What is the greenhouse effect?

The "greenhouse effect" is a natural occurrence. Energy from the sun passes through the atmosphere and is absorbed by the Earth's surface - some of that energy is then emitted back to the atmosphere as heat. A portion of the heat is absorbed by heat-trapping gases in the atmosphere (among them carbon dioxide (CO2) and methane (CH4)), which creates an insulating layer around the Earth. The trapped heat, which would otherwise be released into space, raises the temperature of the atmosphere and, subsequently, the Earth's surface. Human activities that produce additional greenhouse gases increase the amount of heat trapped in the atmosphere, thus causing global warming and climate change.

What is Global Warming?

"Global warming" refers to the rise in the Earth's temperature resulting from an increase in heat-trapping gases in the atmosphere.

What are the primary greenhouse gases (GHG) and their sources?

Carbon dioxide (CO_2) - Carbon dioxide cycles naturally between the atmosphere and living organisms. Plants and algae remove CO_2 from the atmosphere via photosynthesis, while all living things release CO_2 via respiration (i.e., breathing). Carbon dioxide also cycles back and forth between water on the Earth's surface (freshwater and the oceans) and the atmosphere. In addition to these natural processes, humans release large quantities of CO_2 into the atmosphere by burning fossil fuels, deforestation, and other industrial processes.

Methane (CH_4) - Methane is a natural byproduct of decomposition, but significant quantities are also produced via agriculture and animal husbandry as well as by fossil fuel production.

Nitrous oxide (N_2O) - Nitrous oxide is released naturally from soil and the oceans, but substantial quantities also are generated from the use of nitrogen fertilizers in agriculture and through some industrial processes.

Water vapor - Water vapor also contributes to the greenhouse effect and occurs in the atmosphere as a result of the natural cycle of water

Other gases - A number of other natural and man-made gases also contribute to the greenhouse effect, including ozone near the Earth's surface, some industrial gases and aerosols (airborne particles) that result from burning fossil fuels.

What are some of the effects of global warming that have been observed globally?

- Increase in global average surface temperature of about 1°F in the 20th century
- Decrease in the Earth's snow cover and sea ice and the retreat of mountain glaciers in the latter half of the 20th century
- Rise in global average sea level and the increase in ocean water temperatures
- Likely increase in average precipitation over the middle and high latitudes of the Northern Hemisphere, and over tropical land areas
- Increase in the frequency of hurricanes and tornados in some regions of the world

Examples of observed physical and ecological changes

- Thawing of permafrost
- Lengthening of the growing season in middle and high latitudes
- A shift in the range of of plant and animal habitats toward the polar regions.
- Decline of some plant and animal species
- Earlier flowering of trees
- Earlier emergence of insects
- Earlier egg-laying in birds

What are the projected impacts of climate change?

- Species in natural ecosystems will attempt to migrate with the changing climate, but will differ in their degree of success. Some ecosystems will either flourish or decline in health, at least over the short-term.

- Increases in temperature and changes in precipitation will have significant impacts on water resources, either reducing or increasing water availability along with increasing the risk of floods or droughts.

- Coastal developments will experience additional sea-level rise that will interact with coastal storms to erode beaches, inundate land, and damage structures.

- U.S. agriculture and forestry will likely experience mixed results with moderate warming, with increases in productivity likely in northern states and possible declines in southern states. However, at higher magnitudes of warming, the risk of more uniform adverse effects across the nation increases.

- Human health may be affected by climate change through a number of mechanisms including extreme temperatures (i.e., heat waves), increased air pollution (i.e. leading to rises in asthma incidences) and an increase in disease-bearing vectors (e.g. mosquitos).

Does human activity contribute to global warming?

Human activities are contributing to global warming by adding large amounts of heat-trapping gases to the atmosphere. Fossil fuel use is the main source of these gases. Driving a car, using electricity from coal-fired power plants, and heating homes with oil or natural gas releases carbon dioxide and other heat-trapping gases into the air. Other sources include methane from agriculture, livestock, and landfills; nitrous oxide from agriculture and industry; deforestation; and the use of refrigerants.

Some statistics:

- 2003 was the 2nd hottest year ever recorded;
- 2005 was the hottest year ever recorded;
- The 1990's were the warmest decade in at least 1,000 years; and
- Every year since 1992 is in the current list of the 20 warmest years on record.

Is global warming and the hole in the ozone layer related?

Global warming and ozone depletion are two separate but related threats. Global warming and the greenhouse effect refer to the warming of the lower part of the atmosphere (also known as the troposphere) due to increasing concentrations of heat-trapping gases. By contrast, the ozone hole refers to the loss of ozone in the upper part

of the atmosphere, called the stratosphere. Ozone depletion in the upper atmosphere is believed to have a slight cooling effect on the global climate. This is of serious concern because stratospheric ozone blocks incoming ultraviolet radiation from the sun, some of which is harmful to plants, animals, and humans.

Reducing ozone-depleting gases is crucial to preventing further destruction of the ozone layer and to slowing the global warming problem. On the other hand, efforts to reduce all types of emissions to limit global warming will also be good for the recovery of the ozone layer.

What is COG's Climate Change program?

The COG Climate Change Program is one of the nation's first initiatives to address local greenhouse gas emissions on a regional level. While a growing number of individual cities and counties are moving forward to address climate change, this is one of the first programs to involve localities over a metropolitan area. The elected officials of the National Capital Region view this approach as one that will provide a catalyst for improving the environment.

The COG Board of Directors established the "Climate Change Steering Committee" (CCSC) to take the lead on the development of this new regional strategy. The CCSC will reflect input from an interdisciplinary body of existing policy and committees, including the COG Board of Directors, the Metropolitan Washington Air Quality Committee (MWAQC), the Transportation Planning Board (TPB), the Chief Administrative Officers Committee (CAO), the Chesapeake Bay and Water Resources Policy Committee, the Human Services Policy Committee, the Public Safety Policy Committee, the CAO Energy Advisory Committee, and the Intergovernmental Green Building Group. The CCSC reports to the COG Board of Directors, and provides bi-monthly briefings to the Board.

What will the COG Climate Change Program do for the region?

The heart of the new program is the Steering Committee. During its one-year tenure, the CCSC will consider a wide range of actions designed to reduce greenhouse gas emissions. The committee is charged with pinpointing the local impacts of the emissions, and helping local governments decide how best to address the problem. Because members were appointed to represent a broad range of jurisdictions and agencies, the committee will combine the efforts of all of the region's key stakeholders.

Where can you go for more information?

http://www.pewclimate.org/global-warming-basics/
http://www.ucsusa.org/global_warming/
http://unfccc.int/kyoto_protocol/items/2830.php
http://www.eia.doe.gov/oiaf/1605/ggccebro/chapter1.html
http://www.iclei.org/
http://www.epa.gov/climatechange/
http://www.climate.org/climate_main.shtml
http://www.ipcc.ch/

For more information on the COG Climate Change Initiative, please contact:
Stuart Freudberg, Director, Department of Environmental Programs
or
George Nichols, Principal Environmental Planner
at (202) 962-3200

CLIMATE CHANGE:

Frequently Asked Questions

METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS