WATER FACTS

Chicago, Illinois: Identifying and Becoming More Resilient to Impacts of Climate Change

Cities across the United States should anticipate significant water-related vulnerabilities based on current carbon emission trends because of climate change, ranging from water shortages to more intense storms and floods to sea level rise. To help cities become more resilient to the rising threats of climate change, NRDC reviewed more than 75 scientific studies and other reports to summarize the water-related vulnerabilities in 12 cities—including Chicago. Although there may still be some uncertainty about what particular impacts threaten cities and how quickly or severely they might occur, action at the local level is the most effective method of reducing, mitigating, and preventing the negative effects of water-related climate change outlined in this fact sheet. NRDC urges cities to prepare for coming challenges relating to water resources. Fortunately, there are steps cities are already taking to become more resilient.

As part of the Chicago Climate Action Plan, Chicago compiled an excellent assessment of the impacts it can expect to see due to climate change. Based on this and other localized research Chicago's water-related vulnerabilities from climate change include:

Summary of water-related climate changes and impacts in Chicago throughout the 21st century	
(Highly likely)	Increased annual precipitation
(Highly likely)	More frequent and intense storm events
(Highly likely)	Increased flooding
(Possible)	Decreased Lake Michigan levels
(Possible)	Water supply challenges due to increased droughts

Highly likely

Likely

Possible

Source: NRDC

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LAKE MICHIGAN WATER LEVEL CHANGE

Research is generally in agreement that Lake Michigan's water level is likely to decline, although there is some variability as to the extent of that decline. Predictions range from a long-term drop of 4.5 to 5 feet (1.4 to 1.5 meters) by 2090 to a more modest drop of 1.5 feet (0.5 meter) by the end of the century.

PRECIPITATION AND STORM EVENTS

Both the quantity and intensity of precipitation are projected to increase in Chicago due to climate change. Between 2010 and 2069, average annual rainfall could increase by 5 to 10 percent. During the late century (2070 to 2099), average annual rainfall could increase 20 percent over late-20th-century levels. Most models agree that winter and spring will see increased precipitation; autumn and summer changes are less certain. In fact, some of these changes are already occurring: more winter precipitation is falling as rain than as snow, and snow is melting earlier in the spring. The frequency of intense storm events with very heavy downpours—more than 2.5 inches (6 centimeters) in a 24-hour period—is likely to increase as much as 50 percent between 2010 and 2039, and 80 to 160 percent by 2100. By 2100, average annual river and stream flows are projected to increase, though seasonal changes will vary.

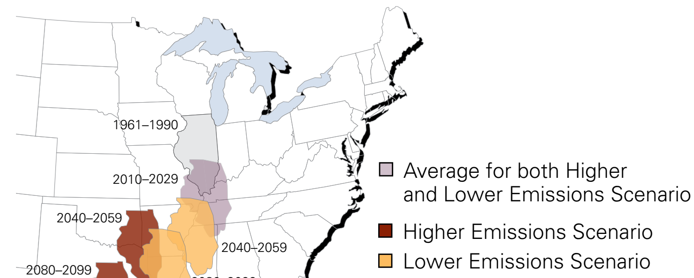
FLOODING

Intense storms with very heavy precipitation and strong winds increase the risk of flooding and wave damage. The potential impacts of floods and strong waves include shoreline erosion, contaminated drinking and recreational waters, damaged roads and bridges, crop damage, and property loss. Due to Chicago's combined stormwater and sewage collection system, rainfall exceeding as little as 0.67 inches (1.7 centimeters) in 24 hours can result in combined sewer overflows (CSOs) that discharge a mix of untreated sewage and stormwater into the Chicago River and Lake Michigan. Without improvements to the stormwater system, increased precipitation is thus likely to cause an increase in CSOs and a higher risk of waterborne disease outbreaks at Lake Michigan. Projected increases in temperature and floods also have economic consequences.

INCREASED TEMPERATURE

Compared with the latter half of the 20th century, annual temperatures in Chicago are expected to increase about 2.5°F (1.4°C) between 2010 and 2039, 3.6° to 5.4°F (2° to 3°C) by mid-century, and 5.4° to 9°F (3° to 5°C) between 2070 and 2099. The frequency, duration, and intensity of heat waves are also expected to increase, particularly starting in mid-century, though some summers may still be relatively mild. Typically there is a 69-day window in which heat waves occur; this could increase by 1 or 2 months by 2100 under the higher-emissions scenarios. Increased annual temperatures are expected to reduce ice cover on Lake Michigan. Between 1973 and 2008 there was record-low ice cover on the lake. Average annual ice cover could fall to near zero before 2050.

Illinois's projected "climate migration" due to changes in summer average temperatures and rainfall



Source: Hayhoe et al., Regional Climate Change Projections for Chicago and the US Great Lakes, Journal of Great Lakes Research 36(sp2):7-21 (2009).

WATER SUPPLY AND WATER QUALITY

Warmer summertime temperatures combined with potentially longer summertime dry periods make summer droughts more likely. Warmer water and air temperatures increase evaporation from the lake surface, which can concentrate waterborne pollutants and create conditions more favorable to waterborne diseases. Reduced lake levels and warmer waters could adversely affect wetlands and wildlife habitats. Cold-water fish such as walleye and trout may migrate away from current habitats, to be replaced by invasive species that thrive under warmer conditions. Native plants in riverine habitats and wetlands that provide ecological benefits such as stormwater filtration and storm buffering may decline due to lower water levels and drier summers.

ACTION

The city is moving forward with efforts to mitigate greenhouse gas emissions and prepare for inevitable impacts of climate change. For instance, one of Chicago's main challenges will be how to deal with increased stormwater, flooding, and CSOs as a result of increased precipitation. The city has a stormwater management ordinance in place, and since January 2008 the ordinance has addressed at least 265 development projects, resulting in a 20 percent increase in permeable area per site and a total increase of 55 acres of permeable surface area. The city has also installed at least 120 green alleys, resulting in the conversion of more than 32,000 square feet of impervious surfaces to pervious surfaces. This conversion allows rain to infiltrate into groundwater, decreasing runoff that must be handled by aging treatment plants. The city is also developing a sewer model to help determine how certain areas are performing under different precipitation conditions and pinpoint areas where capital improvements or green infrastructure solutions should be prioritized.