



Basics of Climate Change

Introduction

Outline

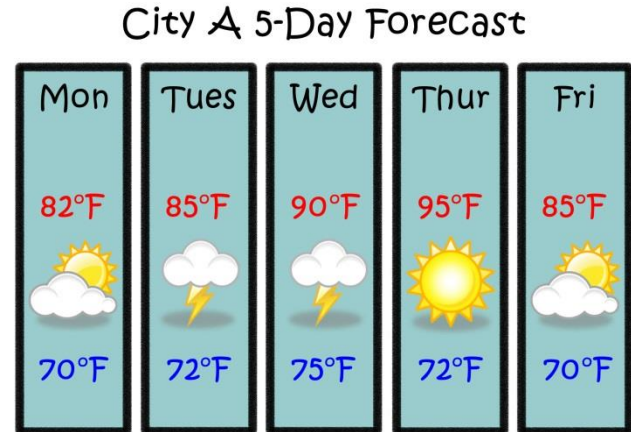
- Climate of Chicago
- Definitions and controls of climate
- Greenhouse effect and climate change
- What is the National Climate Assessment?



Weather vs. Climate

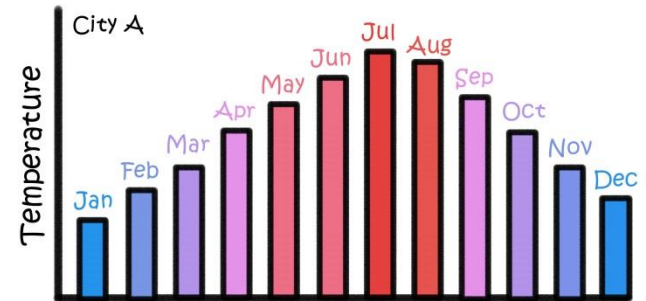
- **Weather**

- Day-to-day changes in the atmosphere



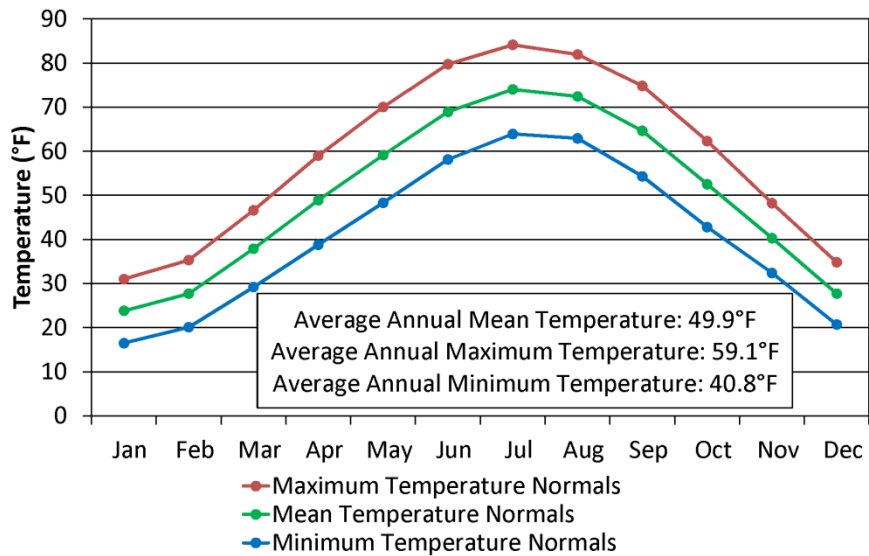
- **Climate**

- Average long-term weather for a specific location
- The type, frequency, and intensity of extreme weather

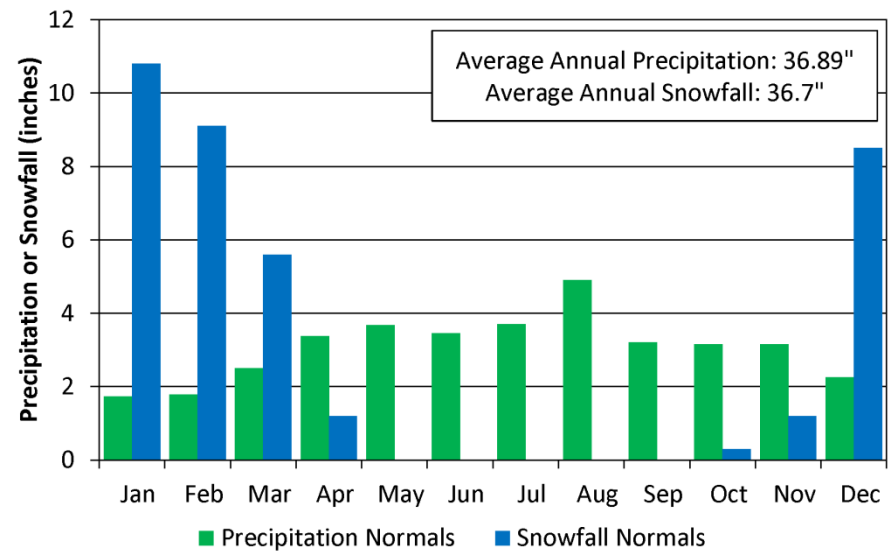


Climate of Chicago: Normals

Temperature



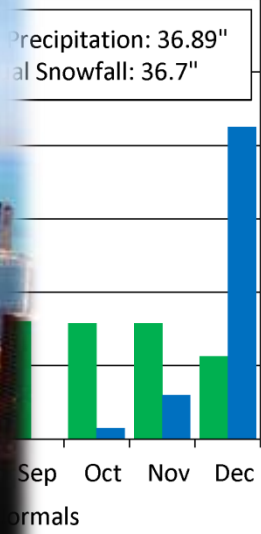
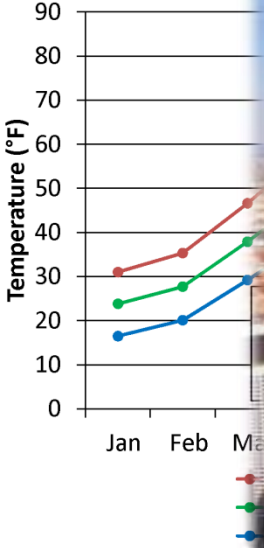
Precipitation



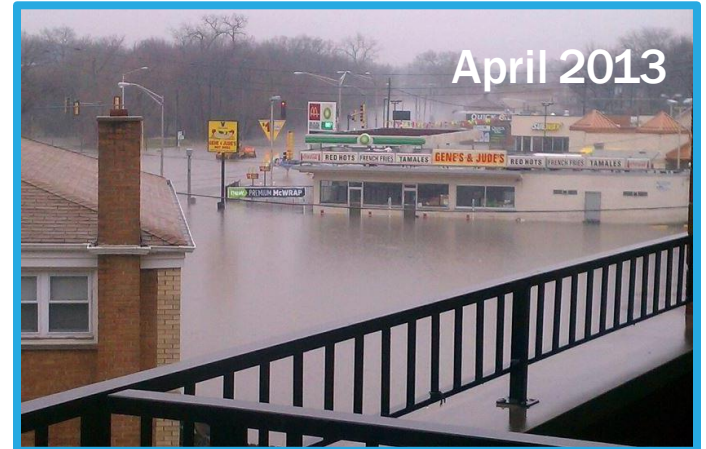
Climate of Chicago: Normals



Climate of Chicago: Normals



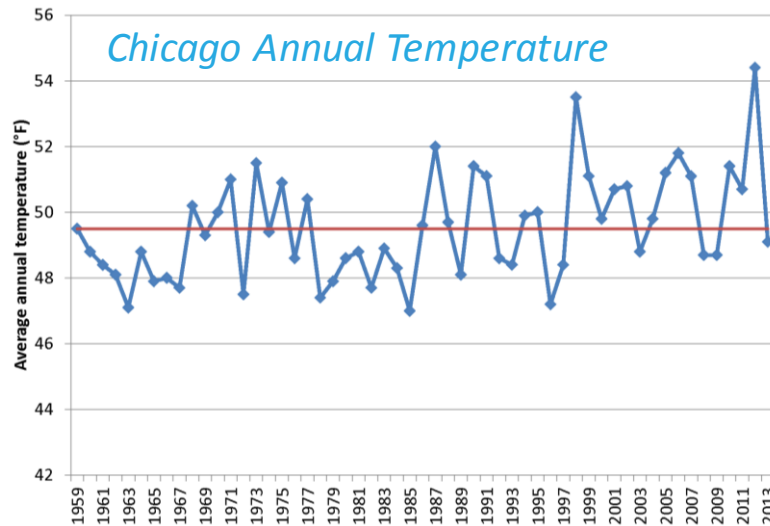
Climate of Chicago: Extremes



Climate Variability

- The way climate fluctuates yearly above or below a long-term average value
 - Time scale: season to decades

“The last few winters have seemed so short”

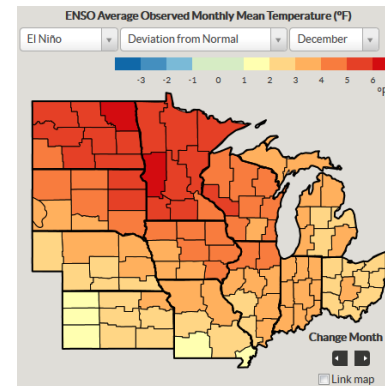


“There seem to be more heavy downpours in recent years”

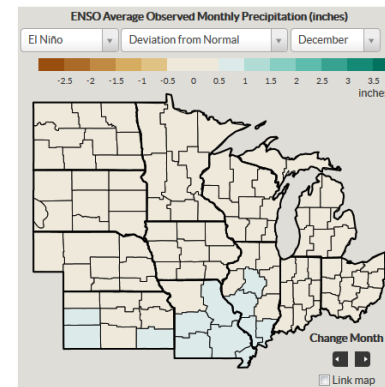
Red line: long-term average

Controls of Climate Variability

- Natural processes with connections to North American weather
 - El Niño/La Niña
 - Arctic Oscillation
 - North Atlantic Oscillation
 - Sunspots
 - Volcanic eruptions



El Niño:
December
Temp



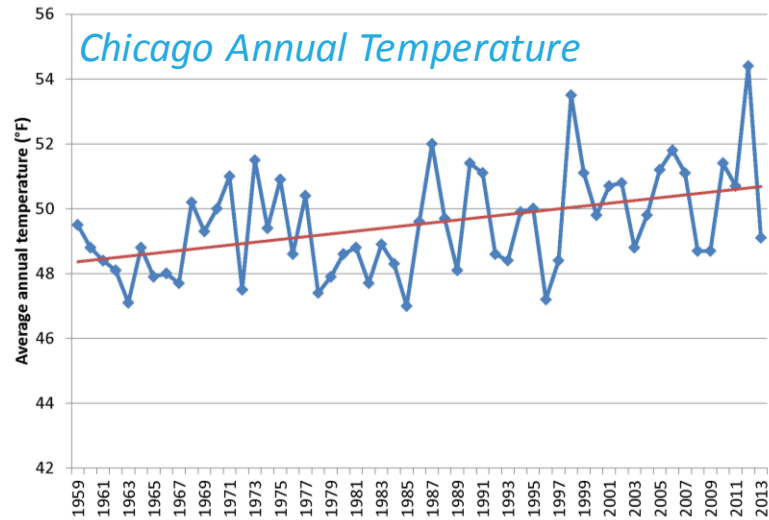
El Niño:
December
Precip



Climate Change

- Long-term and persistent shifts in the climate of a location
 - Time scale: several decades or longer

“Based on new data from the last 3 decades, the 100-year storm has increased by 1 inch”



“The average temperature has increased by 2° F since the early 1900’s”

Red line: trendline



Controls of Climate Change

- Natural causes

- Variations in solar activity
- Slow orbital changes
- Large volcanic eruptions



- Human influence

- Addition of heat trapping gases (greenhouse gases)
- Change in land cover



Recent Climate Change



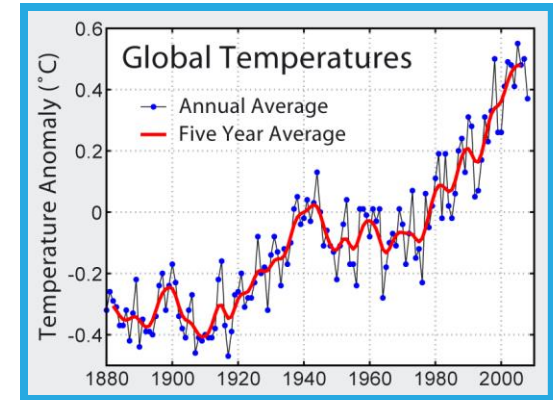
2014 National Climate Assessment

Although climate changes in the past have been caused by natural factors, human activities are now the dominant agents of change. Human activities are affecting climate through increasing atmospheric levels of heat-trapping gases and other substances, including particles.



Global Warming and Climate Change

- Global warming
 - Long-term trend of rising average global temperature

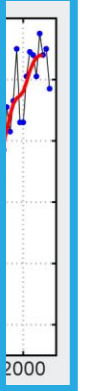
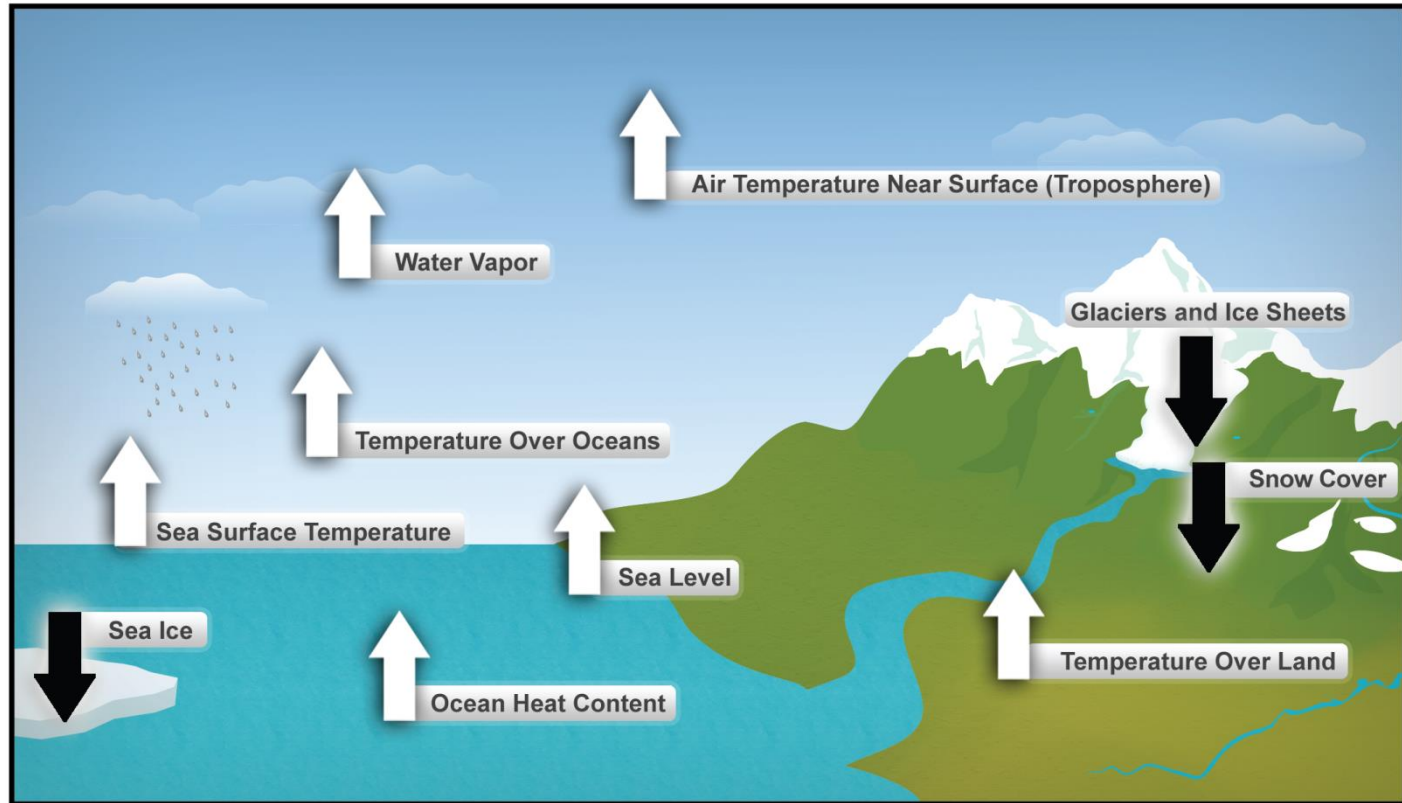


- Climate change
 - Changes in climate which result from the increasing average global temperature



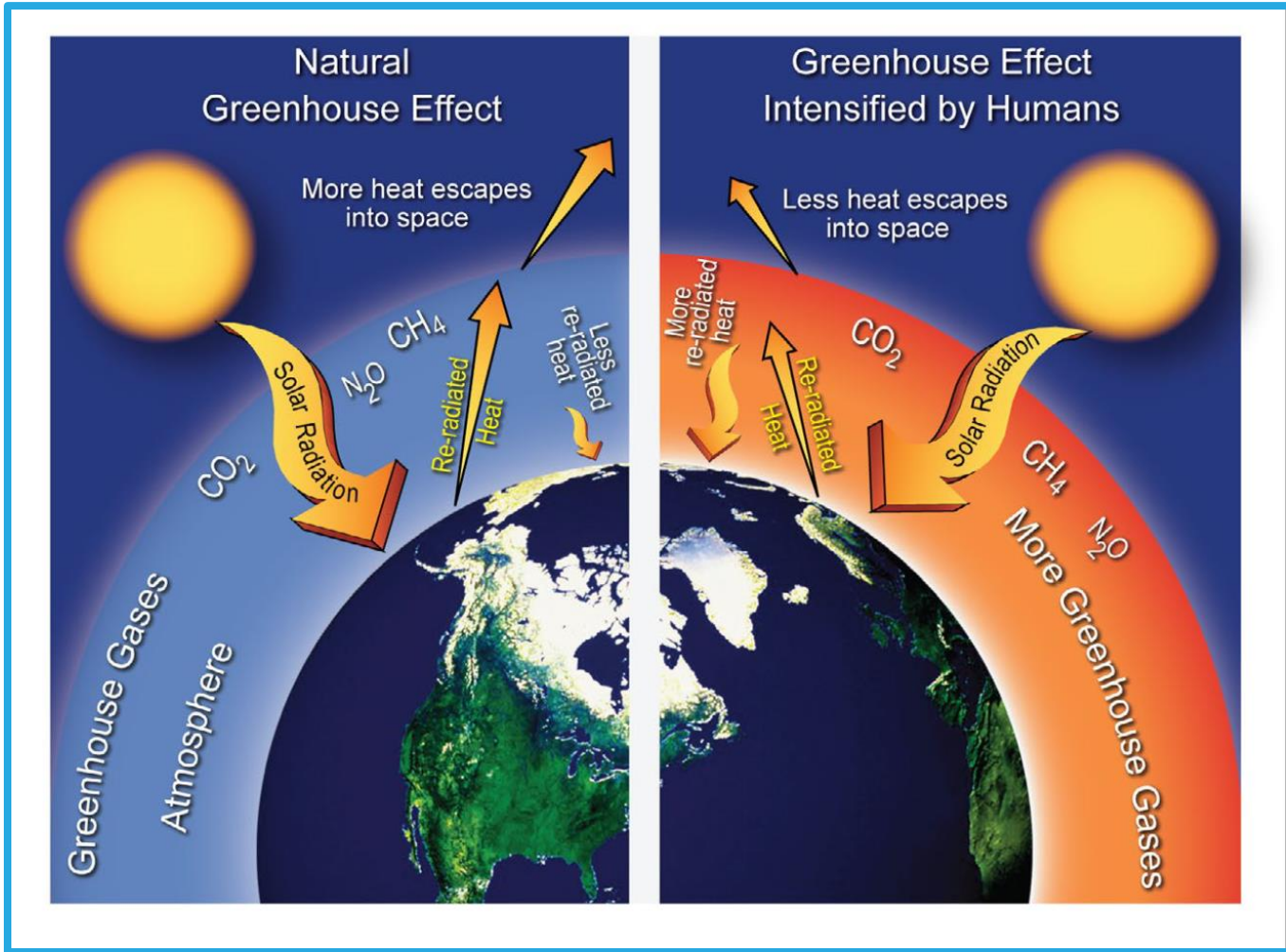
Global Warming and Climate Change

Ten Indicators of a Warming World



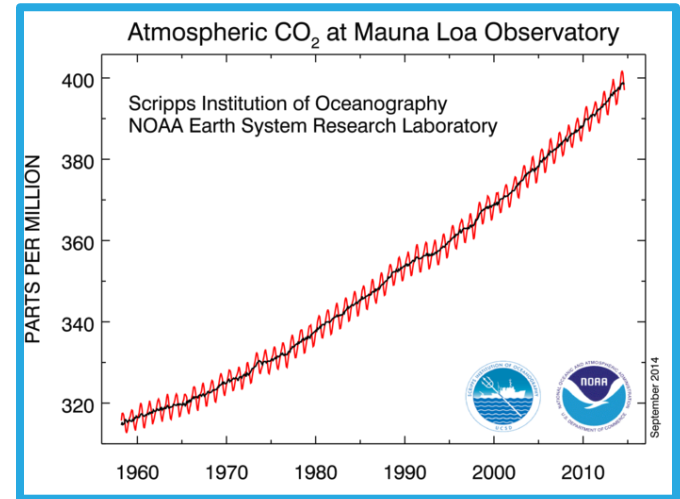
The Greenhouse Effect

2014
NCA



Human Produced Greenhouse Gases

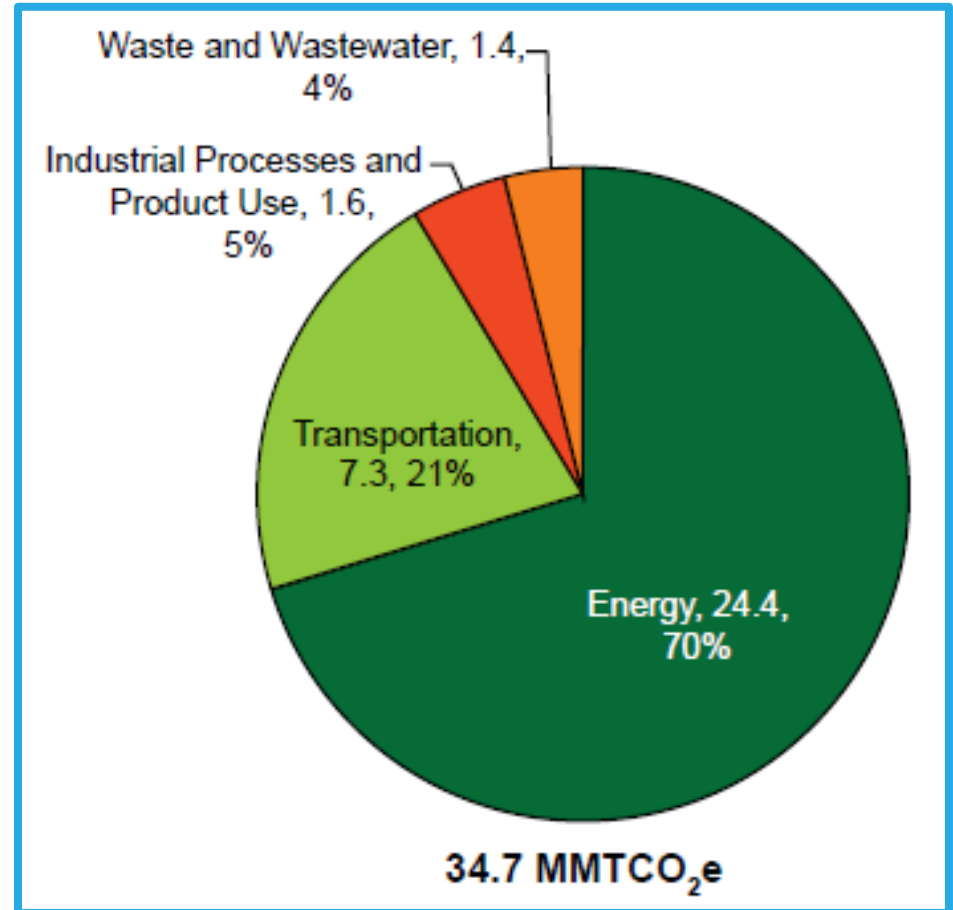
- Carbon dioxide
- Nitrous oxide
- Methane
- Ground-level ozone



Human Produced Greenhouse Gases

- Carbon dioxide
- Nitrous oxide
- Methane
- Ground-level ozone

Chicago 2000
CNT



The National Climate Assessment

- Report to inform the nation about already observed changes, the current status of climate, and anticipated trends for the future
- Released [May 2014](#)
- Written by 240 authors:
 - Academia
 - Government
 - Private and non-profit sectors

