

CRITICAL THINKING ACTIVITY: RESEARCHING ATMOSPHERIC TRACE GASES

OBJECTIVE: Students will:

- Create a data table of information on the atmospheric trace gases play a significant role in global change;
- Analyze information on specific trace gases and evaluate how it contributes to their role in global change;
- Present their conclusions to the class as a group.

MATERIALS: Notes/Research materials on atmospheric gases, copy of **Student Sheets** including blank data table, calculator, paper and pencil;

PROCEDURE:

1. Read through and discuss the information provided in the reading selection *Atmospheric Trace Gases and Climate Change*.
2. Either present information on atmospheric trace gases in a lecture/note-taking format OR make research materials available for students to work on their own.
3. Assign students into 4 groups (one for each gas being studied).
4. Hand out copies of the blank data table below.

	CARBON DIOXIDE	METHANE	NITROUS OXIDE	CFCs
Greenhouse Role				
Human Sources				
Natural Sources				
Atmospheric Lifetime				
Present Concentration				
Pre-industrial Concentration				
% of Change				
Global Warming Potential				

Teacher Sheet 2

5. Go over each of the column headings and explain.
 - Discuss the math process involved in calculating the amount/percentage of change for each of the gases.

Step #1:

Present Concentration - Pre-Industrial Concentration = Amt. of change

Step #2:

Amt. of change ÷ Pre-industrial concentration = Percent of change

6. Instruct students to work on their own in groups and fill in the appropriate information on the data table for each gas.
7. When students have completed the data table, they should answer the questions in **ANALYSIS AND COMPREHENSION**.
8. Group members should come together and prepare a simple report, poster, pamphlet, etc. on their gas, how they predict it will impact the climate in years to come and steps to eliminate its influences on climate and present it to the class.

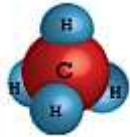
ATMOSPHERIC TRACE GASES INVOLVED IN GLOBAL CHANGE

CARBON DIOXIDE



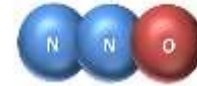
- Dominant gas in atmospheric heating;
- Principal human sources are fossil fuel burning and deforestation;
- Balanced in nature: sources equal sinks;
- Exists in the atmosphere for 50-200 yrs.
- Present atmospheric concentration about 395.3 ppm;
- Pre-Industrial Revolution concentrations about 280 ppm;
- **Global Warming Potential: 1**

METHANE (CH₄)



- Second strongest gas involved in atmospheric heating;
- Principal manmade sources: agriculture (ruminants, rice), fossil fuel extraction and use, and biomass burning;
- Principal natural sources: wetlands, oceans, termites, and geological sources ;
- Exists for about 9.1 years in the atmosphere;
- Present atmospheric concentration about 1865 ppb
- Pre-Industrial Revolution concentration estimated at .720 ppb;
- **Global Warming Potential: 28**

NITROUS OXIDE (N₂O)



- Third strongest gas involved in atmospheric heating;
- Main human sources: fertilizers/land use changes;
- Natural sources are soils and tropical forests;
- Estimated lifetime in the atmosphere of 150 years;
- Present atmospheric concentration about 325.9 ppb;
- Pre-Industrial Revolution concentration was about 288 ppm;
- **Global Warming Potential: 265**

CHLOROFLUOROCARBONS (CFCs)



- Fourth strongest gas involved in atmospheric heating;
- Main human sources are refrigerants, aerosol sprays, and industrial foam processes;
- No natural sources;
- Estimated lifetime in the atmosphere is 45-100 years;
- Present amounts estimated at: CFC11- 23450 ppt and CFC12-5218 p;
- Introduced in the in 1970's;completely man-made;
- **Global Warming Potential :**
CFC-11- 10,220; CFC-12-4660

