Greenhouse Gases

• Naturally occurring gases (known as direct greenhouse gases) (water vapor, carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), and ozone (O3))

• Halogenated substances that contain fluorine [hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulfur hexafluoride (SF6)), chlorine (chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs)), or bromine (bromofluorocarbons (i.e., halons)).

Source: Environmental Protection Agency
"According to a new U.N. report, the global warming outlook is much worse than originally predicted. Which is pretty bad when they originally predicted it would destroy the planet." –Jay Leno
Fall Canceled After 3 Billion Seasons

“...the classic period of the year, which once occupied a coveted slot between summer and winter, will be replaced by new, stifling humidity levels, near-constant sunshine, and almost no precipitation for months.”
Regulated Greenhouse Gases and their ECC Source

Table 3: Regulated Greenhouse Gases

<table>
<thead>
<tr>
<th>GAS</th>
<th>EXAMPLE SOURCE FROM ECC OPERATIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide (CO2)</td>
<td>• Natural gas boilers</td>
</tr>
<tr>
<td></td>
<td>• electricity consumption</td>
</tr>
<tr>
<td></td>
<td>• oil consumption</td>
</tr>
<tr>
<td>Methane (CH4)</td>
<td>• Natural gas boilers</td>
</tr>
<tr>
<td></td>
<td>• electricity consumption</td>
</tr>
<tr>
<td></td>
<td>• oil consumption</td>
</tr>
<tr>
<td></td>
<td>• landfilling solid waste</td>
</tr>
<tr>
<td>Nitrous Oxide (N2O)</td>
<td>• Natural gas boilers</td>
</tr>
<tr>
<td></td>
<td>• electricity consumption</td>
</tr>
<tr>
<td></td>
<td>• oil consumption</td>
</tr>
<tr>
<td></td>
<td>• fertilizer on campus lawns</td>
</tr>
<tr>
<td>Hydrofluoro-carbons (HFCs)</td>
<td>• refrigerant gases</td>
</tr>
<tr>
<td>Perfluoro-carbons (PFCs)</td>
<td>• refrigerant gases</td>
</tr>
<tr>
<td>Hexafluoride (SF6)</td>
<td>• refrigerant gases</td>
</tr>
</tbody>
</table>

Table 2: Global Warming Potential of Specific Gases

<table>
<thead>
<tr>
<th>GAS</th>
<th>UNITS EQUIVALENT OF CO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon Dioxide (CO2)</td>
<td>1</td>
</tr>
<tr>
<td>Methane (CH4)</td>
<td>21</td>
</tr>
<tr>
<td>Nitrous Oxide (N2O)</td>
<td>310</td>
</tr>
<tr>
<td>HFC-134a</td>
<td>1,300</td>
</tr>
<tr>
<td>Sulfur Hexafluoride (SF6)</td>
<td>23,900</td>
</tr>
</tbody>
</table>
Decisions to Frame the Inventory

1. Selecting a GHG Protocol and tools
2. Scoping the preliminary and follow-on inventories
3. Choosing organization boundaries
4. Establishing base and trend years
5. Determining data collection strategy
6. Identifying data limitations and strategies for future
Clean Air--Cool Earth Calculator

- Recommended by the ACUPCC
- Compliant with World Resources Institute (WRI) Greenhouse Gas Protocol and IPCC guidelines
- Implemented in more than 1200 campuses across the country in schools of all sizes
- Factor conversions incorporated, but allows for more developed approaches
- The calculator continues to be updated
Scope of Emissions

**Scope 1**
- On-site energy production
- Mobile combustion
- Industrial activities
- Fugitive leaks
- Farm animals

**Scope 2**
- Purchased energy (electricity, gas, steam)

**Scope 3**
- Broader GHG from off-site operations
- Campus commutes
- Air travel
- Product purchase
- Waste disposal
Summary of Emissions

- SCOPE 1 Emissions
- SCOPE 2 Emissions
- SCOPE 3 Emissions
- Net Emissions (MT eCO2)

Bar chart showing emissions for May, June, and July, with different categories for emissions.
Setting Goals

Goals can take a number of forms:

- **Absolute**
  - Reduce total emissions by 15 percent from 2009 – 2015

- **Normalized**
  - Reduce emissions by 12 percent per square foot of building space from 2009 – 2015

- **Index**
  - Reduce emissions by 13 percent per production index from 2009 – 2019

- **NetZero/Carbon Neutral**
  - Achieve netzero emissions by 2015 and maintain that level through 2020.
Initiatives to Reduce GHG

- **Operations**—focuses on the day to day running of the school
- **Energy**—specific initiatives on the energy sources
- **New Buildings**—new construction opportunities around energy usage
- **Buildings**—retrofit and management modifications on existing buildings
- **Grounds**—landscaping and management of the overall campus
- **Fleet**—the vehicles owned or managed by the campus
- **Commutes**—daily/weekly travel to and from campus by faculty, students and staff
- **Air**—air travel associated with campus activities
- **Waste**—waste, composting, and recycling activities
GHG Inventory Limits

- Not a full “footprint” calculator
- Sustainability is more than greenhouse gases
“A small group of thoughtful people could change the world. Indeed, it's the only thing that ever has.”

-- Margaret Mead