Objective:

Do Now:

Coal and Natural Gas Guided Notes

**Natural gas:**

* Produced in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ states.
* Scientists estimate we have enough natural gas to last us about

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Natural Gas Use:

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: Industrial manufacturing burns natural gas for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.**

Impact on the Environment:

* Pros: Natural gas is the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_burning fossil fuel.
  + Releases less \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than coal and oil.
* Cons: Methane can be emitted into the air from \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Coal:**

Mine Reclamation:

Top Coal Users:

1)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

3)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of coal consumed in the U.S. goes to producing \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Coal is plentiful but dirty

* Environmental costs of burning coal:
  + Sulfur released as SO2
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + CO2
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Coal Advantages:

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* High net energy yield
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Disadvantages of Coal:

* Land disturbance and water pollution
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Emits large amounts of CO2

Case Study: The Problem of Coal Ash

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + Arsenic, cadmium, chromium, lead, mercury
* Most is buried or put in ponds
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Should be classified as hazardous waste

The Hazards of Coal Ash

By The Sierra Club

Living near a wet coal ash storage pond [is significantly more dangerous than smoking a pack of cigarettes a day, according to a risk assessment done by the EPA.](http://earthjustice.org/sites/default/files/library/reports/epa-coal-combustion-waste-risk-assessment.pdf" \t "_blank) The toxins found in coal ash have been linked to organ disease, cancer, respiratory illness, neurological damage, and developmental problems. [People living within 1 mile of unlined coal ash ponds can have a 1 in 50 risk of cancer](http://earthjustice.org/sites/default/files/library/reports/epa-coal-combustion-waste-risk-assessment.pdf" \t "_blank)—more than 2,000 times higher than what the EPA considers acceptable.

Coal ash contains arsenic, lead, mercury, and selenium, as well as aluminum, barium, boron, and chlorine. All can be toxic. Particularly where there is prolonged exposure, these toxins can cause cancer, heart damage, lung disease, respiratory distress, kidney disease, reproductive problems, gastrointestinal illness, birth defects, impaired bone growth in children, and behavioral problems. In short, coal ash toxics have the potential to injure all of the major organ systems in adults (including pregnant women) and children alike.

Exposure to toxic coal ash can lower birth rates, cause tissue disease, slow development and even kill plants and animals, leading to changes in wildlife concentrations and disruptions in entire ecosystems. The toxic pollution from coal ash builds up in exposed animals and plants, causing the pollution to make its way up the food chain when they are eaten. Children are more susceptible to the health impacts of coal ash—and according to the EPA, [1.54 million children live near coal ash storage sites. Not only is coal ash toxic, it is likely to grow increasingly dangerous.](http://www.epa.gov/osw/nonhaz/industrial/special/fossil/ccr-rule/transcripts/transcript-knoxville-tn.pdf" \t "_blank)

1. What are some of the negative effects of coal ash?

Coal ash is not subject to federal protections, and state laws governing coal combustion waste disposal are usually weak or non-existent. The result: millions of tons of coal ash are being stored in ponds, landfills, and abandoned mines. Many of these sites lack adequate safeguards, leaving nearby communities at risk from potential large scale disasters like the December 22, 2008, TVA disaster in Tennessee in which a dike holding back decades’ worth of coal ash failed at the Kingston Fossil Plant, flooding the surrounding residential area with more than one billion gallons of toxic coal ash—enough to flood more than 3,000 acres one foot deep.

1. Why is so much coal ash being stored in ponds landfills and abandoned mines?

3) Do you think the coal industry wanted coal ash classified as a hazardous waste? Why or why not?

**Homework:** Explain the following coal mining techniques. List at least 2 advantages and disadvantages for each

**Strip Mining:**

Advantages:

Disadvantages:

**Underground Mining:**

Advantages:

Disadvantages:

**Mountaintop removal:**

Advantages:

Disadvantages: