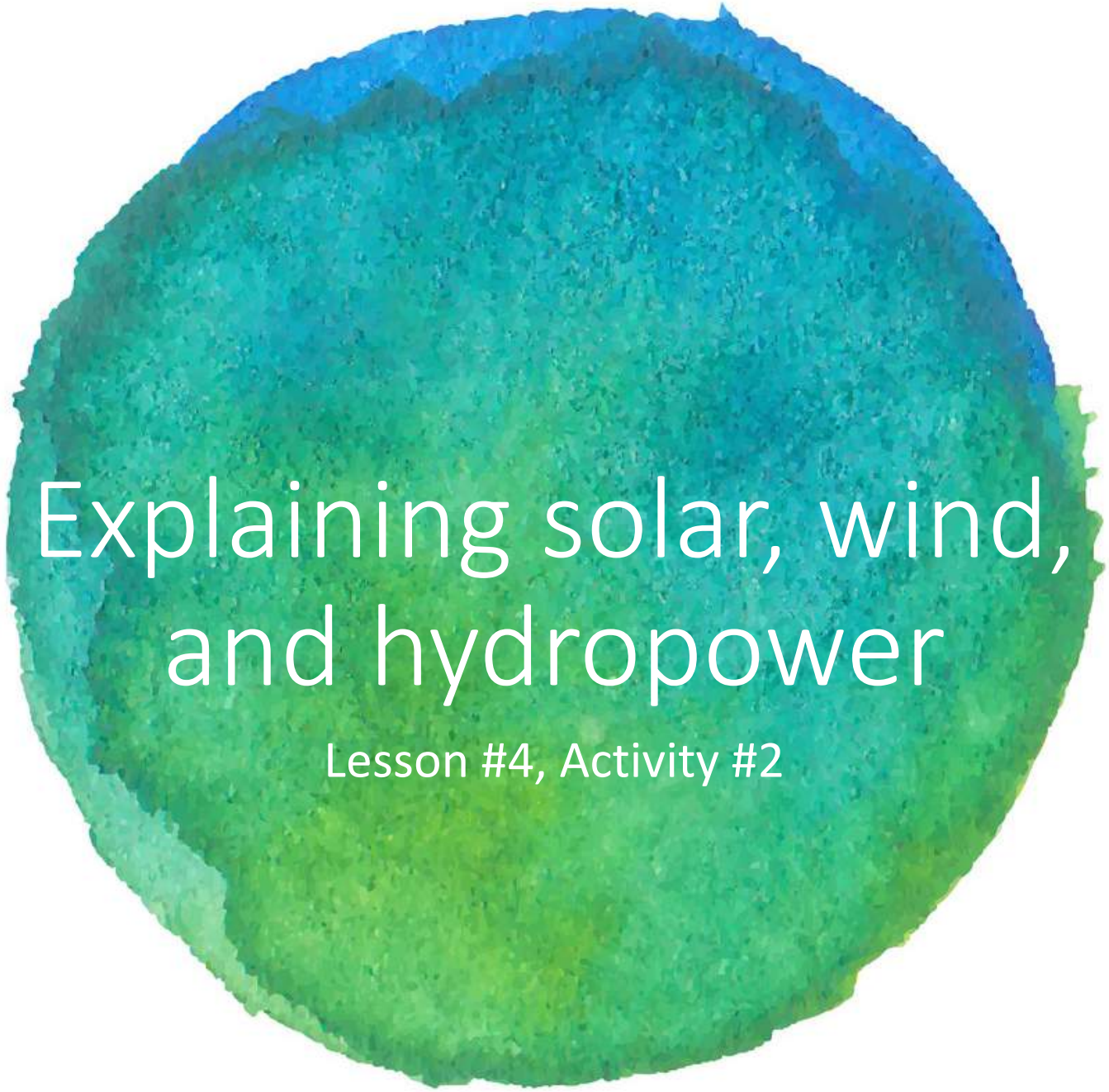
- Any source that can or will be replenished naturally over a short amount of time to meet consumption needs. Ex: wood or solar (sun)



Non-renewable resources

- Resources that have a limited supply and cannot be replaced by natural means at a pace that meets its consumption.



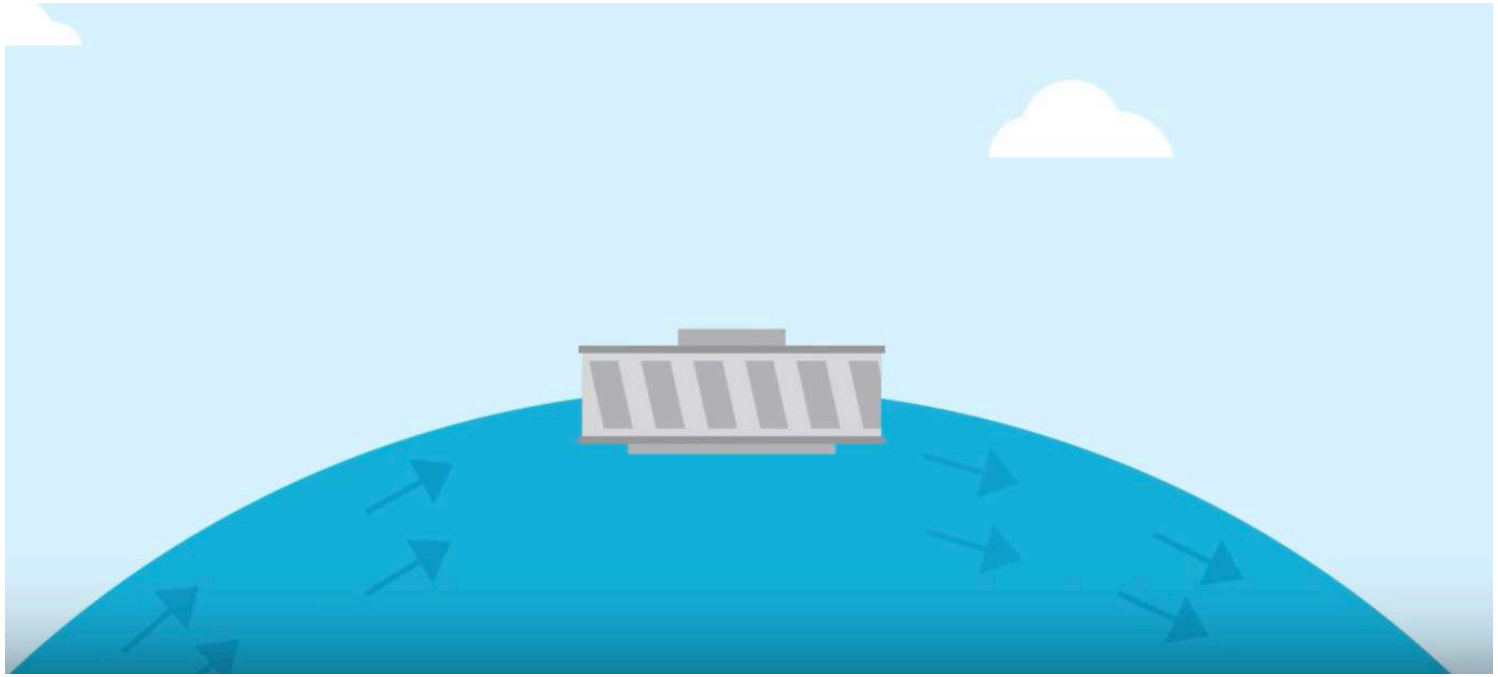


Explaining solar, wind, and hydropower

Lesson #4, Activity #2

Video – Renewable Energy 101: How does hydropower work?

- Renewable Energy 101: How Does Hydroelectricity Work?
- Click here to watch the video

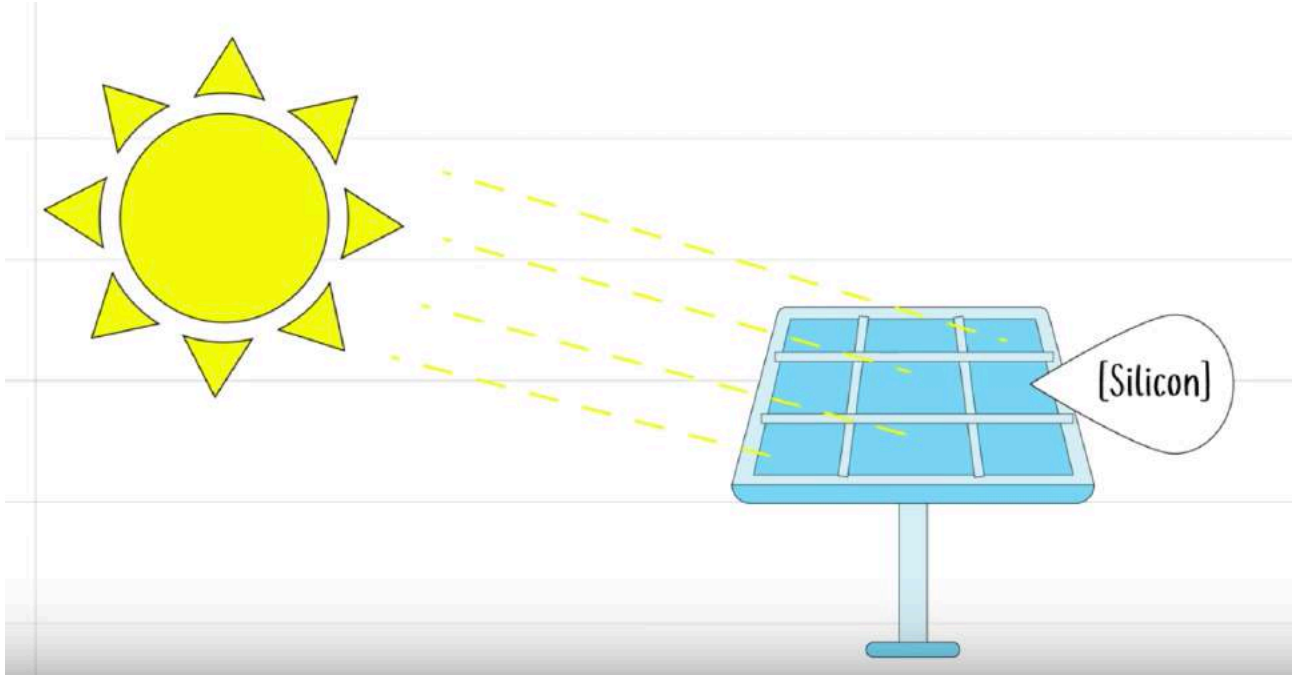


Video – Renewable Energy 101: How does wind energy work?

- Renewable Energy 101: How Does Wind Energy Work?
- Click here to watch the video

Video – Renewable Energy 101: How does solar energy work?

- Renewable Energy 101: How Does Solar Energy Work?
- Click here to watch the video

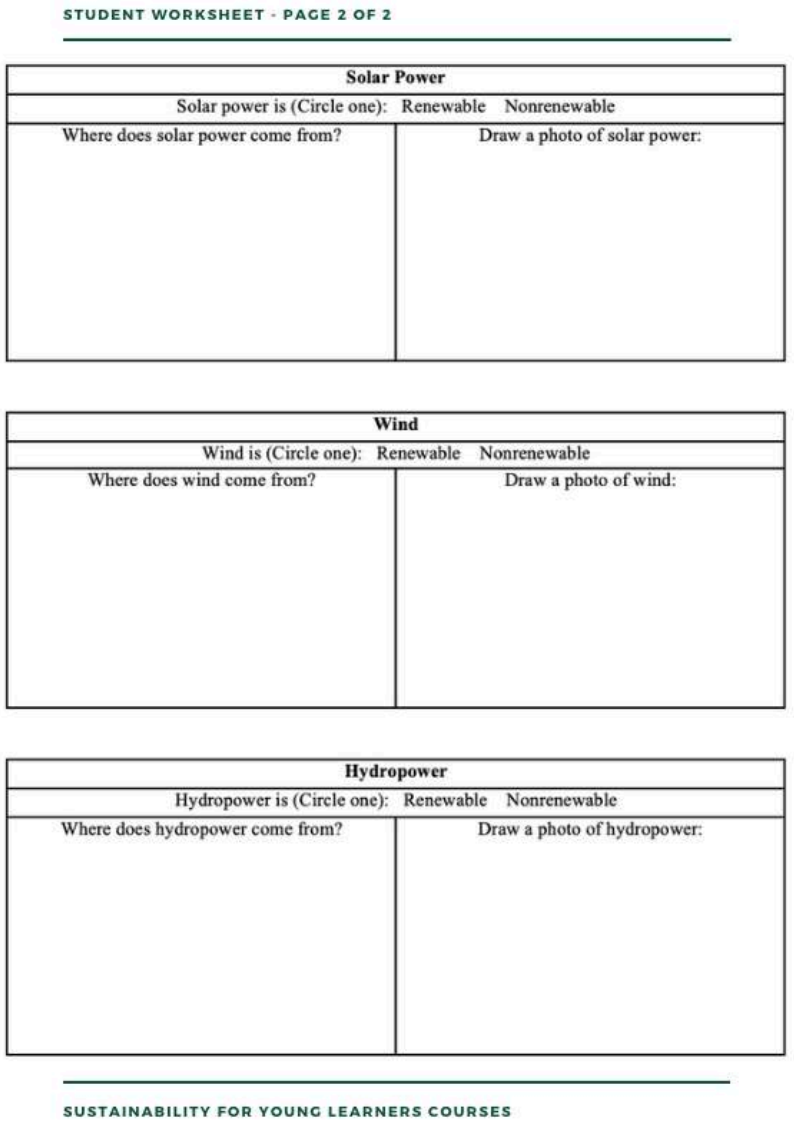


Renewable and nonrenewable energy source handout

Lesson #4, Activity #3

Video – Renewable Energy 101: How does solar energy work?

- Students will complete the following handout



STUDENT WORKSHEET - PAGE 2 OF 2

Solar Power	
Solar power is (Circle one): Renewable Nonrenewable	
Where does solar power come from?	Draw a photo of solar power:

Wind	
Wind is (Circle one): Renewable Nonrenewable	
Where does wind come from?	Draw a photo of wind:

Hydropower	
Hydropower is (Circle one): Renewable Nonrenewable	
Where does hydropower come from?	Draw a photo of hydropower:

SUSTAINABILITY FOR YOUNG LEARNERS COURSES

Reducing our use of nonrenewable resources

Lesson #5

Group Review and Brainstorm

Lesson #5, Activity #1

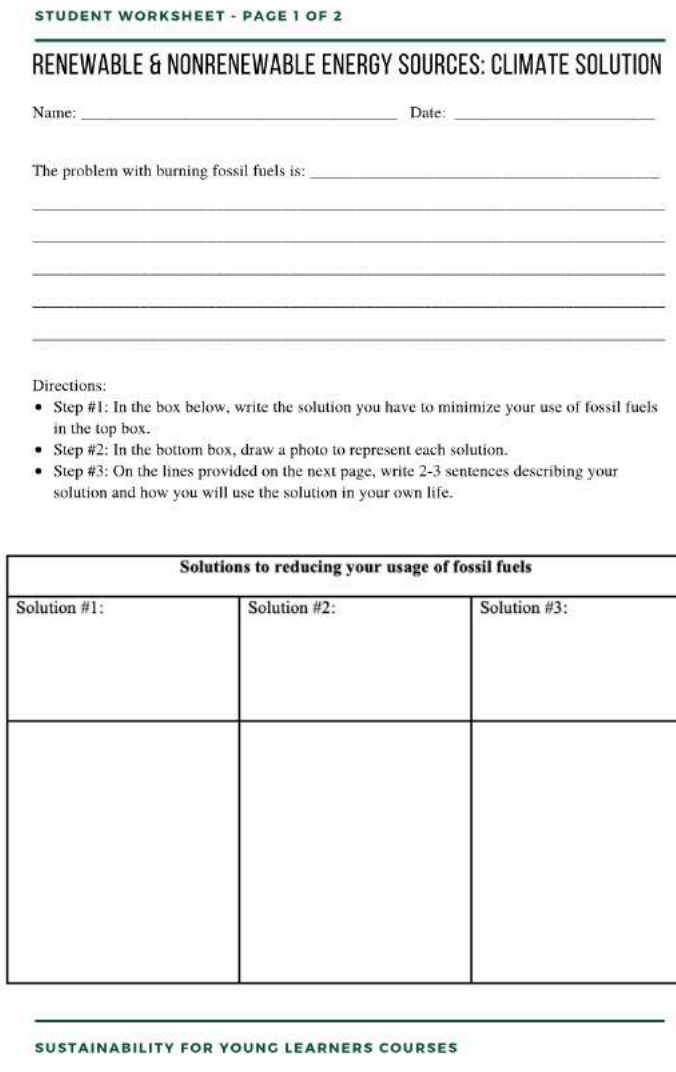
How can we conserve energy?

Worksheet and Sharing Solutions

Lesson #5, Activity #2

Worksheet - Renewable and Nonrenewable Energy Sources

- Students will complete the following two-sided worksheet.



STUDENT WORKSHEET - PAGE 1 OF 2

RENEWABLE & NONRENEWABLE ENERGY SOURCES: CLIMATE SOLUTION

Name: _____ Date: _____

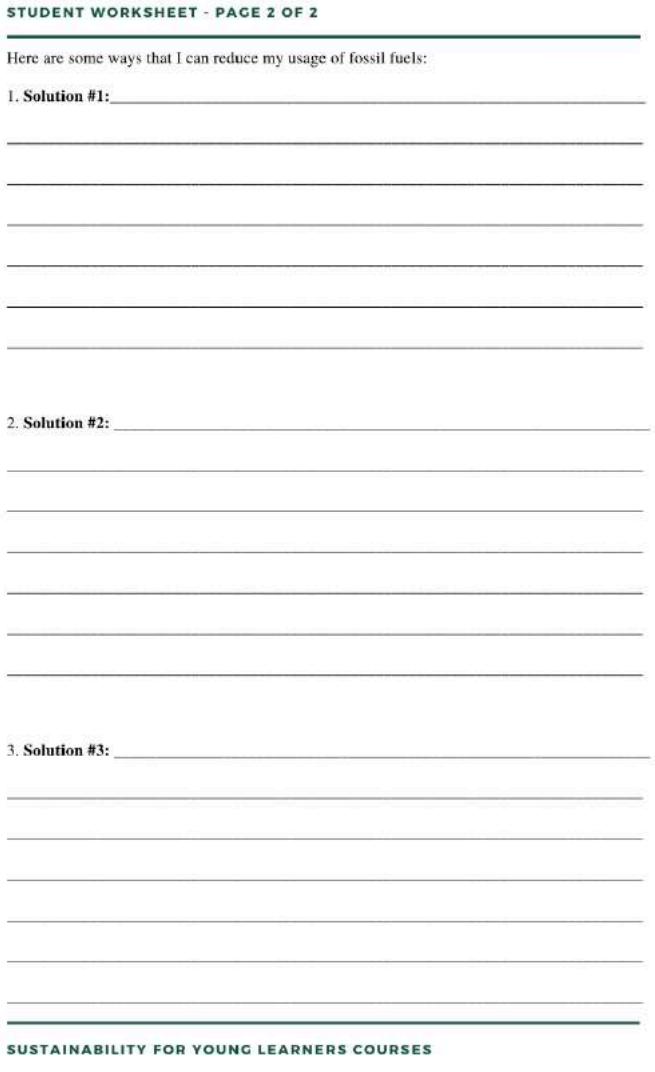
The problem with burning fossil fuels is: _____

Directions:

- Step #1: In the box below, write the solution you have to minimize your use of fossil fuels in the top box.
- Step #2: In the bottom box, draw a photo to represent each solution.
- Step #3: On the lines provided on the next page, write 2-3 sentences describing your solution and how you will use the solution in your own life.

Solutions to reducing your usage of fossil fuels		
Solution #1:	Solution #2:	Solution #3:

SUSTAINABILITY FOR YOUNG LEARNERS COURSES



STUDENT WORKSHEET - PAGE 2 OF 2

Here are some ways that I can reduce my usage of fossil fuels:

1. **Solution #1:** _____

2. **Solution #2:** _____

3. **Solution #3:** _____

SUSTAINABILITY FOR YOUNG LEARNERS COURSES

Sharing the Solutions in Groups

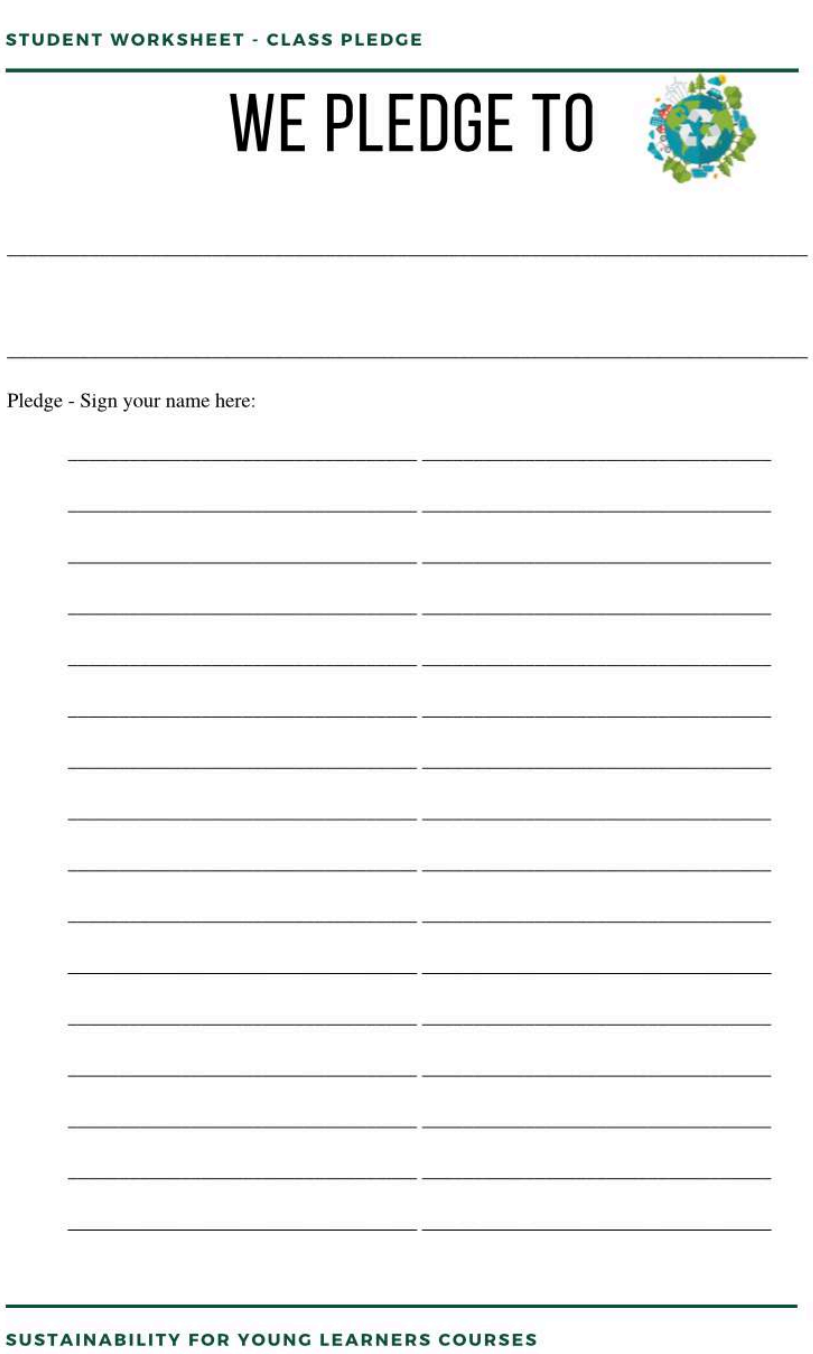
- Optional activity, if time permits.

Call to Action: Pledge

Lesson #5, Activity #3

Call to Action

- The class will create a pledge and every student will sign the pledge.



STUDENT WORKSHEET - CLASS PLEDGE

WE PLEDGE TO

Pledge - Sign your name here:

SUSTAINABILITY FOR YOUNG LEARNERS COURSES

Thank you for your time.

Content Creator:

Sydney Lund

Master of Sustainability Leadership

End of the Unit Presentation