FACT SHEET

Historic and Projected Climate Change

Scientists from around the globe and across the US have recorded changes in the hydrologic cycle, a decline in glaciers and polar ice, and shifts in precipitation intensity and trends.

This evidence strongly indicates that the earth's climate is changing (Bates et al., 2008, Clark et al., 2009, and Lawler et al., 2009).

A widespread consensus of research amongst the world's scientists indicates that:

- Human activities are changing the composition of the Earth's atmosphere. Since pre-industrial times, increasing atmospheric levels of GHGs (greenhouse gasses) like carbon dioxide (CO_2) are well-documented.
- The atmospheric buildup of CO_2 and other GHGs is largely the result of human activities such as the burning of fossil fuels.
- A warming trend of about 1.0 to 1.7°F occurred from 1906-2005. Warming occurred in both the Northern and Southern Hemispheres.
- Major GHGs emitted by human activities remain in the atmosphere from decades to centuries leading to a high degree of certainty that concentrations will continue to rise over the next few decades.
- Increasing GHG concentrations tend to warm the planet.

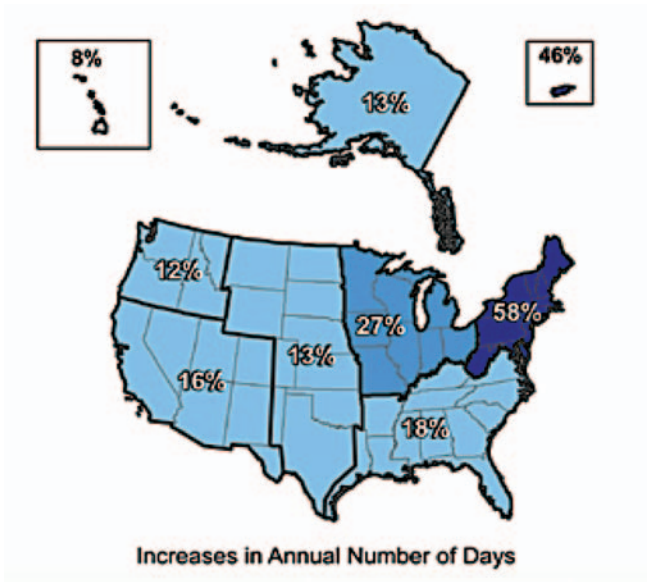
LONG-TERM CLIMATE RECORDS

Since last mid-century, CO_2 concentrations have increased dramatically. In the 1990s, global CO_2 emissions increased 1.3 percent per year, but since 2000, this rate has jumped to 3.3 percent per year. Data from the Mauna Loa Observatory, located on the island of Hawaii, indicates that current atmospheric CO_2 levels have risen approximately 138 percent above those of the pre-industrial period (Tans, 2010).

NATURAL AND HUMAN INFLUENCES

The long record of climate evidence found in ice cores, tree rings, and other natural records show that earth's climate patterns have undergone rapid shifts from one stable state to another within as short of a period as a decade. Paralleling the rise in global and regional temperatures are increases in the associated average precipitation and number of extreme storm events across the U.S.'s northern latitudes. Since the early 20th century, average precipitation has increased 6.1 percent. In New England from 1979 to 2000, there was a 20 to 28 percent increase in the average amount of rain that fell in a twenty-four hour period (Stack et al., 2005; Simpson et al., 2008).

INCREASE IN HEAVY RAINFALL EVENTS 1958-2007 (KARL 2009)



The northern states have shown trends over the last few decades that are associated with global temperature and precipitation change, including:

- Increase in frequency of intense storms
- Warmer winters
- Decreased snowfall
- Fewer days with snow on the ground
- Earlier spring runoff and later date of first frost
- Lake ice-out 9-16 days earlier
- Shifts in U.S. Department of Agriculture plant Hardiness Zones and earlier spring flower bloom dates
- More frequent summer drought periods

PROJECTED CHANGES IN CLIMATE (PRECIPITATION AND INTENSITY)

Based on building evidence from around the world, the United Nations created the Intergovernmental Panel on Climate Change (IPCC) in 1988. The IPCC released its Fourth Assessment Report (2007) assessing current climatic changes and projecting future climatic changes. This IPCC report is a culmination of decades of research and contributions from more than 1,200 authors and 2,500 scientific expert reviewers from over 130 countries.

According to multiple research efforts and studies, by mid-century across the northern tier of the U.S., the following can be expected:

- Temperatures will rise, with winters warming the fastest.
- The number of summer days exceeding 90°F will increase.
- Winter precipitation will increase with more precipitation falling in the form of rain as compared to snow.
- Summer precipitation will remain relatively the same.
- Snow-pack will not last as long and will melt earlier in the spring.
- The frequency of intense storms and storms with greater amounts of precipitation will increase.
- Rising temperatures will cause evaporation rates to increase, reducing soil moisture.
- The frequency of short-term summer droughts will increase.

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Chapter 4: Historic and Projected Climate Change

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