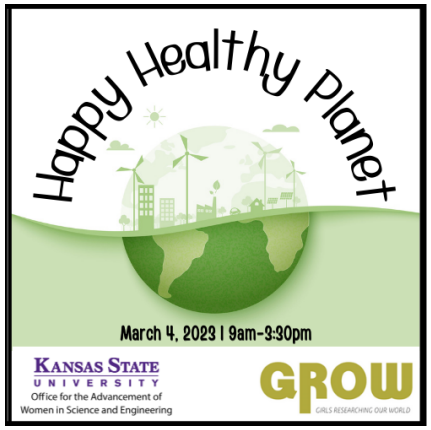


Earth's thermostat

Dr. Karin Goldberg (Geology)

Dr. Cristiane Brazil (Engineering)

Kansas State University

What are we doing here?

- We will learn…

…the effect of CO_2 on temperature

…how scientists find out what the temperature and CO_2 concentration were, a long time ago!


ATMOSPHERE
(industrial machinery chugging frantically)

The Greenhouse Effect Experiment

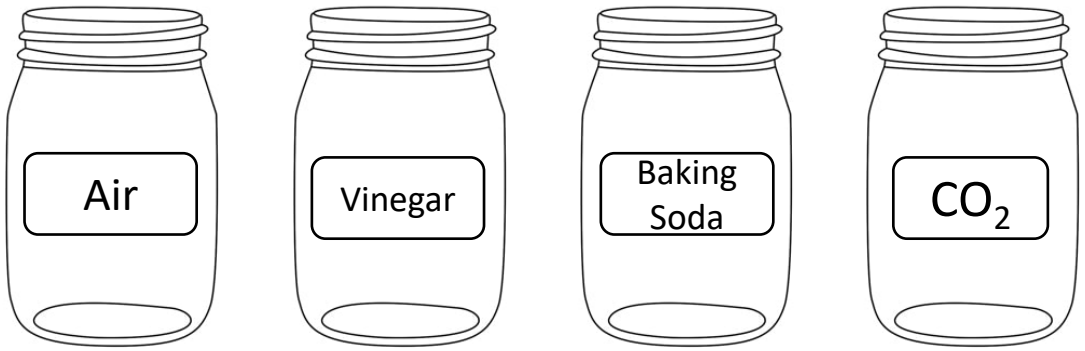
- Get together in groups of 2 or 3
- Each group will have:
  - 4 Jars
  - Mailing labels
  - A sharpie
  - A set of measuring cups and spoons
  - Vinegar
  - Baking soda
  - Elastic bands
  - A thermometer
  - Plastic wrap

The Greenhouse Effect Experiment

1. Label the jars:
   - Air (control)
   - Vinegar (control)
   - Baking soda (control)
   - CO_2

What are controls?
Controls are conditions that are known and kept constant during an experiment

They will be an important point of reference when collecting and comparing our data!



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The Greenhouse Effect Experiment

2. Cut 4 pieces of plastic wrap (big enough to cover the mouth of the jar with a bit of extra down the sides)
3. Place plastic wrap on the air jar and secure it with an elastic band
4. Add 1/4 cup of vinegar to the vinegar jar, then cover with plastic wrap and secure with an elastic
5. Add 1 tablespoon of baking soda to the baking soda jar, cover with plastic wrap and secure with elastic

The Greenhouse Effect Experiment

6. For the CO_2, one person gets ready with the plastic wrap and elastic;

   Another other person will add 1 tablespoon of baking soda to the jar, then add 1/4 cup of vinegar → the reaction will form CO_2!

   VERY QUICKLY place the plastic wrap over the mouth of the jar and secure it with an elastic band

The Greenhouse Effect Experiment

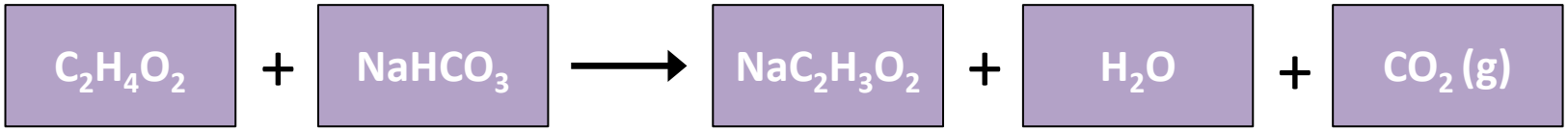
7. Place the jars in front of the heaters
8. Allow the jars to heat for 5-10 minutes

Meanwhile…

The Greenhouse Effect Experiment

- What happens when we mix vinegar and baking soda?

- Chemical reaction!



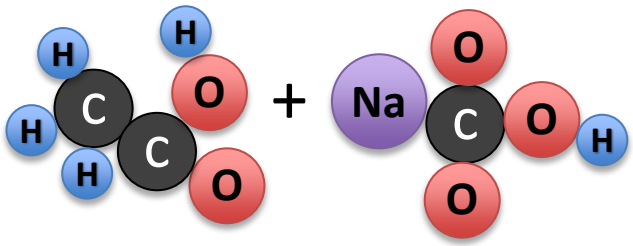
Vinegar

Baking soda
Sodium bicarbonate

Sodium acetate

Water

Carbon dioxide (gas)



Vinegar

Baking soda
Sodium

Carbonic Acid

\+

\+

Sodium acetate

Water

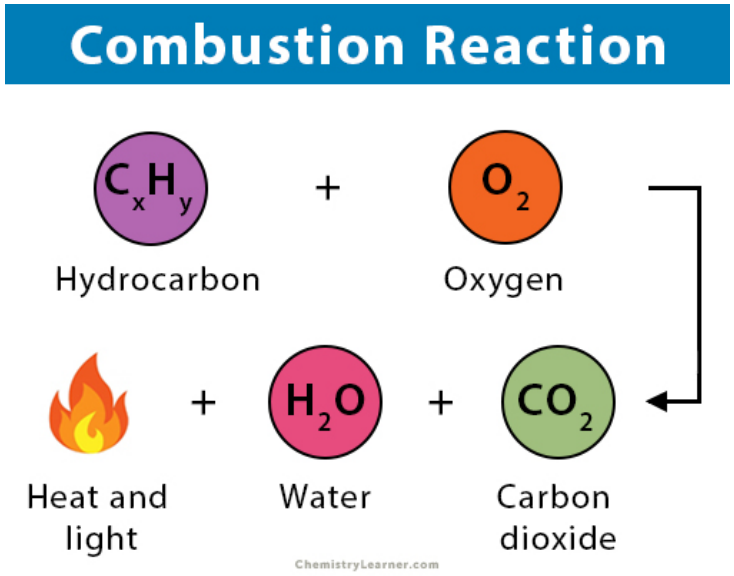
Carbon dioxide (gas)

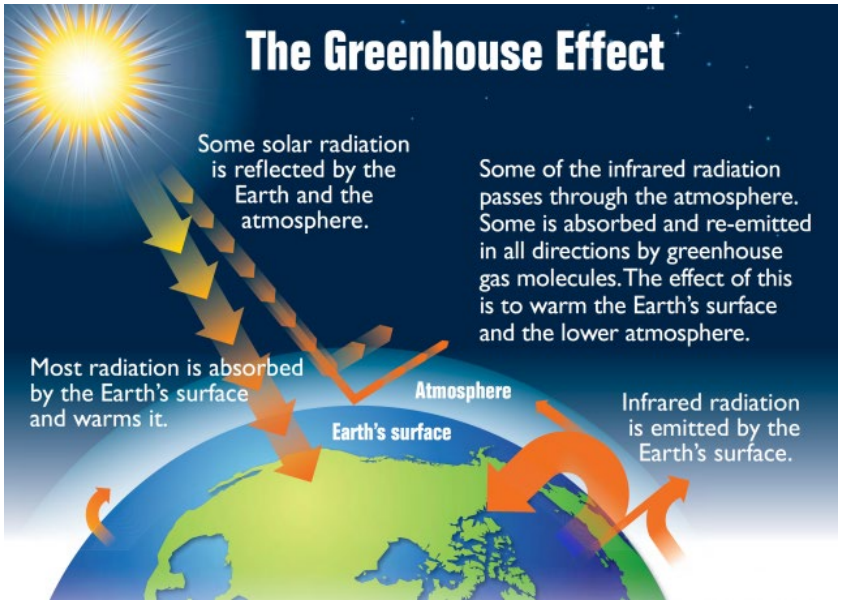
The Greenhouse Effect Experiment

9. Use the thermometer to measure the temperature from each jar (aim it straight down)
10. Record your results
11. What do you notice about the temperature readings?

How do fossil fuels relate to CO_2?

- Burning (combustion) produces CO_2
- CO_2 traps heat → greenhouse effect

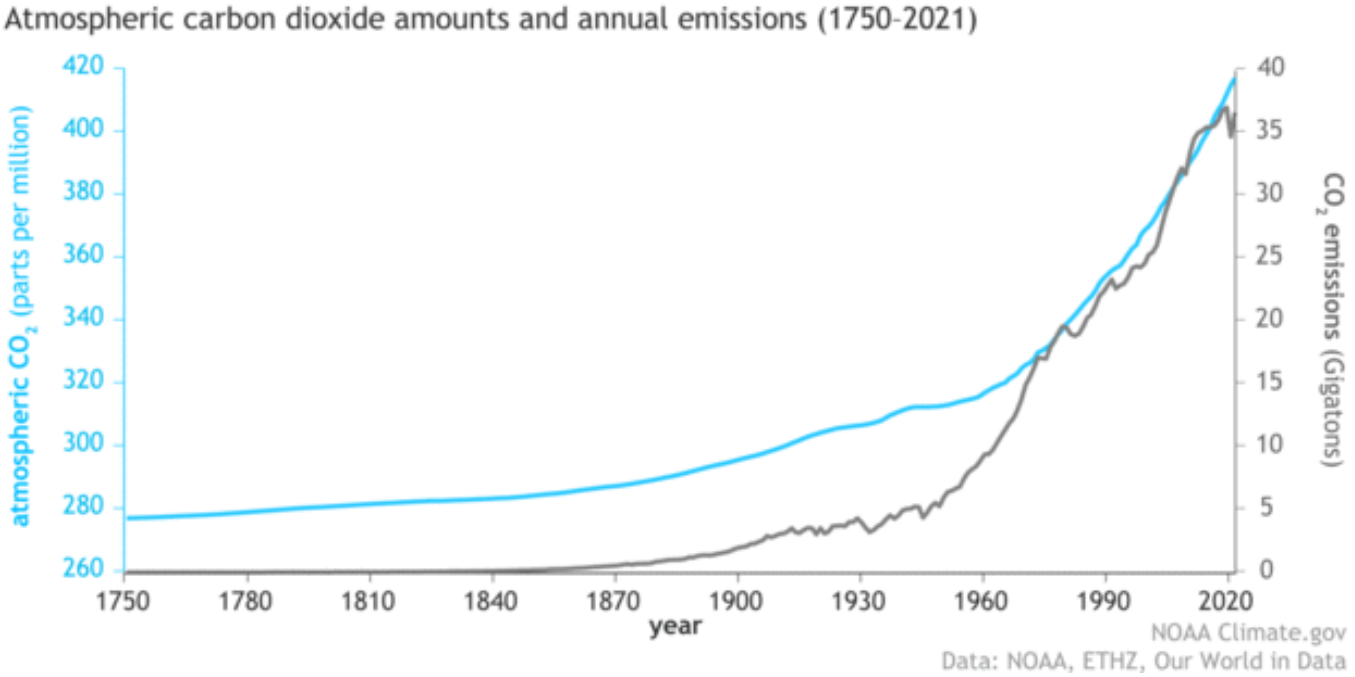




https://www.epa.gov/climatechange-science/basics-climate-change

How do fossil fuels relate to CO_2?

- The more we burn, the more CO_2 we generate!



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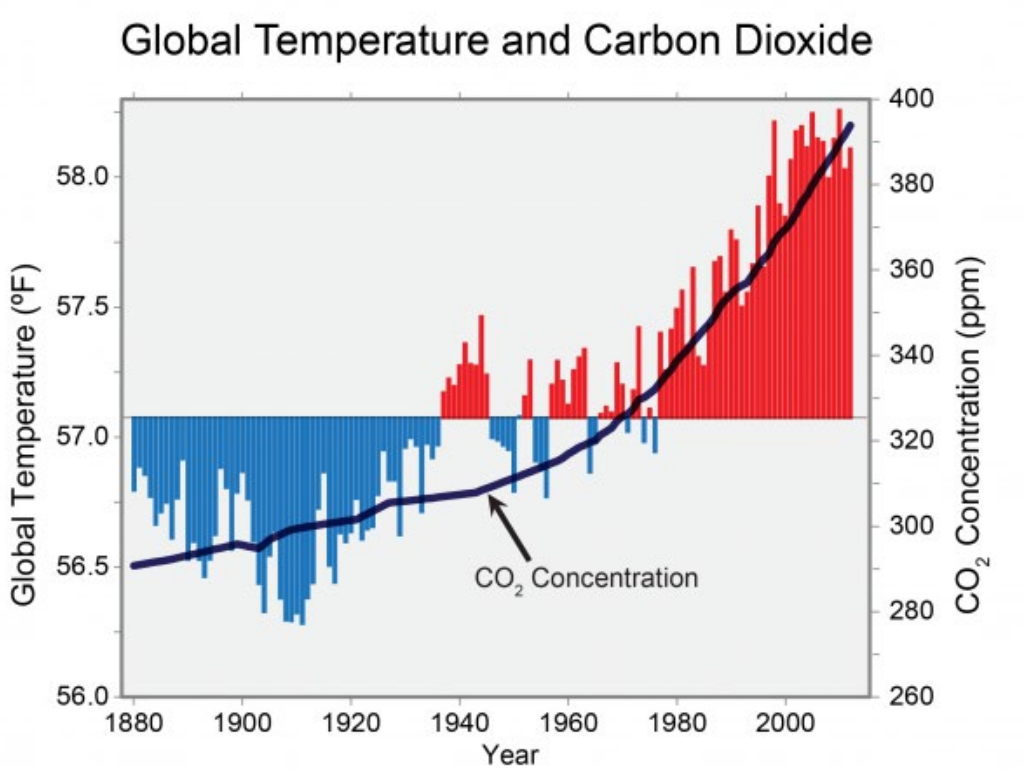
How does CO_2 in the atmosphere impact global temperature?

- The more CO_2, the more heat is trapped, the hotter our Earth gets!



www.globalchange.gov

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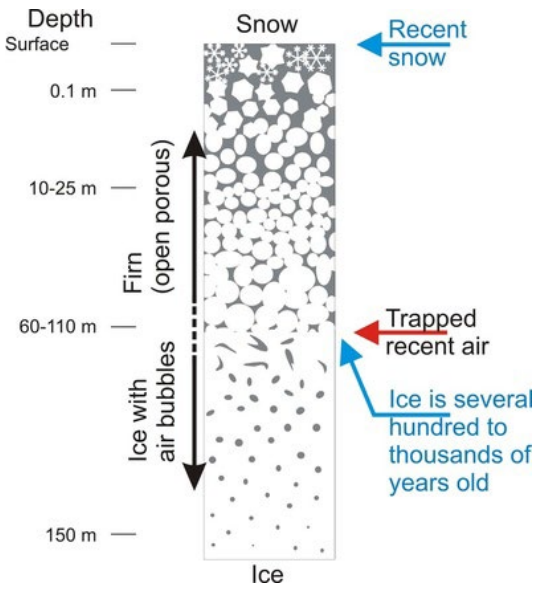
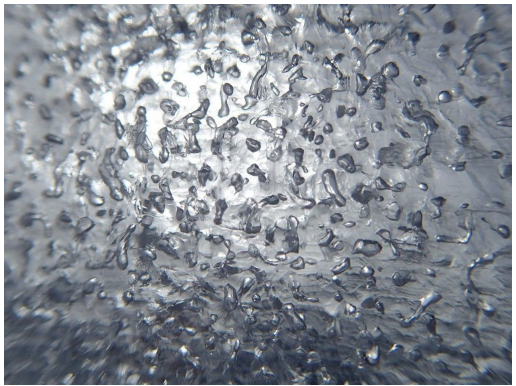
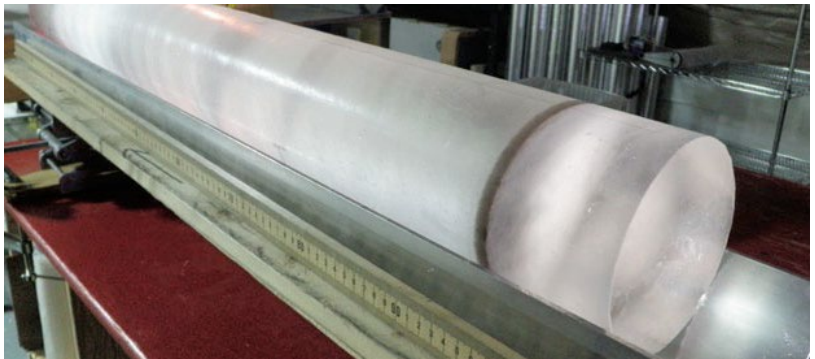
How do we know CO_2 levels long, long time ago?

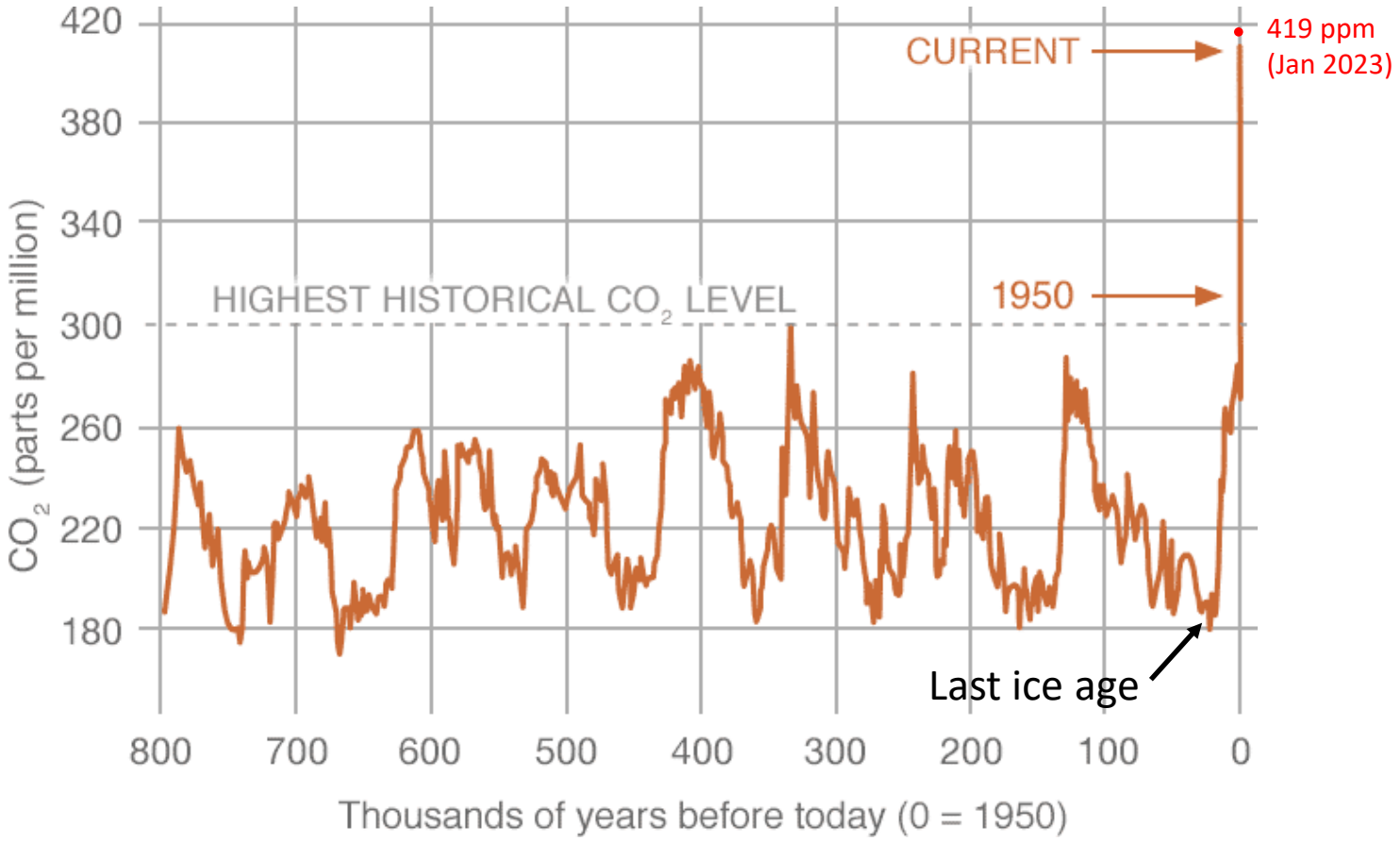
- Gas bubbles in ice cores (wait… what?!?)







How do we know CO_2 levels long, long time ago?



NOAA Climate.gov

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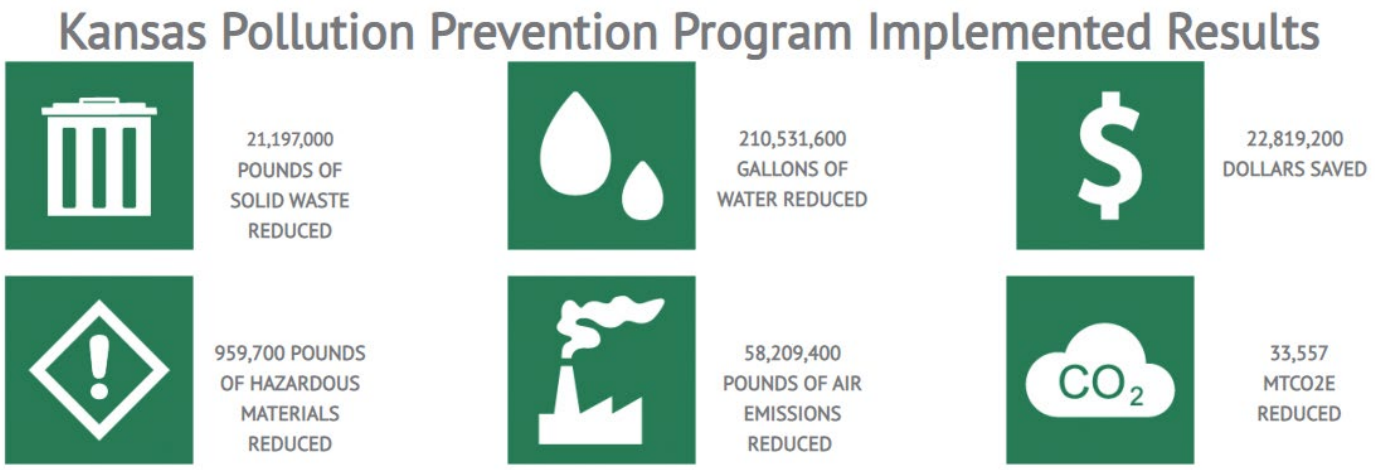
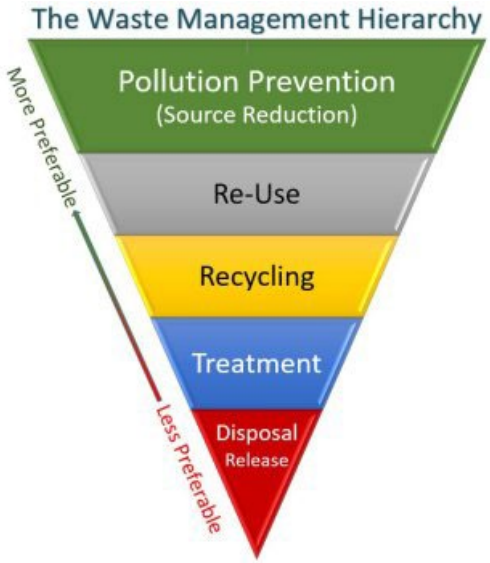
Reducing greenhouse gas emissions





Pollution Prevention Institute

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We can all do our part to our planet happy and healthy!

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