



# CLIMATE CHANGE

IN THE WINDY CITY AND THE WORLD



A TOOL FOR UNDERSTANDING  
CLIMATE SCIENCE IN THE  
CHICAGO REGION





## INTRODUCTION

**Research conducted** by The Field Museum from 2008 to 2011 shows that **Chicago residents** generally think **climate change is real** and is an important issue that needs to be addressed.

But... they often don't understand **how it relates to their lives** or what they can do about it.

This booklet is informed by studies conducted by Field Museum anthropologists in seven communities throughout Chicago (see map). The studies were commissioned by the Chicago Department of Environment to engage diverse communities in the Chicago Climate Action Plan. Visit <http://fieldmuseum.org/climateaction> to download reports.



**This booklet** provides Chicago leaders and residents with a basic **understanding of climate change as it relates to our region**, so they can **take action** informed by scientific, global, and local knowledge.

## INTRODUCTION

**This booklet** also presents best practices in **climate action** from the **Chicago region**, from The Field Museum's research. They demonstrate the **diverse and creative ways** in which **communities are responding** to climate change.

**The examples** in this booklet also show the power of **building on communities' strengths**—such as DIY skills, frugality, conserving water, and growing food—to implement **broad climate action strategies** in **locally meaningful** ways that will encourage widespread participation.

## The Field Museum's Approach to Climate Action

The Field Museum helps community organizations execute a three-pronged approach to climate action that links community strengths with the strategies of the region's climate action plans. The resulting projects address both climate change and other community issues.



## KEY TAKEAWAY POINTS

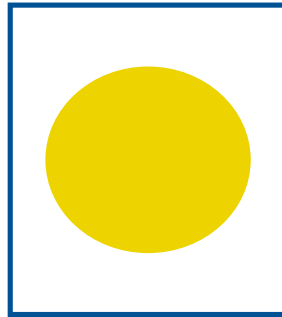
**Even if you don't memorize all the science**, we hope you'll remember these **key ideas**:

1. The world's scientists overwhelmingly agree that **climate change** is happening and is **caused by human activities**.
2. People in the Chicago region are also concerned about climate change and want to understand more about how it **relates to Chicago and their lives**.
3. Climate change affects different regions in different ways and is **already impacting Chicago**.
4. People everywhere are finding ways to live that will stop climate change from **getting worse** and help their communities **adapt to the changes** that are inevitable.
5. "Climate action" will not only address climate change, but will make our **communities better places to live**.

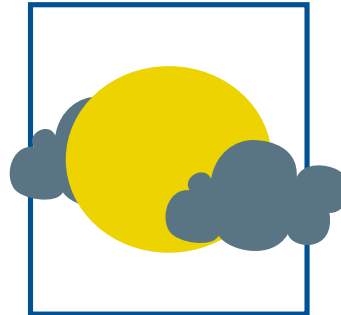


# WHAT'S THE DIFFERENCE BETWEEN WEATHER AND CLIMATE?

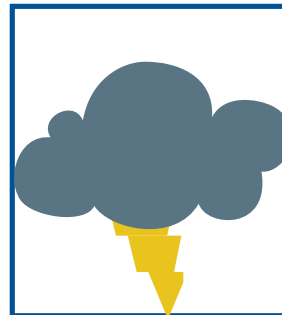
**Weather** is **short-term changes** in the atmosphere: what we experience day-to-day.



MONDAY

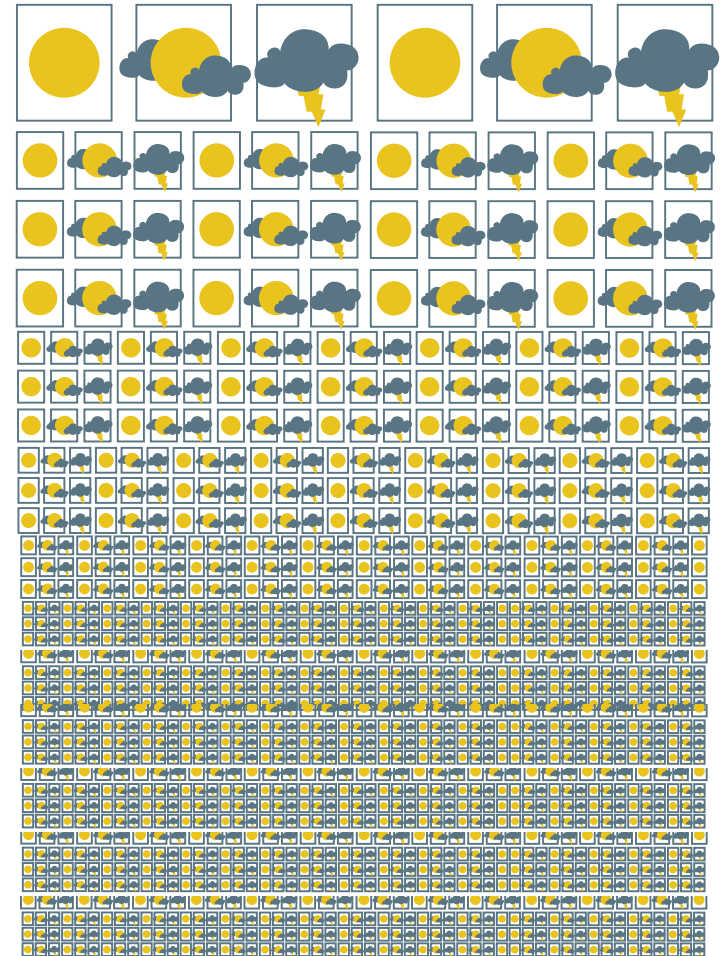


TUESDAY



WEDNESDAY

**Climate** is the average long-term weather pattern of a specific location: how the atmosphere behaves over **many, many years**.



## WHAT IS CLIMATE CHANGE AND WHAT DOES IT HAVE TO DO WITH GLOBAL WARMING?

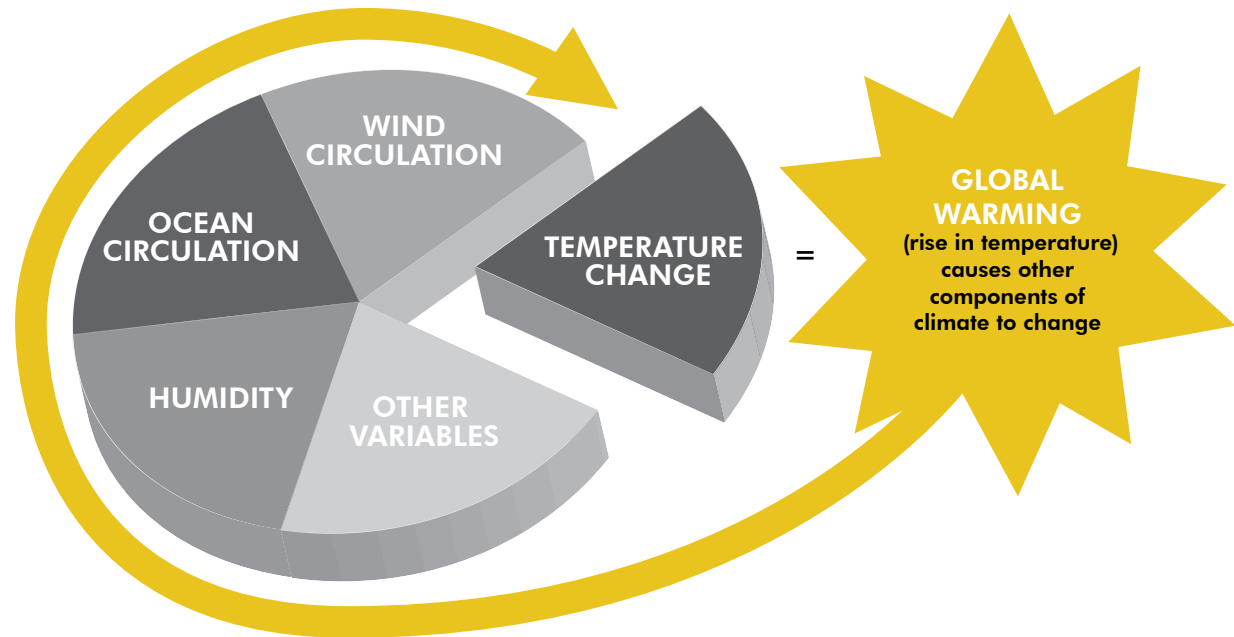
**Climate change** refers to changing patterns of temperature, precipitation, humidity, wind and ocean circulation, and other variables **over long periods of time**.

Climate change today is **caused by human activity** such as **burning fossil fuels**, like coal, petroleum, and natural gas.

**Global warming** is the rise in the Earth's **average temperature**.

It is caused by an increase in the amount of **greenhouse gases** in the atmosphere, which trap heat.

### Components Of Climate Change



## WHAT DOES CLIMATE CHANGE HAVE TO DO WITH OZONE?

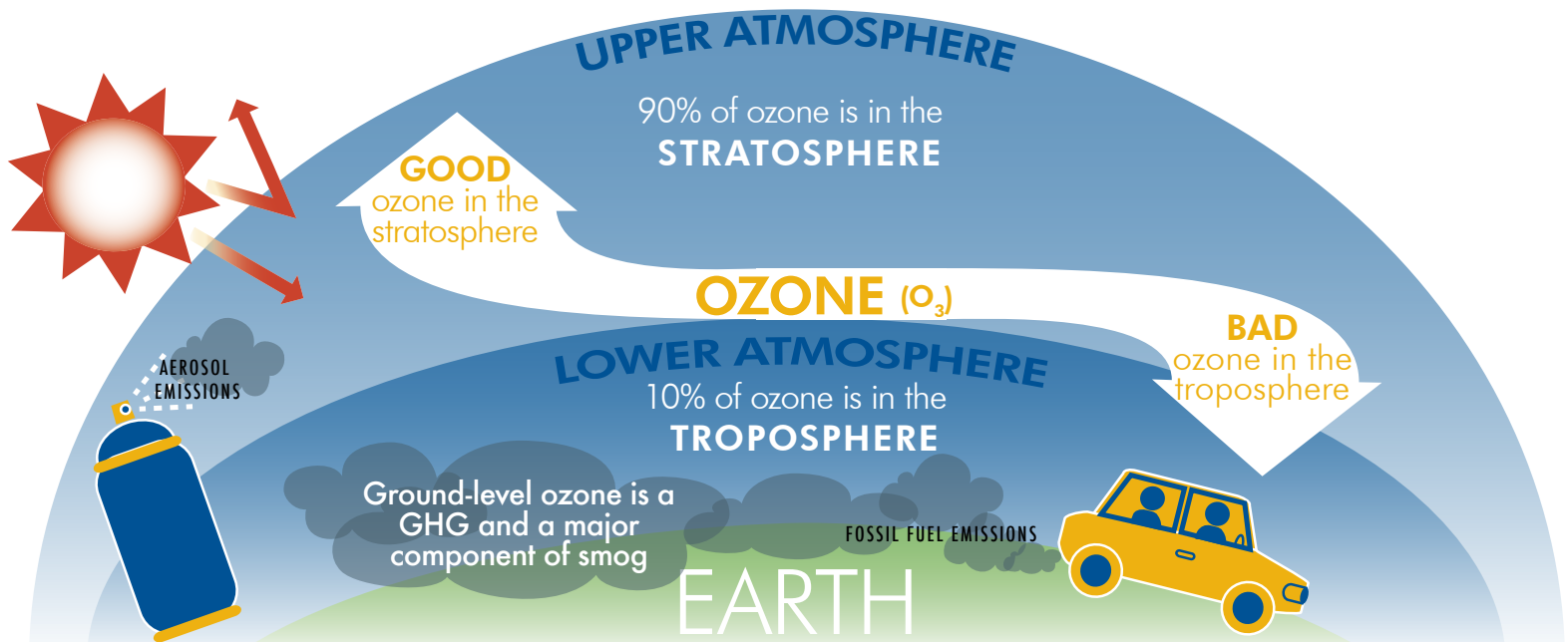
### People sometimes confuse

today's **climate change** crisis with the problems that we faced with the **ozone layer** in the 1970s. In fact they are related but **different challenges**.

**Ozone** in the upper atmosphere blocks UV-B radiation emitted by the sun from entering our atmosphere. This is important because high levels of UV-B radiation can cause severe skin damage, including skin cancer. Human-made aerosols depleted some of this ozone, creating the "hole in the

ozone layer." Since the 1970s, international efforts have successfully reduced the amount of ozone-depleting aerosols through legislation that banned the use of the chemicals that caused the problem.

**Ground-level ozone** in the lower atmosphere is a **greenhouse gas** (GHG), like CO<sub>2</sub>. Burning fossil fuels creates **pollutants that become ozone** when they react with heat and sunlight. Ozone is the primary component of **smog**, and a contributor to climate change.





## HOW DO WE KNOW CLIMATE CHANGE IS REAL?

**Scientists throughout** the world have conducted thousands of studies on climate change.

They overwhelmingly agree that climate change is happening and our **Earth is warming**, due mainly to **human activities** that burn fossil fuels.

**In Chicago** residents generally **believe** that climate change is real in part because of what they know about changes

happening in the **Arctic**: loss of ice cover and the danger this poses for polar bears. They also tend to associate climate change with **dramatic weather events** around the country and the world—including, for immigrant residents, in their home countries.

Residents are also noticing the effects of climate change **in Chicago**, such as stronger **storms**, **hotter summers**, and even **acorns falling earlier** from trees.

**FACT:**  
97 out of 100 scientists who study climate conclude that climate change today is largely caused by human activity.

[www.skepticalscience.com](http://www.skepticalscience.com)

In February 2011, a Chicago blizzard stranded Lake Shore Drive commuters overnight. Global warming increases moisture in our atmosphere, resulting in extreme storms like this one.

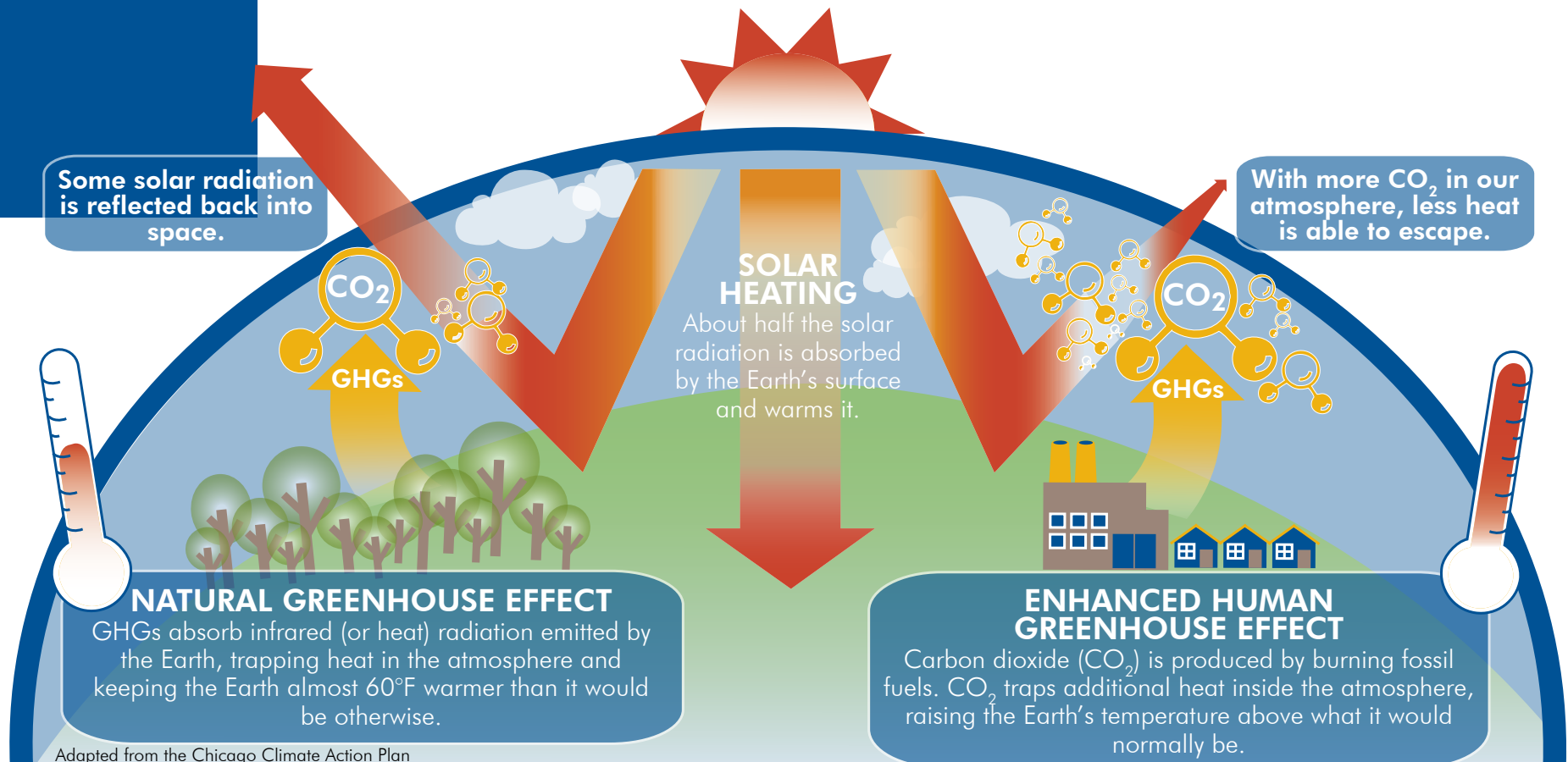


Photo courtesy of Carrie Porter

## HOW DOES HUMAN ACTIVITY CAUSE CLIMATE CHANGE?

**We burn fossil fuels** when we do things like drive, heat our homes, dispose of waste, and process food. Burning fossil fuels produces **greenhouse gases** (GHGs), the most significant being **carbon dioxide** (CO<sub>2</sub>). GHGs **trap heat in the Earth's atmosphere**.

**GHGs** are also produced by many natural sources such as forests and oceans. This is called the "natural greenhouse effect." But it is the additional amount of human-produced GHGs, which produce the "**enhanced human greenhouse effect**," that is **causing the climate to change** too quickly today.



## HOW DOES HUMAN ACTIVITY IN CHICAGO CAUSE CLIMATE CHANGE?

**People often** do not realize that the major **cause of climate change** is the use of energy produced by **burning fossil fuels** (coal, petroleum, natural gas).

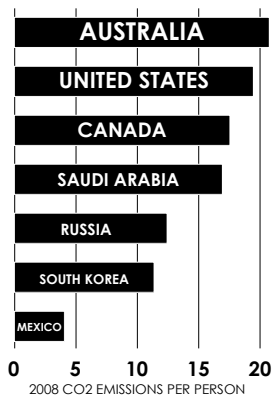
This is why many national and local initiatives aimed at curbing climate change currently focus on **reducing energy consumption**, largely

through commercial and residential retrofits (tightening up buildings so less energy leaks out).

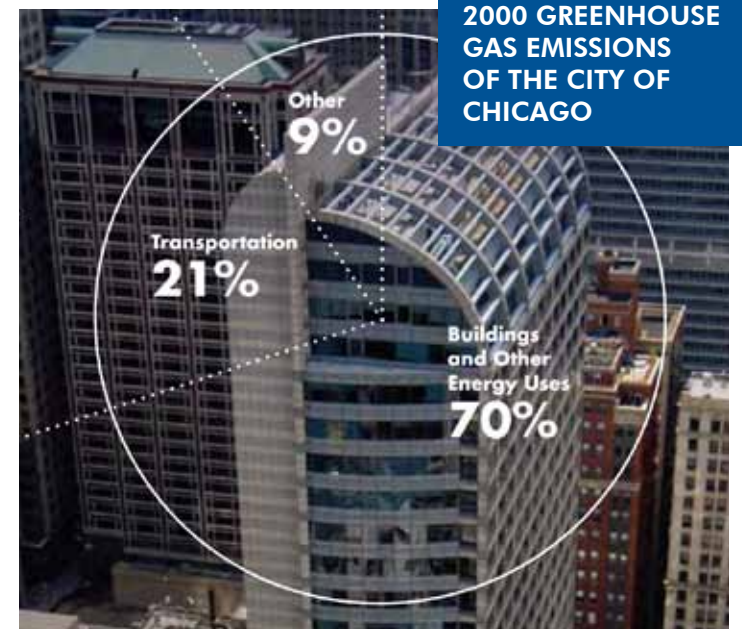
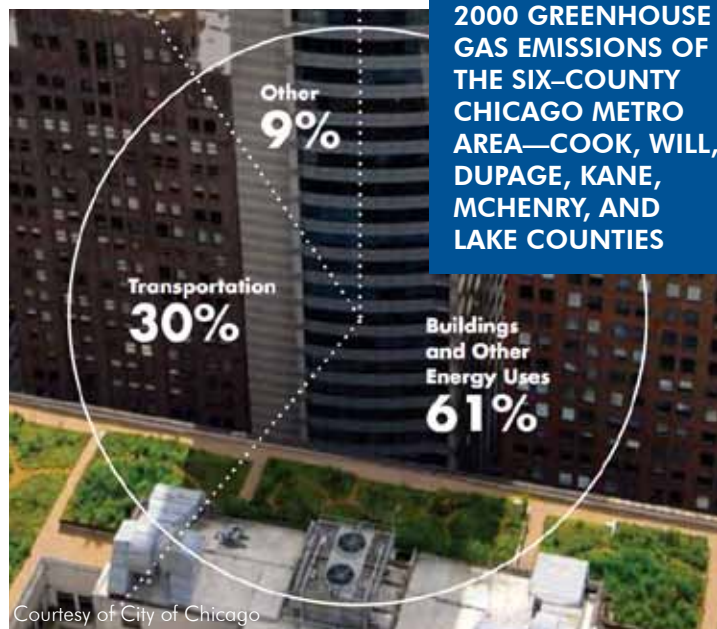
As shown below, **energy use** makes up **61% of greenhouse gas** (GHG) emissions **in the Chicago region**.

In the **city of Chicago**, it **makes up 70%**.

**FACT:**  
The U.S. has more CO<sub>2</sub> emissions per person than any other country except Australia.



Data courtesy of the U.S. Department of Energy





## HASN'T THE CLIMATE ALWAYS BEEN CHANGING?

**Yes**, the climate has always been changing, but the **current** warming trend **is different** because:

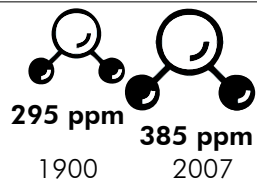
- It is largely **caused by human** activities.
- **CO<sub>2</sub> levels** are the **highest** they have been in **over 800,000 years**.
- The rate of increase is **unprecedented**.

**Chicago** is like many other **industrial cities** when it comes to the causes of climate change. In the early 1900s, Chicago was booming. It was the beginning of the Century of Progress.

But some **progress comes at a price**: intensifying levels of **CO<sub>2</sub>** accelerated **climate change**.

**FACTS:**  
Levels of CO<sub>2</sub> have risen 25% in the last century.

**CARBON DIOXIDE**  
in ppm (parts per million)



Courtesy of the U.S. Department of Energy

Many scientists say we need our CO<sub>2</sub> levels back below 350 ppm this century to avoid irreversible impacts.

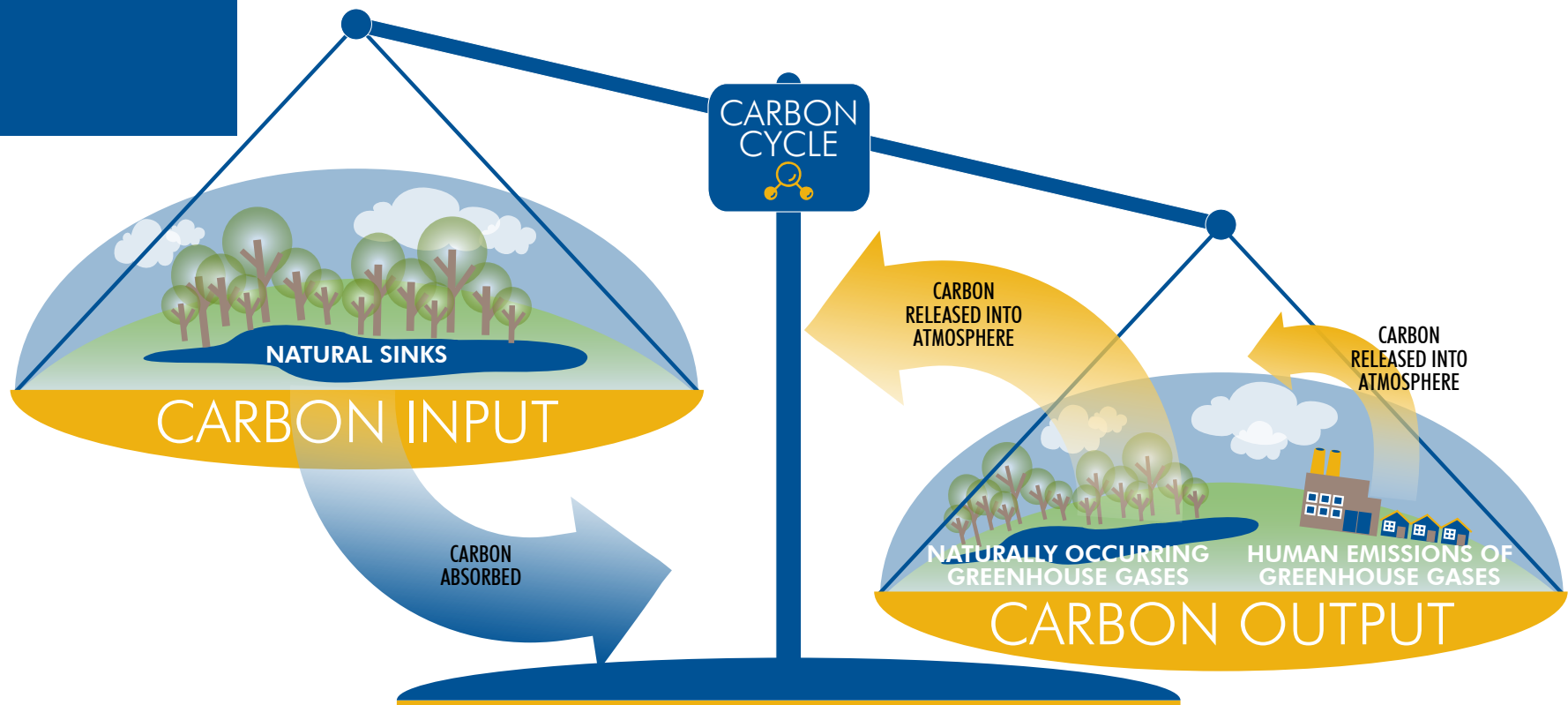


## WHY ARE CO<sub>2</sub> LEVELS SO HIGH?

**Natural sources** like plants, animals, oceans, and soils have always **released more carbon** into the atmosphere than human activities do. But **in the past the amount** of gases released by natural sources **was balanced** by the amount of gases being absorbed **by natural "sinks."**

Sinks include oceans, lakes, forests, and other green spaces. They keep the amount of CO<sub>2</sub> in the atmosphere in check. This process is called the "**carbon cycle**."

The added **emissions** from **human sources** today **create an imbalance** in this cycle that results in too much CO<sub>2</sub> in the atmosphere. Because of this increase, the **Earth is warming**.



## HOW DO WE CORRECT THE IMBALANCE IN THE CARBON CYCLE?

**Many** of our **natural sinks** have been greatly **fragmented or completely lost** to development, agriculture, and pollution.

Oceans and lakes are likely to **reach** a **CO<sub>2</sub> intake threshold** in the future. This means that they would not be as good at capturing and storing carbon, so more carbon would remain in the atmosphere.

As a result, our remaining **natural sinks** would be **less effective** at reducing the amount of CO<sub>2</sub> in the atmosphere **than they have been** in the **past**.

**Preserving** and **restoring** the **sinks** we do have left **is essential** to addressing today's climate change challenge.

## A Greener Vision for the Chicago Region

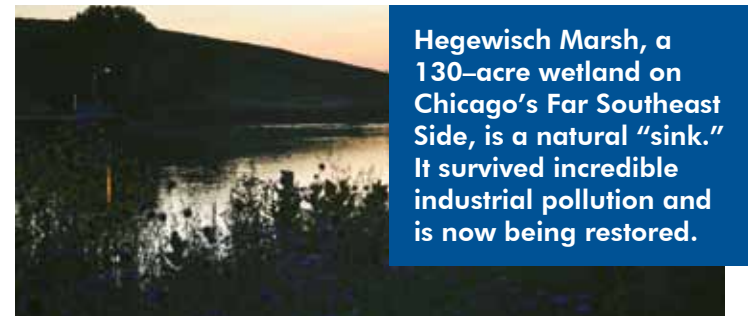
**FACTS:**  
Lake Michigan and the green spaces in Chicago, including 75,500 acres of parks and forest preserves in Cook County, act as CO<sub>2</sub> sinks.

These areas are also critical in providing habitat for the region's plants and animals.



Image courtesy of  
Chicago Metropolitan Agency for Planning

There are 370,000 acres of protected land in the Chicago region. This map depicts a vision of an expanded network of waterways and open space.



Hegewisch Marsh, a 130-acre wetland on Chicago's Far Southeast Side, is a natural "sink." It survived incredible industrial pollution and is now being restored.



Chicago's suburbs contain some of the best remaining tall grass prairie and oak savanna east of the Mississippi River. Their deep roots store a substantial amount of carbon.

## WHAT EXACTLY IS CHANGING?

The Earth's temperature has **increased** approximately 1°F over the past 100 years. This has resulted in changes in the atmosphere, ice, ocean, and land.

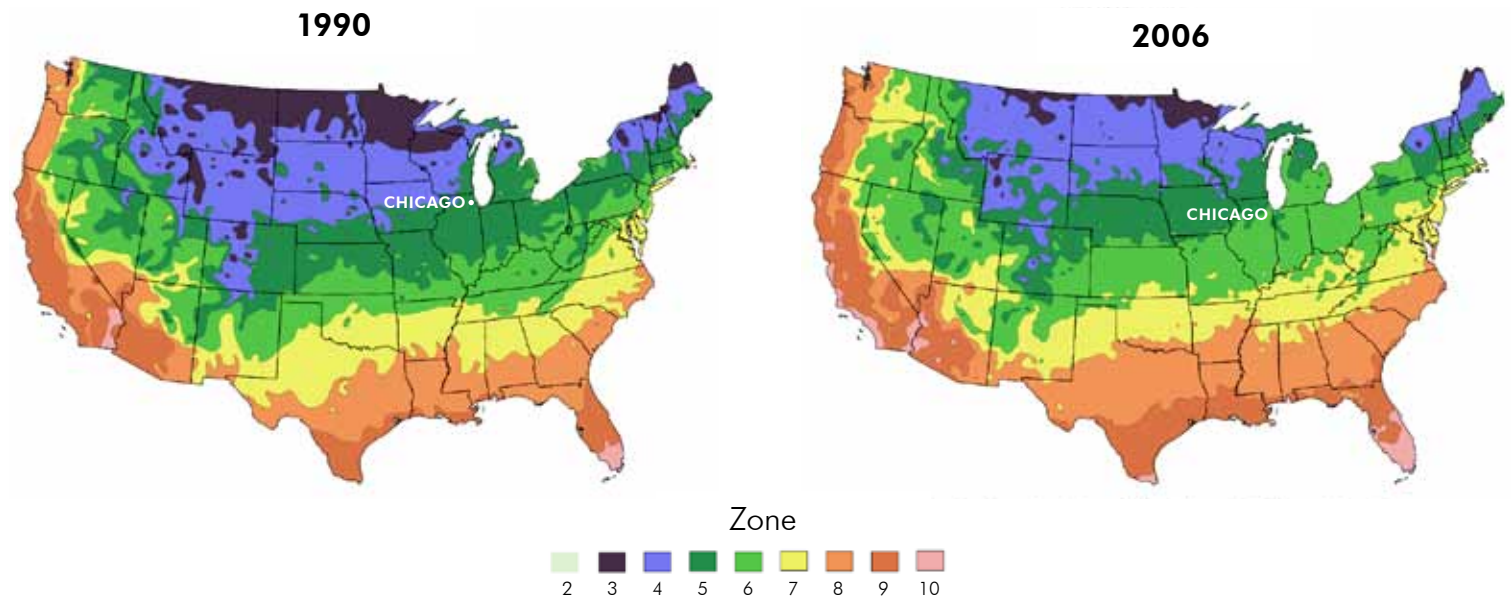
**These changes** have already begun to **destabilize the climate**, resulting in some regions experiencing more extreme storm events and **flooding**, as well as rising sea levels, and others being afflicted with **drought**.

In many regions, **spring is coming earlier**, which is **disrupting natural processes**.

For example, some animals that migrate, such as insect-eating birds, are finding that the animals or plants they are accustomed to eating are no longer around when they arrive. The scientific phrase for this is "phenophase mismatch."

## Plant Hardiness Zone

The plant hardiness zone in Chicago is changing. This measurement uses average annual minimum temperatures to determine which plant species thrive in which climatic regions. During the past 15 years, over half the U.S., including Chicago, warmed one hardiness zone. Plants that once thrived in the Chicago region now fare better farther north.



© 2006 by The National Arbor Day Foundation®



## WHAT ELSE IS ALREADY CHANGING IN CHICAGO?

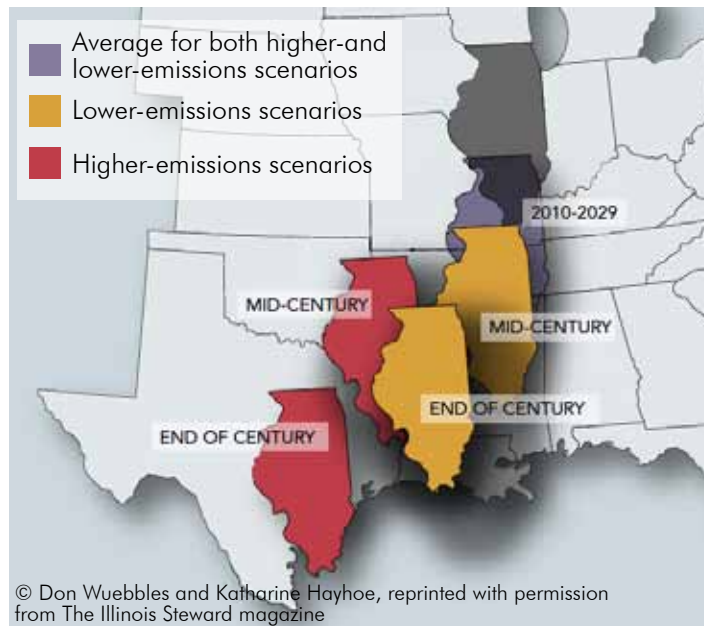
**Chicago's average temperature** is increasing. Temperatures have risen by 2.6°F since 1980.

The change in temperature is causing **Lake Michigan** to be frozen for shorter periods of time during the winter.

**Chicago** is experiencing more extreme weather events, including **heat waves**, **flooding**, and more 100° summer days.

In September 2008, a **record-breaking** 6.5 inches of **rain** fell in a 24-hour period in Chicago. Many parts of the city were quickly flooded by the overflow of the Chicago River, resulting in **widespread damage** to cars and buildings. In Albany Park, on the northwest side of the city, dozens of **residents were evacuated** from their homes because of dangerously high waters. The 2008 all-time record was broken in July 2011, when 6.86 inches fell.

This map shows the projected summer climate changes over this century for Illinois relative to existing average summer temperature and precipitation found throughout the United States. For the higher-emissions case, the Chicago region would have a summer climate more like eastern Texas by the end of the century.





## HOW WILL CLIMATE CHANGE CONTINUE TO ALTER LIFE IN CHICAGO?

**Climate change** may continue to alter many aspects of life in Chicago. Scientists project increases in...

- **Heat-related diseases** like heart attacks and asthma;
- **Flooding**, affecting residences, public transportation, and bridges;
- **Electricity shortages** and changes in energy demands;
- **Municipal costs**, such as landscaping, road maintenance, and emergency response.

**Climate change** is also expected to affect our natural communities. Scientists project that...

- **Animals** and **plants** may **become stressed** from too much heat and too much or too little precipitation;
- Rivers, lakes, and wetlands may become more **polluted from increased stormwater run-off**, which picks up sewage, garbage, fertilizer, etc. that then flows into these waterways. waterway
- **Invasive species** and **pests** may become **more prevalent**.

Chicago doesn't have polar bears, but climate change threatens animals here too. The Hine's emerald dragonfly (left) is an endangered species only found in a few remaining wetlands, including some in Chicago. The Bobolink (right) is already rare in Chicago due to a scarcity of open spaces for nesting and food. Climate change threatens the habitat of both.



Photo courtesy of the U.S. Fish and Wildlife Service



Photo public domain

## CLIMATE CHANGE LINKS THE LOCAL TO THE GLOBAL

**Climate change** is a global phenomenon, but it **affects** different parts of the **world** in **different ways**. **Some areas** will get more **floods** while others will suffer from **droughts**.

Some places, like Chicago, may experience a change in **when** and **how much** rainfall they receive. Chicago is expected to have wetter winters and springs, and long periods of dryness in the summer punctuated with more extreme storms and flooding.

**The world's northern regions**, such as the Arctic, are seeing the greatest **changes first**. These include extensive permafrost and glacial melt and increasing sea surface temperatures.

**Chicago's immigrant** communities maintain very **close ties** with their **home countries** and are often affected by **international climate events**.

Chicago's Polish community rallied to help people in Poland affected by severe flooding in 1997 and 2010 (left).

Hurricanes in Mexico in 2010 caused some people to migrate to Pilsen as "climate refugees" (right).



**CLIMATE  
CHANGE  
IS AN  
ENVIRONMENTAL  
JUSTICE ISSUE**

**People in regions** of the world **that contribute** the **least** to climate change—including sub-Saharan Africa, low-lying Indonesian Islands, and the Arctic—**will** likely **suffer** the **most**.

**In the places** that contribute the most to climate change, including the U.S. and other **industrialized countries**, climate

change will have a **disproportionate impact** on **economically disadvantaged** communities and communities **of color**.

**African-American** residents in Chicago and around the country often reference **Hurricane Katrina** as a climate **injustice**.

During Chicago's heat wave in July 1995, 739 people died in one week from heat-related causes. Most were elderly without supportive social networks who lived in low-income areas of the city. Their deaths are a grim reminder that climate change affects most those who lack the resources to adapt.





## SO... WHAT CAN WE DO? ACT NOW!

**It's not too late to make a difference.** Two **climate action plans** have been created to help Chicago meet its commitment of reducing GHGs to 25% below 1990 levels by 2020, and 80% below 1990 levels by 2050.

Strategies from these plans **aim to help** the region lower greenhouse gas emissions and cope with changes already underway. These strategies are called **"mitigation"** and **"adaptation"** (see sidebar).

**FACT:**  
**MITIGATION**  
strategies reduce  
greenhouse gas  
emissions to prevent  
additional climate  
change.

**ADAPTATION**  
strategies help  
humans and nature  
respond to climate  
change impacts (such  
as heat waves).

Some strategies do  
both.

### City of Chicago

#### Chicago Climate Action Plan (CCAP)

##### 5 strategies:

- 1 Energy Efficient Buildings
- 2 Clean and Renewable Energy Sources
- 3 Improved Transportation Options
- 4 Reduced Waste and Industrial Pollution
- 5 Adaptation

Projected number of 100 degree days per year in Chicago, at current and lower emission levels.

Courtesy of City of Chicago



### Chicago Wilderness

#### Climate Action Plan for Nature (CAPN)

##### 5 strategies:

- 1 Climate-friendly Gardens and Lawns
- 2 Water Conservation
- 3 Monitoring
- 4 Stewardship
- 5 Climate Change Education

## CITIES WILL LEAD THE WAY

**Cities** are often pointed to as a major cause of climate change because they produce so many emissions.

But in fact, they **offer the solution.**

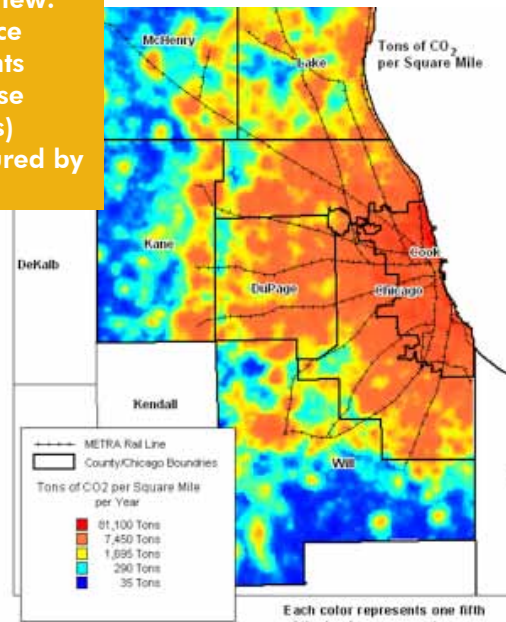
In cities, people and their homes are closer to each other. This pattern supports local businesses, encourages people to ride trains and buses instead of drive, and shortens travel times.

The effect: much **lower emissions per household.**

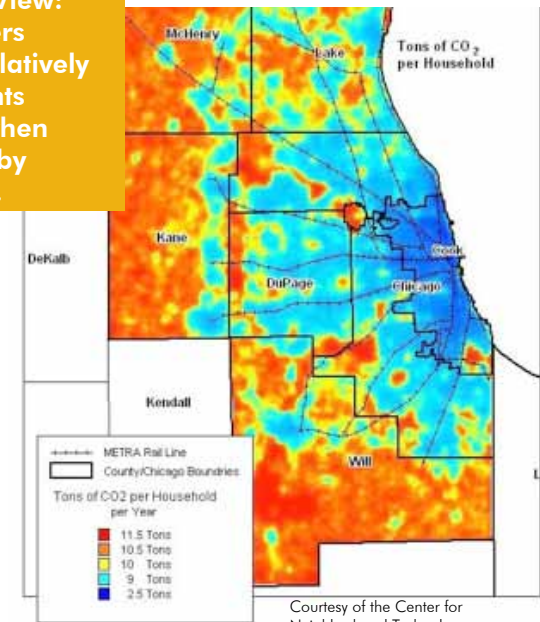
### A New View of Cities and Climate Change:

CO<sub>2</sub> Generated by Automobiles in the Chicago Region per Year

**Traditional View:**  
Cities produce large amounts of greenhouse gases (GHGs) when measured by square mile.



**Emerging View:**  
City dwellers produce relatively low amounts of GHGs when measured by household.



## CHICAGO IS LEADING THE WAY



By the end of 2012, the Chicago region will have over 250 electric charging stations – the densest *DC Fast Charge Network* in the world.



Photo courtesy of the City of Chicago

The Energy Action Network engages 27 community organizations in scaling up energy efficiency efforts in their neighborhoods.



Photo courtesy of the City of Chicago

In 2001, the City installed a green roof on City Hall. Studies revealed the air temperature to be 78°F cooler than the temperature on the traditional black tar roof of the Cook County half of the building.



Chicago is creating a Climate Ready Checklist for natural area managers to help them take climate change into account in future planning.



CHICAGO  
RESIDENTS  
ARE  
MAKING A  
DIFFERENCE



When she leaves the house, one Roseland resident disconnects all of her non-essential appliances. Her monthly bill has been reduced by \$100.



One Pilsen resident learned to conserve water from a 1970s TV campaign in Mexico, called "*Cierrale!*" ["Turn it off!"], that discouraged wasting water. He said it was as popular as the U.S. "Got Milk?" ads.



Volunteer stewards have been working with the Forest Preserve District of Cook County since 1977 to revitalize Glenview's Harms Woods.



To save money and energy, an electrician/carpenter built this solar water heater for his family's home in Jefferson Park, duplicating what he did at his recreational home in the Polish countryside.

CHICAGO  
ORGANIZATIONS  
**ARE  
MOBILIZING  
THEIR  
COMMUNITIES**



Fernwood United Methodist Church in Roseland composts and encourages community members to donate leaves and food scraps in return for a discount on goods at their farmers' market. The composting provides natural fertilizer for the farmers and the church-run community garden while reducing the amount of landfill waste.



Little Village Environmental Justice Organization (LVEJO) participates in national and international climate justice efforts and leads local campaigns on public transit, water, and clean power. It advocates the closing of Chicago's two coal-fired power plants, including the Fisk plant in Pilsen (see photo).



Blacks in Green (BIG) builds awareness of climate change in South Side communities through "Green-Village-Building" activities that highlight African-American sustainable traditions. These include classes run in partnership with the University of Chicago and cultural activities such as movie discussions, green "expos," and story circles.



The Council of Islamic Organizations' "Green Ramadan" campaign promotes green living and climate action among Chicago Muslims as part of a long-term solution to social disasters in Africa, including drought and famine in Somalia.





The Field Museum is working with organizations in four Chicago neighborhoods to develop diverse models for community-led climate action that others can learn from.



Each project builds on community heritage and other local strengths identified through the Museum's research to implement strategies from the region's two climate action plans that simultaneously address community concerns. For more information and tools, visit:

[climatechicago.org](http://climatechicago.org)  
[fieldmuseum.org](http://fieldmuseum.org)

**FOREST GLEN**

In Forest Glen, Boy Scout and Girl Scout troops are building upon the community's strong history of environmental youth leadership to promote water conservation and climate-friendly gardening.

**PILSEN**

In Pilsen, partners are building on a long tradition of gathering outdoors to transform a daycare center's vacant lot into a native garden where children can play and families can learn about climate change.

**BRONZEVILLE**

In Bronzeville, community organizations are building on the neighborhood's African-American history to develop culturally meaningful gardens, healthy soul food cooking events, and "green" tours.

**SOUTH CHICAGO**

In South Chicago, as part of a City-funded community retrofit project, youth organizations are creating a community-wide exhibit highlighting the Southeast Side's transformation "From Steel to Green, Pollution to Solution."

HOW WILL  
YOUR  
COMMUNITY  
LEAD THE  
WAY?  
LEARN MORE  
ABOUT HOW  
YOU CAN  
MAKE A  
DIFFERENCE

## General Resources:

**Pew Center on Global Climate Change** provide a series of brief reports entitled Climate Change 101: Understanding and Responding to Global Climate Change.

[http://www.pewclimate.org/global-warming-basics/climate\\_change\\_101](http://www.pewclimate.org/global-warming-basics/climate_change_101)

**Skeptical Science** presents common climate skeptic arguments and gives suggestions on how to refute them with real findings from climate science.

<http://www.skepticalscience.com/argument.php>

**Wisconsin Initiative on Climate Change Impacts** presents adaptation science and strategies.

<http://www.wicci.wisc.edu/adaptation.php>

**Alliance for Climate Education** works with youth, and its website offers dynamic educational tools on climate change.

<http://www.acespace.org/>

**WE ACT for Environmental Justice** is a national leader of the climate justice movement and convenes the Environmental Justice Leadership Forum on Climate Change, comprising over 35 organizations.

<http://www.weact.org/>

<http://www.weact.org/Programs/MovementBuilding/TheWEACTforClimateJusticeProject/AdvancingClimateJusticeConference/tabid/330/Default.aspx>

**NOAA's Essential Principles of Climate Science** aims to increase the public's understanding of basic climate science, and provides educators with entry points into discussions of climate change.

[http://climate.noaa.gov/education/pdfs/ClimateLiteracyPoster-8\\_5x11\\_Final4-11.pdf](http://climate.noaa.gov/education/pdfs/ClimateLiteracyPoster-8_5x11_Final4-11.pdf)

**The Will Steger Foundation** offers resources on designing climate change curricula, lesson plans, and educational activities for a range of age groups.

<http://www.willstegerfoundation.org/curricula-resources#ccc>

## Chicago Resources:

**Chicago Conservation Corps Blog** provides up-to-date information about a range of environmental and climate action initiatives and events in the Chicago area.

[www.chicagoconservationcorps.org](http://www.chicagoconservationcorps.org)

**The Chicago Climate Action Plan (CCAP)** is the City of Chicago's comprehensive and detailed strategy to lower heat trapping emissions that cause climate change.

<http://www.chicagoclimateaction.org/>

**The Climate Action Plan for Nature (CAPN)**, created by the Chicago Wilderness conservation alliance, addresses climate change impacts on nature in the four-state Chicago Wilderness region. It complements the Chicago Climate Action Plan.

[http://www.chicagowilderness.org/pdf/CAPN\\_Brochure-FINAL\\_singlepages\\_WEB\\_6.21.10.pdf](http://www.chicagowilderness.org/pdf/CAPN_Brochure-FINAL_singlepages_WEB_6.21.10.pdf)

**Climate Action Plan for Nature – Community Adaptation Strategies** is a companion piece to the Chicago Wilderness Climate Action Plan for Nature (CAPN). The Strategies document lays out five strategies that communities and residents can undertake to help the region's nature adapt to climate change.

[climatechicago.fieldmuseum.org](http://climatechicago.fieldmuseum.org)

**Union of Concerned Scientists Citizens - Action Alerts in the Midwest** guides the public in advocating for local and regional policy change on climate-related issues important to the Midwest.

<http://www.ucsusa.org/action/alerts/midwest-actions.html>



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Global Warming is on our hands.

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