

Global Warming Summary Sheet

Facts

1. There is a natural atmospheric greenhouse effect on Earth which keeps the average surface temperature about 59° F warmer than if there were no atmosphere.
2. The atmospheric concentrations of several greenhouse gases are increasing due to human activities. Alarmingly, the rate of increase (i.e., how fast the greenhouse gases are accumulating in the atmosphere) is increasing.
3. There has been a measurable increase in global average surface temperature of about 0.8°C (1.4°F) since 1860. **This is NOT proof that the warming has been caused by human emissions of greenhouse gases.**
4. The climate of Earth has changed all through its history irregardless of human activity. This shows as both global and regional scale changes.

Solid Inferences

1. We expect that adding greenhouse gases to the atmosphere will result in warming the global average temperature by enhancing the natural atmospheric greenhouse effect. **However, the details of how much warming and the pattern of related climate changes are uncertain.**
2. Current levels of CO₂ in the atmosphere are higher now than at any time over the several hundred thousand years. **Again this is NOT proof that the recent warming has been caused by human emissions of greenhouse gases.**
3. There is evidence in the climate record showing that rather large climate shifts have occurred over relatively short periods of time (within decades).

Questions / Uncertainties (Partial List)

1. Complete knowledge of the chemical cycles of greenhouse gases (sources/sinks) is lacking. This makes it difficult to predict current and future atmospheric concentrations of these gases. An example is the missing CO₂ problem.
2. Models used to predict possible anthropogenic global warming are uncertain
 - ☞ Some feedbacks within the climate system are not well understood or properly taken into account within the models
 - ☞ Models are unable to reproduce the known regional scale variability in climate zones, which limits confidence in their ability to changes in the global average temperature.

3. Impact Studies

- ☞ The magnitude of regional climate change and the rate at which it occurs must be compared with the sensitivity and adaptability of human populations and ecosystems. Sensitivity and adaptability are uncertain even if regional climate changes were known.

4. Implication of recent warming of global average temperature

- ☞ Has there already been some global warming due to increased greenhouse gases or is the recent warming part of a natural cycle of climate? We may not be able to definitively answer this question for some time.

5. Surprises (Many more could be listed here)

- ☞ Humans are artificially perturbing climate by adding greenhouse gases. This can be considered a grand experiment since we are not able to accurately predict the response of the climate system.
- ☞ So far changes (if they are caused by greenhouse gas increases) have been small. Is there a danger that the relatively stable climate we now enjoy can shift unpredictably to another state if we somehow push the climate system too far from its pre-industrial state? Will it then be too late to go back? Assuming that we are measuring anthropogenic global warming already, will temperatures continue to rise slowly or will temperatures start to increase more rapidly at some point?
- ☞ Perhaps we will find that increased greenhouse gas concentrations has little effect on the natural progression of Earth's climates.