Thinking Green: Environmental Issues and Solutions

In this module, we will be learning about global and local environmental issues and some solutions. But first, we want to know what you already know about this topic!

What I know:

What I want to learn:

One question I have about the environment:

Look at Pollution on a Global Scale

As we are learning CO2 and other types of pollution are quite harmful to our environment but also ourselves. Let's learn about how the United States' citizens or whatever your native country is compare to the citizens of other countries.

1. Let's go on an internet scavenger hunt! Using your device's internet search tool (Example: Google) search and determine what your country's pollution output is. Then determine how it compares to other countries. (Hint try searing for: countries ranked by pollution)

2. If you are from the US like we are you are probably quite concerned about what you found. Now let's do something about it. While the timer on in the video ticks down write down as many ways as you can that you can think of to decrease your pollution. (Some examples could include biking to school, carpooling or walking)
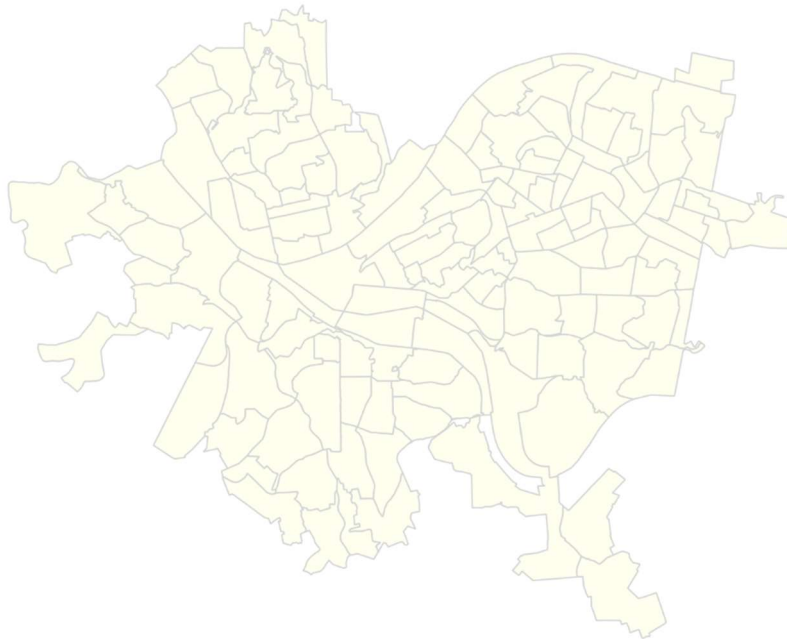
Pittsburgh Pollution

Now that we've looked at pollution on a global scale, let's look at some specific environmental issues in Pittsburgh, Pennsylvania!

1. Air quality (how healthy the air is to breathe) can change from day to day in Pittsburgh, but you can't always see it! However, since air pollution is caused by toxins being put in the air, we can *smell* the pollutants, especially on bad air quality days. Let's take a look at a tool made by our friends at Carnegie Mellon University that helps us map air pollution based on smell.

   Using your device, go to **smellpgh.org** and click on the **Visualization** tab. The triangles show smell ratings by citizens and circles show reports from air quality monitoring stations. Blue arrows next to the circles show the wind direction. You can also see the reports from days in the past.

   Explore the tool to see how air quality changes from day to day in Pittsburgh. Write down some of your observations. (Hint: Look for really bad days and really good days. What do you notice about the number of reports?)

2. Water pollution in the Pittsburgh rivers is mainly caused in two way: point source pollution and nonpoint source pollution. Complete the "Pollution Points in Pittsburgh" activity.

Pollution Points in Pittsburgh

Water pollution can occur in two main ways: point source and nonpoint source.

> **Point source pollution** - pollution from a single, identifiable source (ex: factory waste)
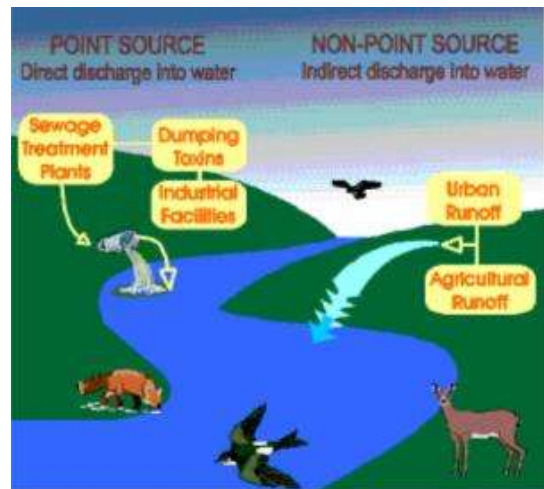> **Nonpoint source pollution** - toxic chemicals that enter a body of water from many sources such as rain runoff from many different streets

Materials:

- Two containers to hold water, preferably clear (ex: Tupperware)
- One container to simulate rain (ex: plastic water bottle with holes in the cap)
- Food coloring

Optional:
- Measuring cup
- Paper or tape

Objective:

This experiment will show how different types of pollution will impact bodies of water.

PREDICT! After reading the procedure, but before doing the experiment, predict which container will be more "polluted", if any.

Procedure:

1. If you do not have a spray bottle, have an adult poke holes in the cap of a plastic water bottle.
2. In each of the two containers add the same volume of water, leaving room for "rain" to be added. You can use a measuring cup when adding water to be precise. Mark one container as the point source (P) and the other as nonpoint source (NP). These are our bodies of water that will be polluted.
3. Mark the plastic bottle about halfway up with a marker or with tape. This will be the rain added to the bodies of water.
4. Fill to bottle with water to the line. Add three drops of food coloring. Swirl the bottle to mix, **don't shake** since there are holes in the cap! This our pollutants from the city streets.
5. Pour the entire pollutant mixture into the NP container with the cap on to simulate rain. Notice the change in color of the water in the container.
6. In the P container, add three drops of food coloring to one spot in the water. This is our point source pollution from somewhere like a factory.
7. Rinse the water bottle out and fill to the mark with water again. Pour over P container to simulate rain without pollutant runoff from the streets.
8. Make observations on the difference of the two containers. Wait 5 minutes and re-observe.

Prediction:

After reading the procedure, but before doing the experiment, predict which container will be more "polluted", if any.

Observations:

(Questions to think about: Did either body of water seem "more polluted" at first? What about after 5 minutes? How was the nonpoint source pollution different from the point source pollution?)
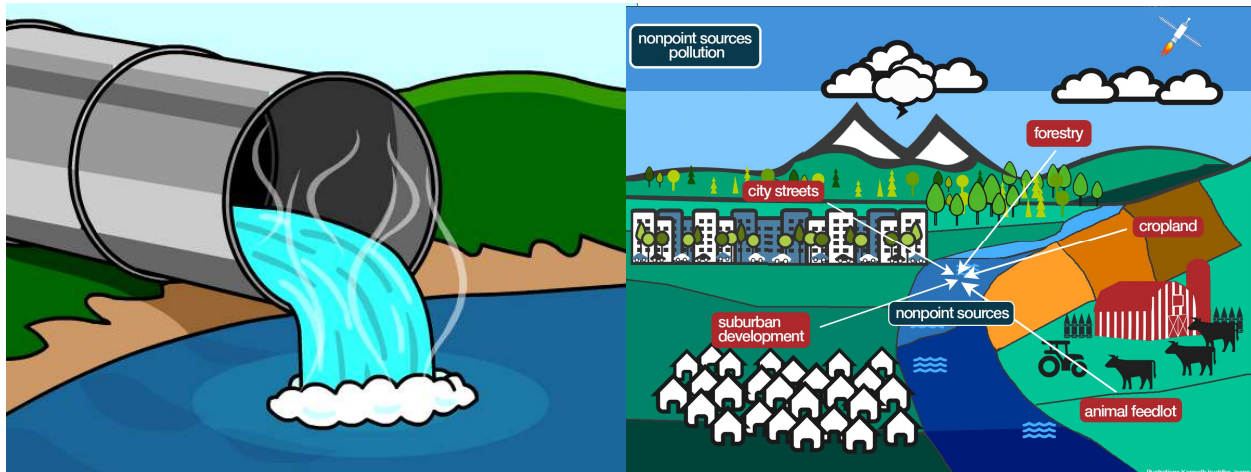
How Much Energy Do You Use?

1. In the blank space below write down as many different devices or activities that you use or do each day that use energy. Examples can include, watching tv, playing video games, using lights… etc.
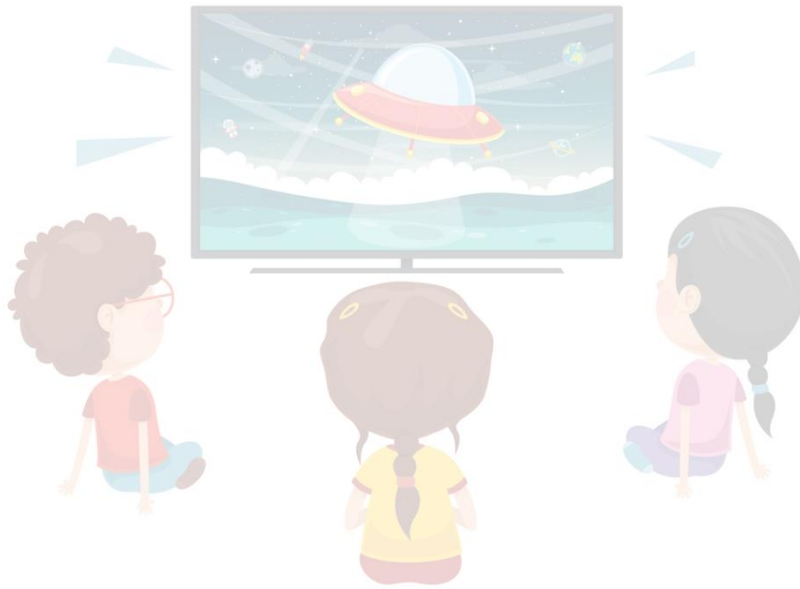
2. Now, looking at all the energy you use per day, guess how many sticks of dynamite the energy you use is equivalent to or how many burritos you could be created using that same amount of energy. You answer could be 10 sticks of dynamite or 100 or even 1000.

Now that you have completed answering these two questions return to the video to see the answer.

How Climate Change Affects Pittsburgh

One effect of climate change is that it changes our rainstorms. With climate change, we've seen more extreme rainstorms, where it rains faster and heavier, without necessarily increasing the volume of rain that falls. Let's see how that might impact our current combined sewer system.

Materials:

- 1 medium sized container that can have holes poked through it (ex: plastic cups, old plastic containers, cans with the top removed)
- 1 larger container that can be used to pour water (ex: pitcher, large measuring cup, reused milk jug)
- Tape or washable marker
- Scissors or other tool to poke holes (with the help of adults)

Objective:

In this small experiment, we'll see how storms of different intensities impact our stormwater management system. In Pittsburgh, the main system is a **combined sewer**, designed to collect rainwater, domestic sewage, and industrial wastewater in the same pipe. If it rains faster than the pipes can move the water, the combined sewer has the risk of overflowing into our streets, and eventually our rivers.

Procedure:

1. Have an adult poke two small holes in the medium sized container on the sides close to the bottom using scissors or another tool.
2. On the large container, use the tape or washable marker to mark near the top. This is to make sure we pour the same amount of water each time.
3. Place the container with holes **in a sink or bathtub**. This will act as our 'combined sewer' and by making holes on the side, instead of the bottom, the holes should still be able to drain water.
4. Fill the large container with water up to the mark.
5. Pour water into the 'combined sewer' cup **slowly**. This is our long, "normal" rainstorm.
6. Fill the large container with water up to the mark again.
7. Without knocking over the 'combined sewer' cup, pour the water as fast as you can (all at once). This is our fast, extreme rainstorm due to climate change.

<u>Observations:</u> Write down the difference you saw between the normal and extreme storms.

<u>Bonus:</u>

See how fast you can pour the water without the 'combined sewer' container overflowing. Try having an adult add more holes to container and see how that changes the experiment.

Combined Sewer Overflows
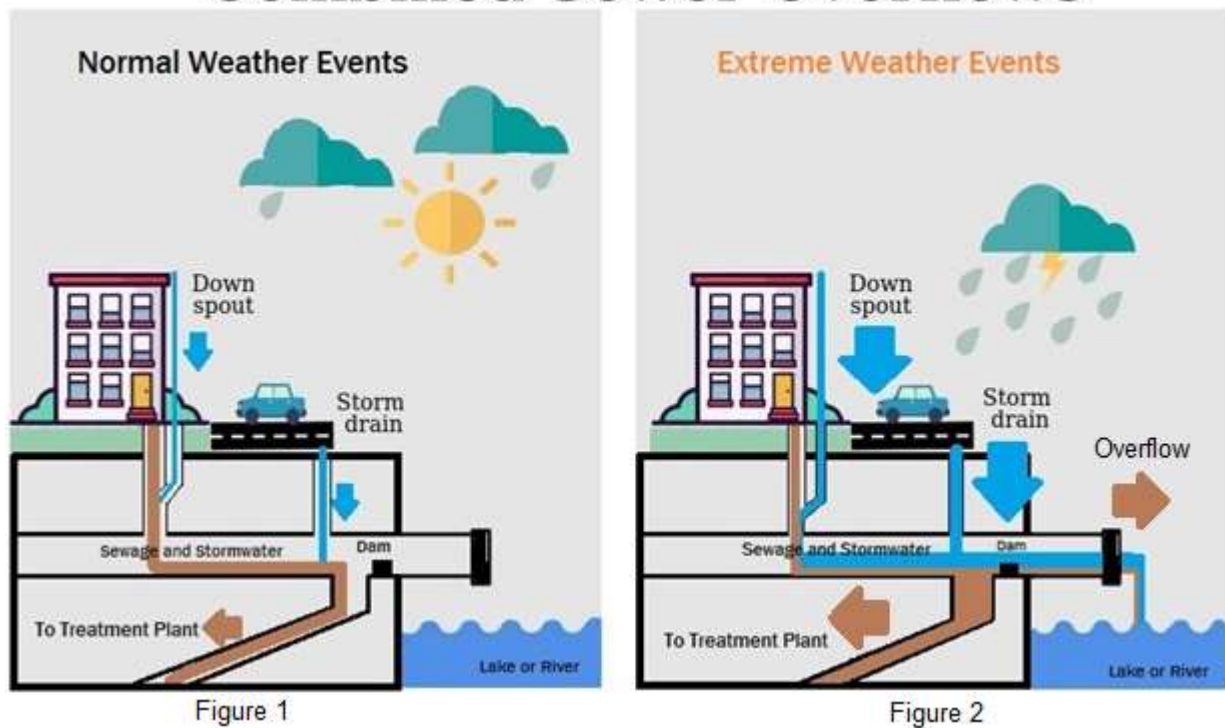
A graphic depicting a CSO event in extreme weather. Credit: Michael Mezzacapo

Greenspaces Near Me

1. We've talked a little about different ways we can try to reduce the risk of flooding due to extreme rainstorms. Can you think about what we've talked about? Can you come up with a few new ideas on how we can reduce the this risk? (Hint: Think of ways we can slow or reduce the volume of water entering the sewer systems during rainstorms)

2. Greenspaces and other stormwater management systems are all around us! Have an adult print out a map of around your house using Google maps (in Map view) or draw your own. Looking at Google maps in "Satellite" view, color in the greenspaces near you, like lawns, parks, gardens. Next time you go on a walk, look to look for storm drains and add them to your map! Using your imagination, add some other stormwater management designs to your map where you think they'd fit in.