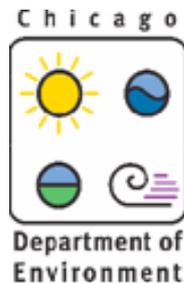
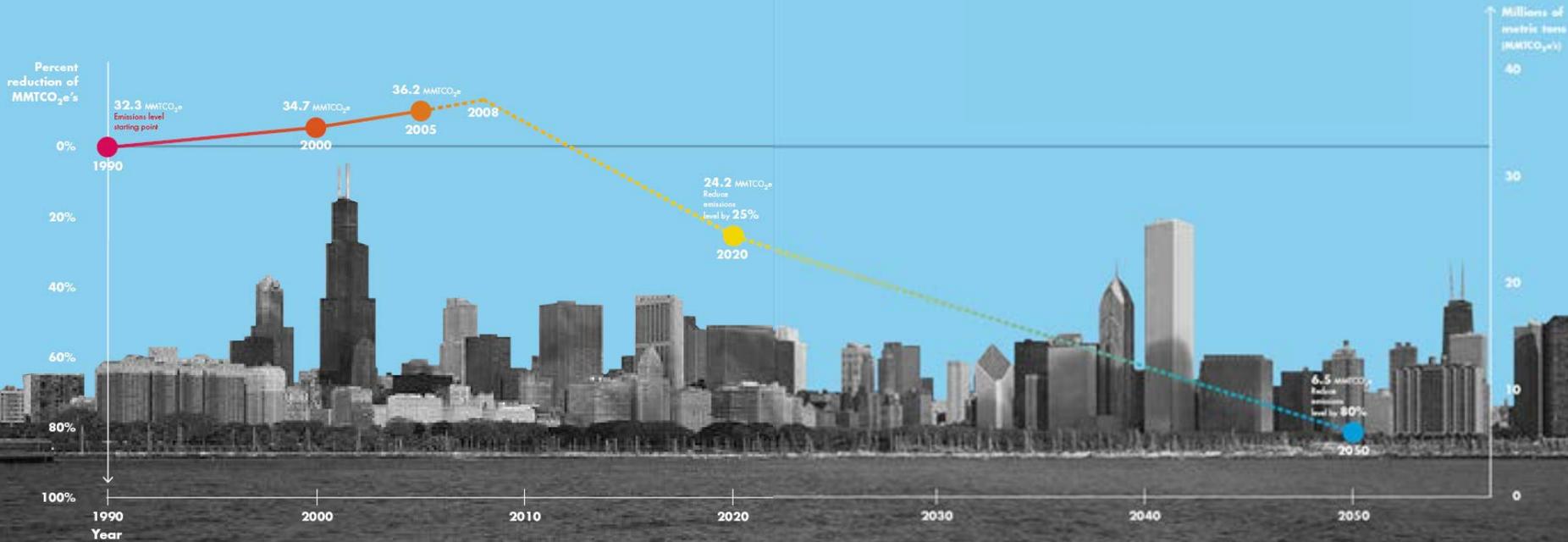


CHICAGO CLIMATE ACTION PLAN

Climate Adaptation Overview



City of Chicago
Rahm Emanuel, Mayor



Chicago Greenhouse Gas Emissions Reduction Goals:

- 25% reduction from 1990 levels by 2020
- 80% reduction from 1990 levels by 2050



FIVE STRATEGIES

ADAPTATION

- Built Environment
- Natural Environment
- People

CHICAGO CLIMATE
ACTION PLAN

ADDRESSING THE CHALLENGE
OF CLIMATE CHANGE

ENERGY EFFICIENT BUILDINGS
8 ACTIONS

CLEAN & RENEWABLE ENERGY SOURCES
5 ACTIONS

IMPROVED TRANSPORTATION OPTIONS
10 ACTIONS

REDUCED WASTE &
INDUSTRIAL POLLUTION
3 ACTIONS

ADAPTATION

=
35 WAYS

TO ENSURE A RESILIENT CITY

Top Six Climate Change Impacts for Chicago

- **“Migrating” seasons:** By century’s end, Chicago winter could feel like Pittsburgh and summers could feel like Knoxville or, under high emissions, Baton Rouge.
- **Temperature increase:** As compared to a 1961-1990 avg. and under high & low emissions, 2070 winters could be 3-5° Celsius (C) warmer and 2070 summers could be 3.5-7.5° C warmer. Under high emissions, the Midwest could experience ~45-85 days over 35° C by century’s end.
- **Heat-related morbidity:** By 2085, there could be 450-1,200 heat-related Chicago metro-area deaths per year, (per 6M people in the Chicago-metro area).

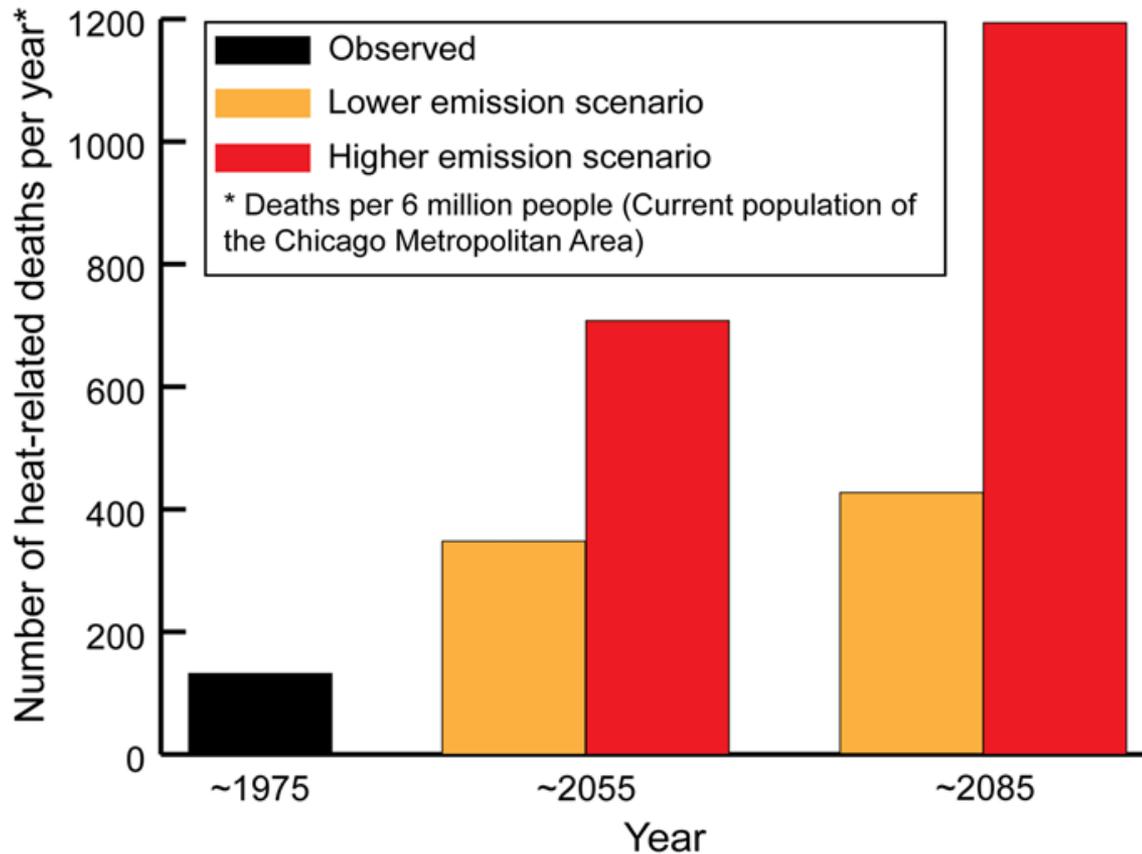
Top Six Climate Change Impacts for Chicago

- **Changed precipitation patterns:** As compared to the 1961-1990 avg., spring and winter in 2070, could have 20-35% more precipitation events. Summers could have 10-15% less.
- **Great Lake impacts:** Long-term trends discern, under high emissions, that the avg. Lake MI level could decrease by up to 1.5' by century's end. The Great Lakes will experience an increased likelihood of extreme storms, e.g., seiches.
- **Plant Hardiness Zone shift:** The Midwest's Zones have shifted and will continue to shift $\frac{1}{2}$ to 1 zone every 30 years. From 1990-2006, Northern Illinois' shifted, representing a 10° F range change in the lowest temperature of the year.

Health: Increasing heat-related risks

Chicago Metropolitan Area Heat-Related Deaths

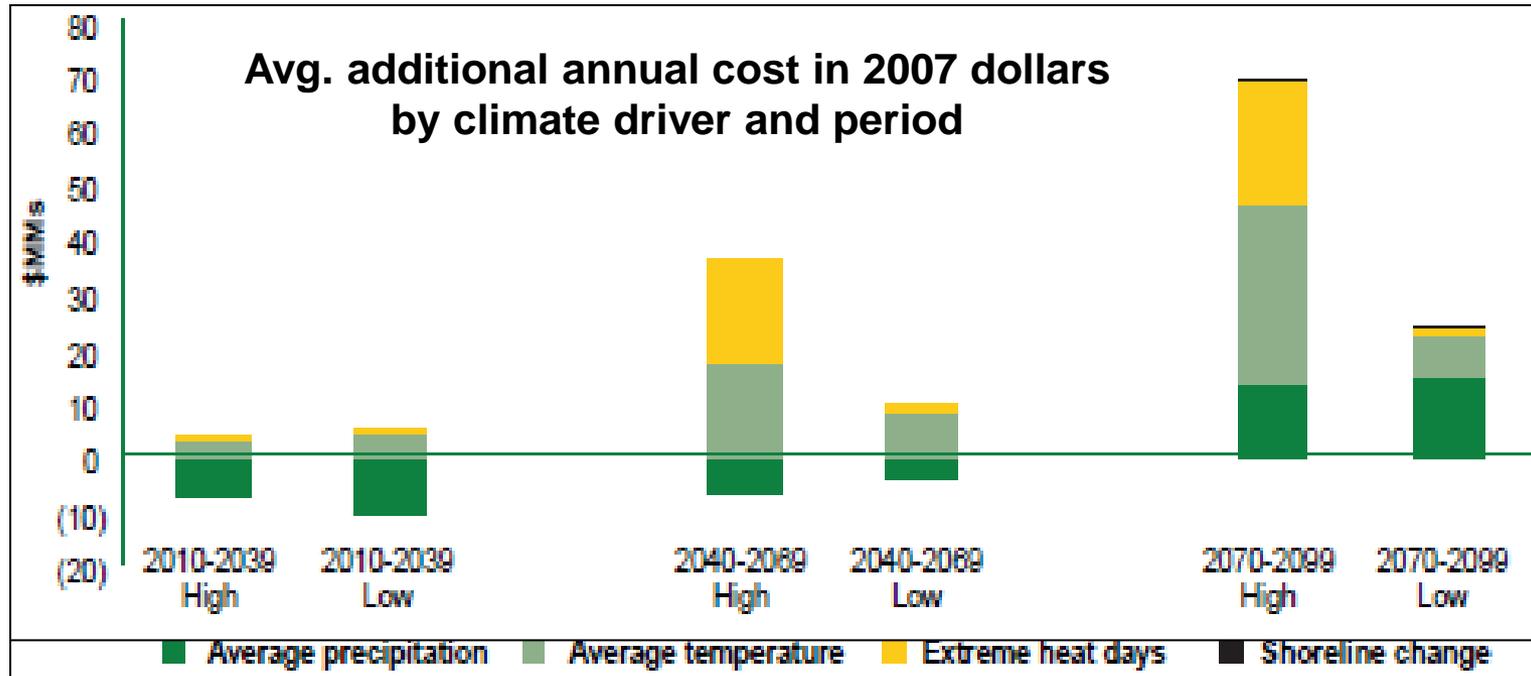
Observations and projections under multiple emissions scenarios



Source: Hayhoe et al. *Journal of Great Lakes Research*, 2010.

Economic Risk of Climate Impacts

The City, in partnership with Oliver Wyman, analyzed economic impacts on City infrastructure, key departments and budgets



1. Areas & type of financial impact (e.g. capital investment, operational costs)
2. Primary impact drivers, (e.g. heat, precipitation)
3. Nature of the impact, (e.g. deterioration of building facades)
4. Magnitude of potential impacts

Chart source: Oliver Wyman, Corporate Risk Case Study, 2008.

Adaptation Implementation Prioritization

The City, in partnership with MWH Global, prioritized adaptation actions by risk, timing, and department

- Identify adaptation strategies and develop implementation tactics to reduce vulnerability to:
 - Extreme heat
 - Extreme precipitation
 - Buildings/infrastructure/equipment
 - Ecosystem degradation

125 Potential Adaptation Actions Organized by Risk, Timing and Department																	
Impact	Risk	Timing **	Construction, Buildings & Property	Tourism	Environment	Fire	Fleet Management	Housing	Human Services	Emergency Management	Police	Public Health	Streets and Sanitation	Transportation	Water Management	Parks and Open Space	Storm Water Management
Need to get greater penetration of A/C to residential units (particularly high risk areas)	Moderate	Near	x					x				x					
Damage to property and increasing cost of insurance due to stormwater	Moderate	Mid	x			x			x			x	x		x		x
Higher costs associated with managing invasive species	Moderate	Mid			x										x	x	
Increased potential for shoreline erosion/ storm damage	Moderate	Mid			x						x						x
Possibility of higher frequency/severity of storms	Moderate	Mid				x				x	x		x				x

Chart Source: MWH, Chicago Area Climate Change Quick Guide, 2008.

CCAP's Adaptation Drivers

- Model City adaptation implementation for CCAP scale-out
- Leverage City business as usual to serve adaptation goals
- Prioritize vulnerable communities
- Balance the need for research with the need to act
- Enhance collateral benefits of climate change mitigation

City Department CCAP Lead By Example (LBE)

- 20 work plans created for Departments & Agencies
- 68 CCAP adaptation initiatives managed by green staff
- Milestones approved by Commissioners and presented to Mayor's Office

Illustrative 2010-2011 LBE Adaptation Initiatives

Dept./ Agency	Action	Initiative	Top 5?	Owner	Q3-2010 Milestone	Status
Aviation	Prepare people	Improve customer service for stranded passengers in anticipation of frequent and high intensity storm events		Jane Doe	Develop a plan to improve the passenger assistance program	<i>Delayed</i>
Environment	Prepare natural environment	Convene Ecosystem Adaptation Work Group to prepare Chicago's landscapes for anticipated climate changes	x	Jessica Doe	Convene Ecosystem Adaptation Working Group to discuss priorities	<i>On Track</i>
General Services	Prepare built environment	Ensure that cooling centers have adequate back-up generation		John Doe	Emergency generation is in place	<i>Complete</i>

CCAP Adaptation Evolution

2007

- **Understood the climate science:** Assess climate impacts
- **Assessed economic risk:** Project City cost of no action at -\$2.54B in high-emissions
- **Developed adaptation action framework:** Prioritize actions by risk & timing

2008

- **Created 5 climate impacts working groups:** 21 departments & agencies create 39 “Tactics” for 5 groups
- **Launched CCAP:** Mayor, September

2009

- **Created CCAP department work plans:** Departments commit to adaptation actions through work plans

2010

- **Redefined adaptation targets:** Define 3 targets
- **Hosting “Lessons Learned” meetings:** Improve responses to extreme weather events
- **Formed Adaptation Advisory Group:** Will provide guidance and oversight

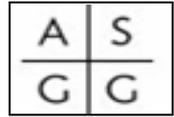


CCAP Research Teams & Strategic Consultants



University of Illinois
Don Wuebbles &
Katharine Hayhoe

Adrian Smith &
Gordon Gill Architecture



Center for
Neighborhood
Technology

A.T. Kearney



Oliver Wyman

Bain



MWH Global

Boston Consulting
Group



Regional Economics
Applications
Laboratory

Civic Consulting
Alliance



ICLEI – Local
Governments for
Sustainability

Environmental Law
and Policy Center



The Field Museum



Global Philanthropy
Partnership



Katzenbach/Booz



CCAP Adaptation Target: Built Environment

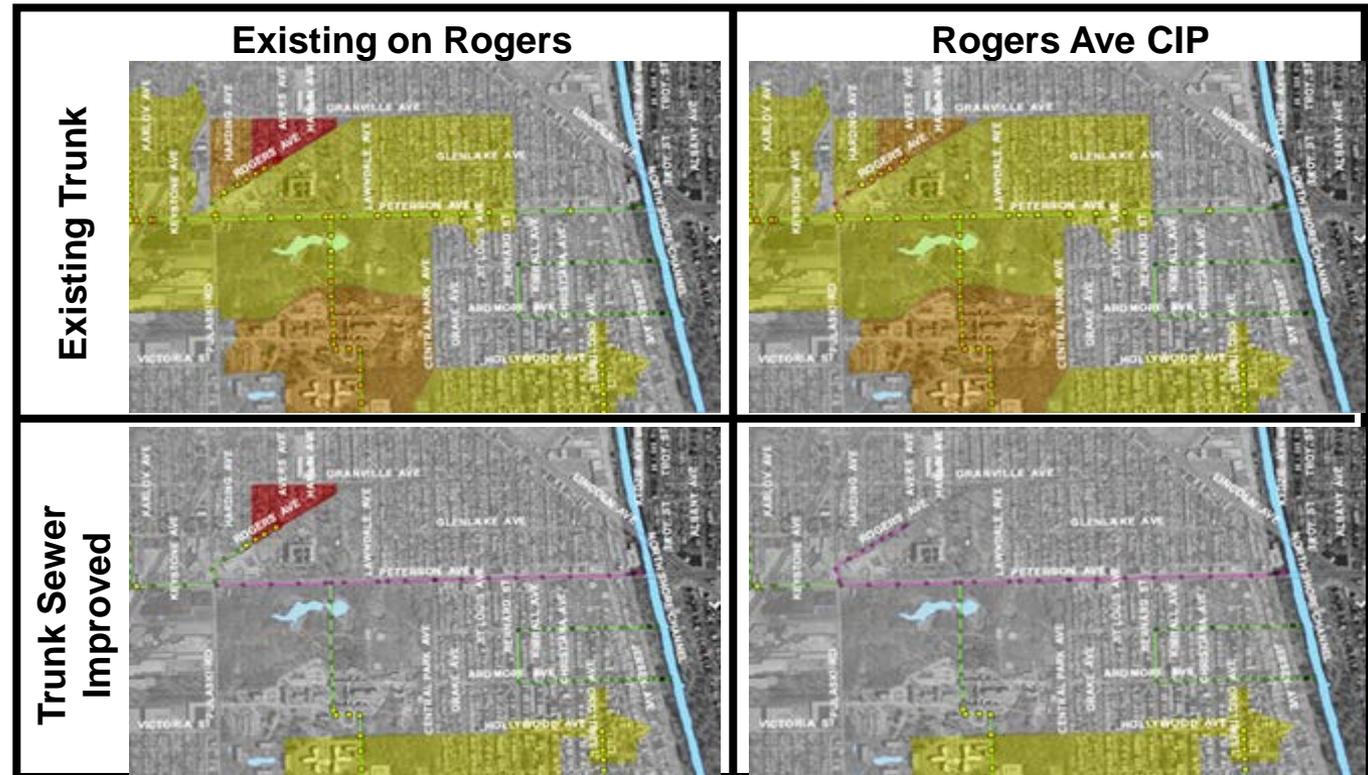
Current
Progress

Climate impacts

Example actions to prepare the built environment

Temperature	<ul style="list-style-type: none"> Piloted high-albedo materials for roofs and streetscapes
Precipitation	<ul style="list-style-type: none"> Developed a trunk sewer model for 775 miles of pipe to prioritize resources
Infrastructure	<ul style="list-style-type: none"> Reinvigorated catchbasin control

Stormwater management: Chicago's comprehensive sewer model



CCAP Adaptation Target: Natural Environment

Climate impacts **Example actions to prepare the natural environment**

Temperature	<ul style="list-style-type: none"> Created the Urban Forest Agenda and the Chicago Trees Initiative
Water Systems	<ul style="list-style-type: none"> Expanded use of wetland water control structures, e.g., establish stormwater parks
Ecosystems	<ul style="list-style-type: none"> Crafted the Invasive Species Ordinance

Chicago's Urban Forest Agenda

Chicago Trees Initiative



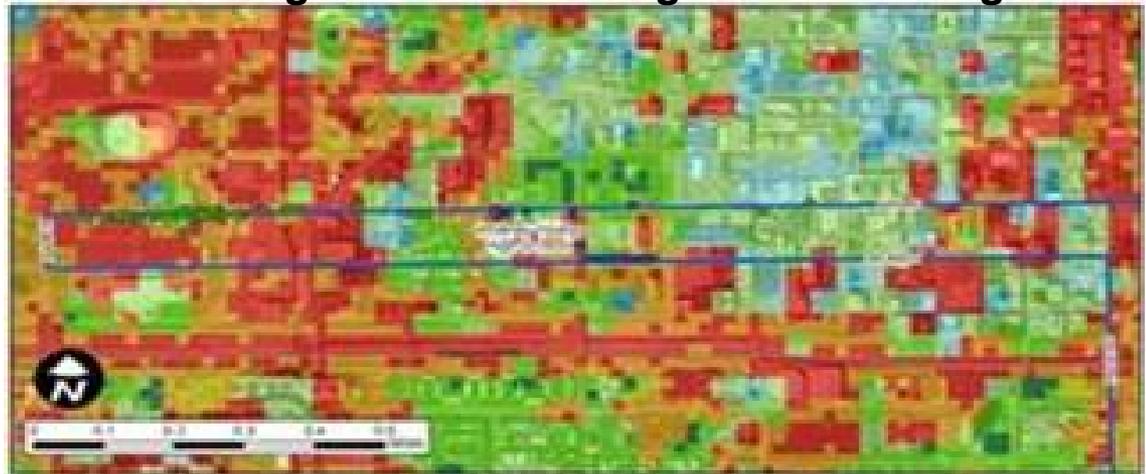
CCAP Adaptation Target: People

Climate impacts

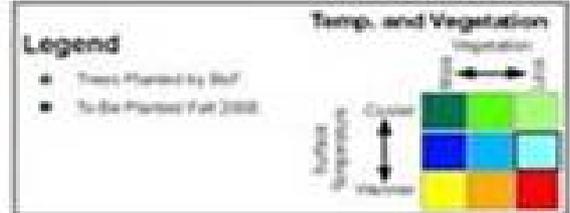
Example actions to prepare people

Temperature	<ul style="list-style-type: none"> Prioritized tree planting initiatives to mitigate urban heat island (UHI) effect
Health	<ul style="list-style-type: none"> Created Air Quality Action Agenda to, e.g., decrease ground level ozone CDPH seeking epidemiologist to develop heat-related illness and death surveillance system
Ecosystems	<ul style="list-style-type: none"> Developed Climate Action Plan for Nature, communicated native specie planting and habitat preservation

Addressing UHI island through increased vegetation



Street Trees Planted along LaSalle Bank Chicago Marathon Course



Adaptation Advisory Group Scope

Advisors helped counsel CCAP adaptation implementation best practice

1. Identify metrics to measure adaptation success
2. Evaluate existing adaptation responses
3. Prioritize future adaptation responses
4. Provide communications input
5. Identify existing resources and funding needs
6. Advise on gaps

Mitigation Performance Indicators

- CCAP created a formal system for measuring mitigation action progress
- CCAP aims to measure adaptation progress for internal decision-making and illustrating progress to the public

Illustrative CCAP 2008-2009 dashboard of progress by action

Chicago Climate Action Plan (CCAP) 2008-09 Dashboard Progress by Action - WORKING DRAFT

Action	Cumulative Implementation				Units	Metric Tons of Carbon Dioxide Equivalent (MMT CO ₂ e) Gases Mitigated		2008-2009 Progress	
	2008 Actual	2009 Target	2009 Goal	2009 Units		Progress to goal	2009 Goal	2008 Actual	2009 Target
1 Commercial and industrial retrofits	393	2,253	9,200	Buildings	0.04	1.30	0.04	1.30	
2 Residential retrofits	13,431	24,915	400,000	Dwellings	0.02	1.44	0.02	1.44	
3a Appliance trade-ins	2,203	18,937	187,000	Appliances	0.01	0.96	0.01	0.96	
3b Light bulbs and fixtures	1,17	TBD	4,01	Fixtures	0.07	0.23	0.07	0.23	
4 Curb-side water	11,496	TBD	29,851	Million gallons water per year	0.02	0.94	0.02	0.94	
5 Update city energy code	203	453	421,073	Buildings	0.00	1.13	0.00	1.13	
6 New guidelines for renovations	TBD	TBD	TBD	TBD	0.00	0.35	0.00	0.35	
7a Trees	840	3,200	5,400	Acres of canopy added since 2008	0.00	0.02	0.00	0.02	
7b Green Roofs**	1.83	TBD	4.50	Millions of sq. ft. added since 2007	0.01	0.02	0.01	0.02	
8a Residential savings challenge	5,788	8,788	585,000	Participants	0.02	0.61	0.02	0.61	
8b Green Office Challenge	73,000	142,000	327,142	Hours	0.04	0.20	0.04	0.20	
11 Build renewable electricity	11	278	4,167	MW	0.01	3.00	0.01	3.00	
12/ Distributed generation of renewable electricity	2,051	-	-	MW	0.00	1.40	0.00	1.40	
14/ Transit mode in District A	37.8	37.2	719.4	Millions of miles added since 2007	0.04	0.83	0.04	0.83	
15 Transit oriented development	TBD	TBD	TBD	TBD	0.00	0.63	0.00	0.63	
17a Working**	5.83	8.24	11.41	% of commuters	0.00	0.05	0.00	0.05	
17b Walking**	1.04	1.12	1.00	% of commuters	0.00	0.00	0.00	0.00	
					0.02	0.34	0.02	0.34	
					0.02	0.25	0.02	0.25	
					0.00	0.55	0.00	0.55	
					0.00	0.68	0.00	0.68	
					0.01	0.01	0.01	0.01	
					0.00	1.61	0.00	1.61	
					0.02	0.94	0.02	0.94	
					0.00	0.74	0.00	0.74	
					0.04	0.24	0.04	0.24	

* Cannot be added due to overlapping effects
 ** 2008 data for these actions are not yet available and thus number represents 2008 progress
 *** Actions 9 and 10 have been eliminated from the plan as the City lacks direct or indirect leverage on these actions
 (Units): Non-additive actions
 (Units): Purple: Actions with adaptation benefits as well

Action	Cumulative Implementation				Units	Metric Tons of Carbon Dioxide Equivalent (MMT CO ₂ e) Gases Mitigated		2020 CCAP Goal (MMT CO ₂ e) *	
	2009 Actual	2010 Target	2020 Goal	Units		Progress to goal	2020 Goal	Achieved	Goal
1 Commercial and industrial retrofits	393	2,253	9,200	Buildings	0.04	1.30	0.04	1.30	
2 Residential retrofits	13,431	24,915	400,000	Dwellings	0.02	1.44	0.02	1.44	

Additional Actions		2009 Actual	2010 Target	2020 Goal	Units
Adaptation	a Morbidity due to extreme heat	0	0	0	Number of Persons
	b Basement water overflow complaints**	7,806	TBD	TBD	Number of overflows
	c High biodiversity areas within the city	3,815	TBD	TBD	Acres

Adaptation Performance Indicators

Potential measures

- **Climate change measures**
 - Increased annual avg. Chicago temperatures
 - Number of days over 95° F per year
 - Number of seasonal precipitation events per year
- **Climate readiness measures**
 - Stormwater catch-basin restrictors in place (built environment)
 - Permeable pavement built (built environment)
 - Water control structures sized for extreme precipitation (natural environment)
 - Urban Heat Island area planted with climate ready trees (natural environment)
- **Surveillance measures**
 - Heat-related fatalities per year (people)
 - Street closure hours per year due to flooding (people, built environment)
 - Power shut down hours per year (people, built environment)
 - Heat-related school and labor absences per year, (people)
 - Beach swim ban and advisory days per year, (natural environment)

CCAP Immediate Priorities

- Refine adaptation working groups and support leaders
- Leverage existing City processes and plans to serve adaptation goals
- Prioritize adaptation implementation for Chicagoans most vulnerable to climate change impacts
- Learn from other Cities' best practice

Drought Implications for Chicago

- Stakeholders
- Potential actions
- Need to determine next steps

Thank You

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