



Chicago Metropolitan
Agency for Planning

Climate change and regional comprehensive planning

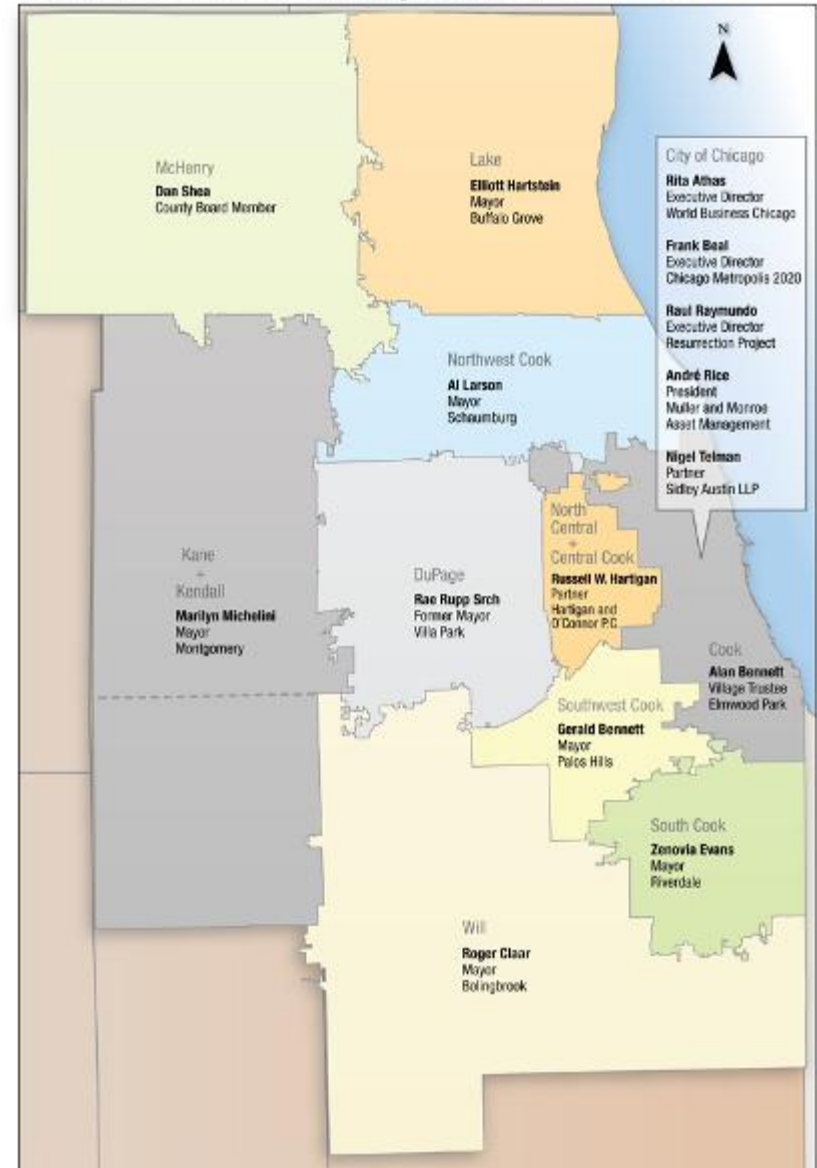
Jesse A. Elam
October 28, 2009



Who we are

- Established in 2005 by the State of Illinois with support from the region's mayors.
- Central purpose is to better integrate planning for land use and transportation.
- Merged the Northeastern Illinois Planning Commission (NIPC) and Chicago Area Transportation Study (CATS).

CMAP Board Composition



Major needs

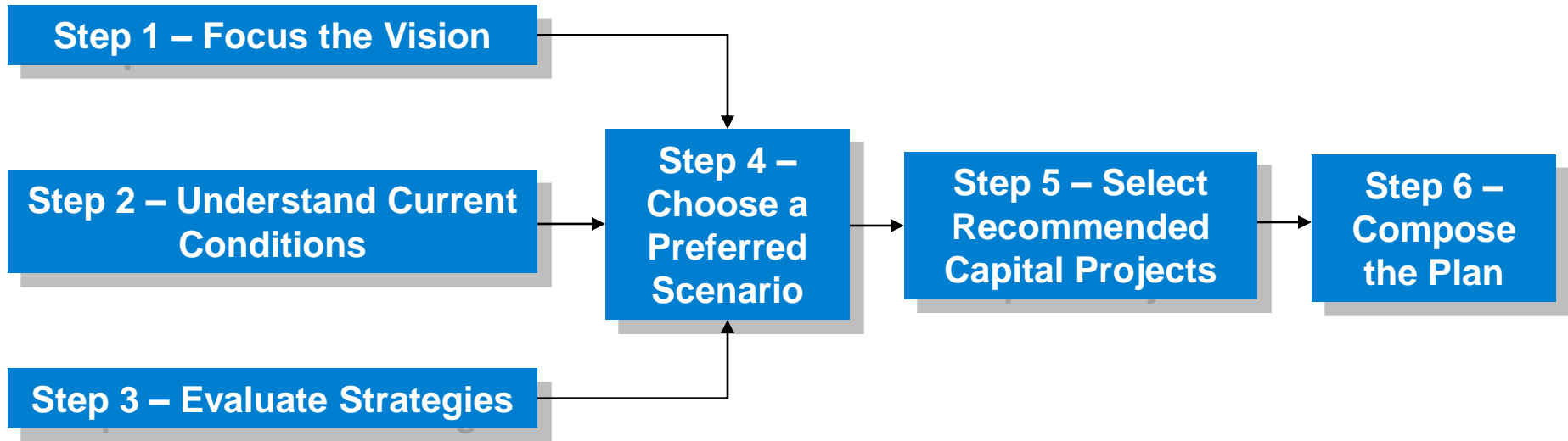
- House 2.8 million more people by 2040
- Make wise transportation investments that mitigate congestion
- Deal with potential water shortages
- Protect air quality
- Support economic development
- Protect important open space and natural resources
- Aggressively shape a sustainable future rather than react to ongoing development trends

Outline

- Overview of GO TO 2040 scenario development
- Potential effects of climate change
- Baseline GHG inventory
- Effects of strategies to reduce GHG emissions



GO TO 2040 Process



Scenario planning

- Alternative futures for the region
- Composed of:
 - Actions/policies
 - Investments
- Compared against a reference case
- Comparison of benefits and costs
 - Financial plan
 - Indicators
- Major capital projects selected after preferred scenario adoption



GO TO 2040 Scenarios

- Reference
 - Current trends in growth patterns (household and employment location)
- Reinvest
 - Major transportation investments in already developed areas → higher densities of population and employment in those areas.
- Preserve
 - Low-capital improvements to transportation systems, protection of additional open space, and protection of existing housing stock → moderate density increases in already developed areas.
- Innovate
 - Technology and policy-based improvements in transportation systems, reduced environmental impacts from land development practices, etc. → low-density growth more likely.

Reinvest



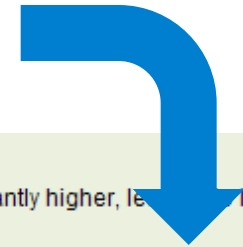
Preserve



Innovate



Scenario indicators



<http://www.goto2040.org/scenarios/>

<u>Imperviousness and runoff</u>	Improves	10% less imperviousness, and 13% less in sensitive watersheds	Development densities were significantly higher, leading to less conversion of undeveloped land.
<u>Water use</u>	Improves	51% less growth in residential water use	Significantly higher development densities, or significantly smaller lots. Adoption of <u>conservation BMPs</u> by 10% of eligible households.
Energy and greenhouse gas emissions			<i>Coming soon</i>
<u>Air quality</u>	Worsens slightly	1% to 7% more emissions	Additional auto travel occurred in this scenario, largely because of the <u>arterial and expressway improvements</u> that were included.
<u>Congestion</u>	Improves greatly	45% less congested VHT; 40% less congested VMT	A number of dramatic <u>transportation infrastructure improvements</u> were made which improved travel conditions for all modes. Capacity additions on arterials and expressways, in particular, reduced vehicle hours traveled in congestion, and transit improvements shifted some travel to transit.
<u>Mode share</u>	Improves slightly	10% more transit, walking, and biking trips	Transit, walking and biking were increased by use of <u>transit oriented development</u> strategies. <u>Transportation infrastructure improvements</u> including adding significant capacity to roadways led to more auto trips as well.

Reinvest

- *Higher density development near transit services, attracted by:*
 - Increased transit infrastructure investment on existing rail lines, improved transit service frequency
 - Development regulation changes to permit more intense TOD
- *Supporting Chicago's status as nation's freight center:*
 - systematic freight operations and infrastructure improvements
 - Workforce development activities to ensure that the region has a trained workforce in the freight industry
 - Targeting state economic incentives to freight and related industries
- *Beyond reinvesting in the region's transit and freight infrastructure:*
 - Improve arterial and expressway operations, located so that they do not counteract the urban design activities occurring near TOD
 - Ensure efficient access to global networks, through interregional transportation

Preserve

- *“Complete streets” approach, which includes:*
 - bicycle and pedestrian improvements
 - access management programs, and improvement of signal timing on arterials
- *Significant transit improvements include:*
 - increasing transit service frequency without major changes to facilities
 - the extension of transit service to underserved areas
 - improvement of paratransit service
- *Aided by other low-capital, operational improvements:*
 - transportation demand management techniques by employers
 - expansion of car-sharing programs
 - changes in parking policy that encourage shared parking and reduce overall parking
 - context sensitive solutions

Innovate

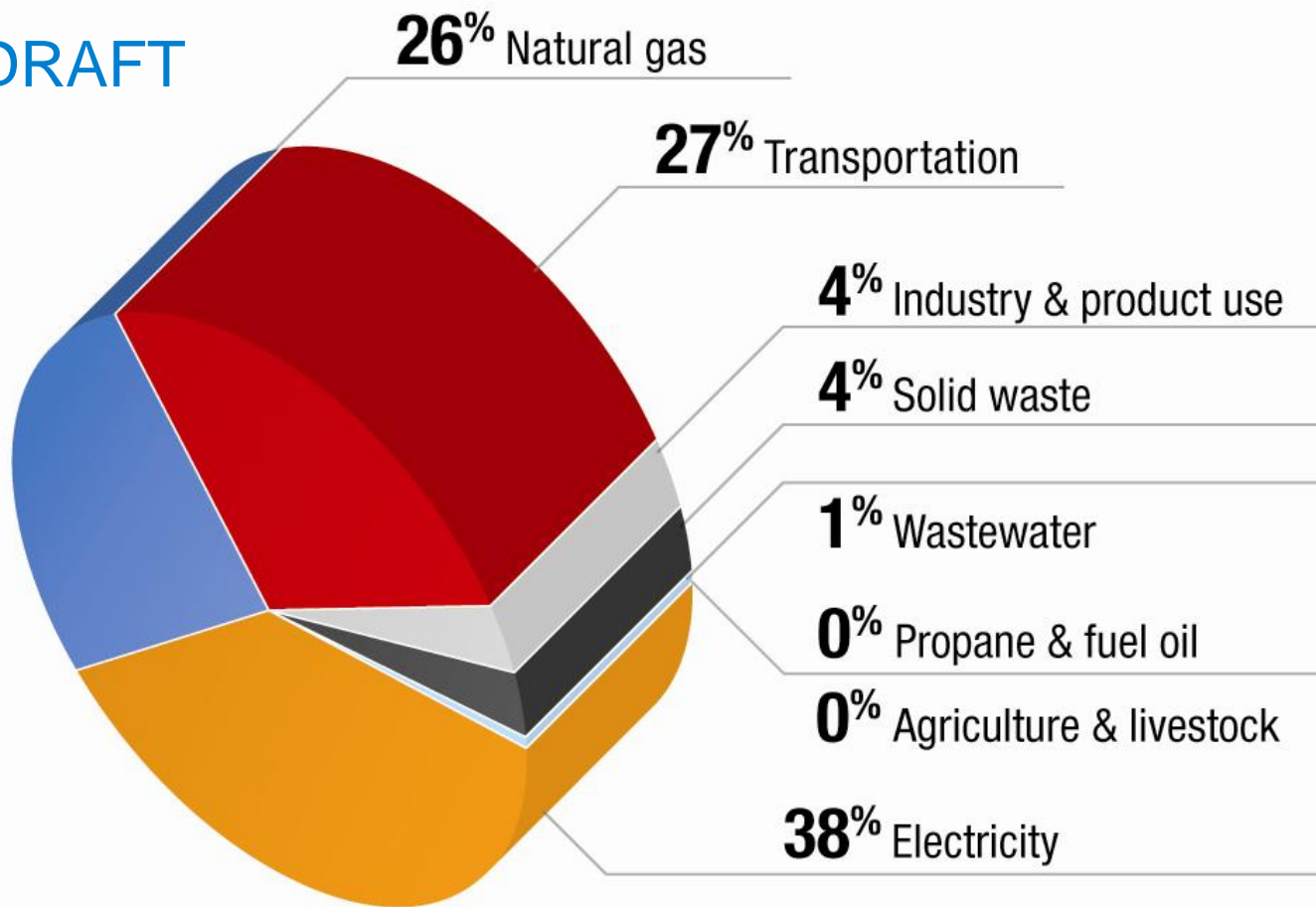
- *Technology-based improvements, including:*
 - Adoption of congestion pricing and variable parking pricing
 - Development of Arterial Rapid Transit (ART) systems to improve bus service regionwide, supported by transit signal priority
 - Advanced signal systems to improve travel conditions for all vehicles
 - Extensive use of alternative fuels
 - Adoption of advanced vehicle technology to speed travel and improve safety
- *Supported by new policies and ideas such as:*
 - Context-sensitive design solutions
 - Innovations in roadway design, including intersection improvements such as roundabouts



2005 CMAP emissions profile without aviation,

total MMT CO₂e: 127.8

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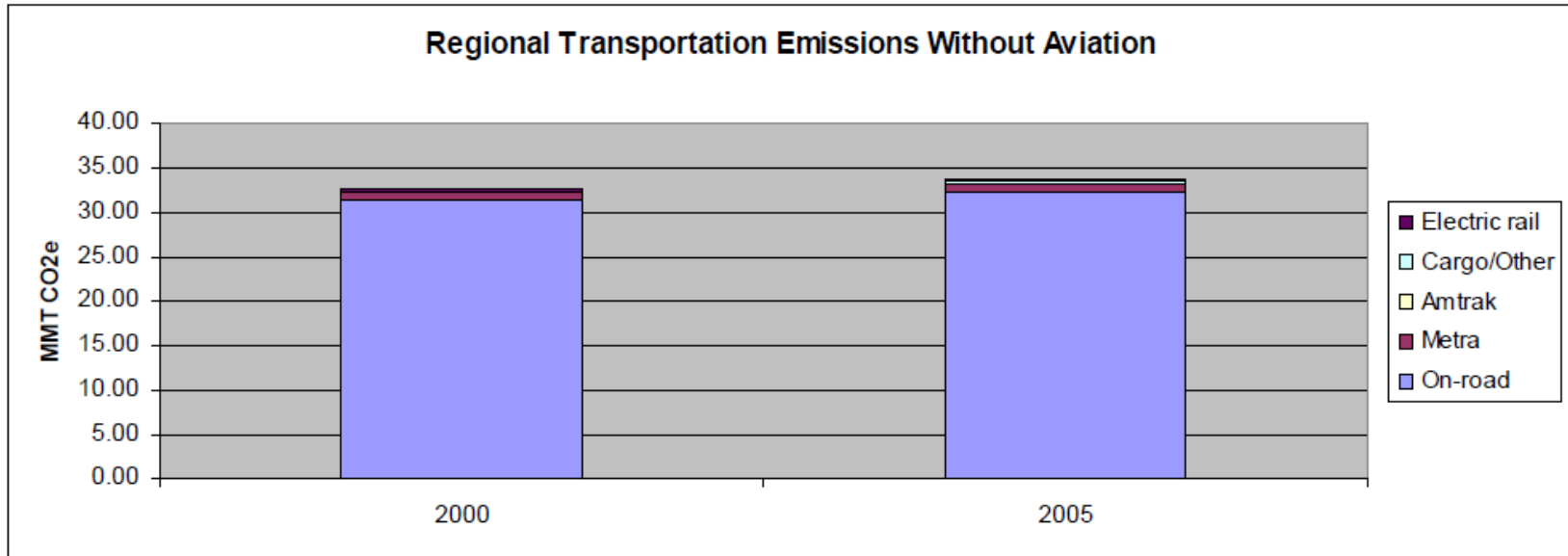


Source: Center for Neighborhood Technology



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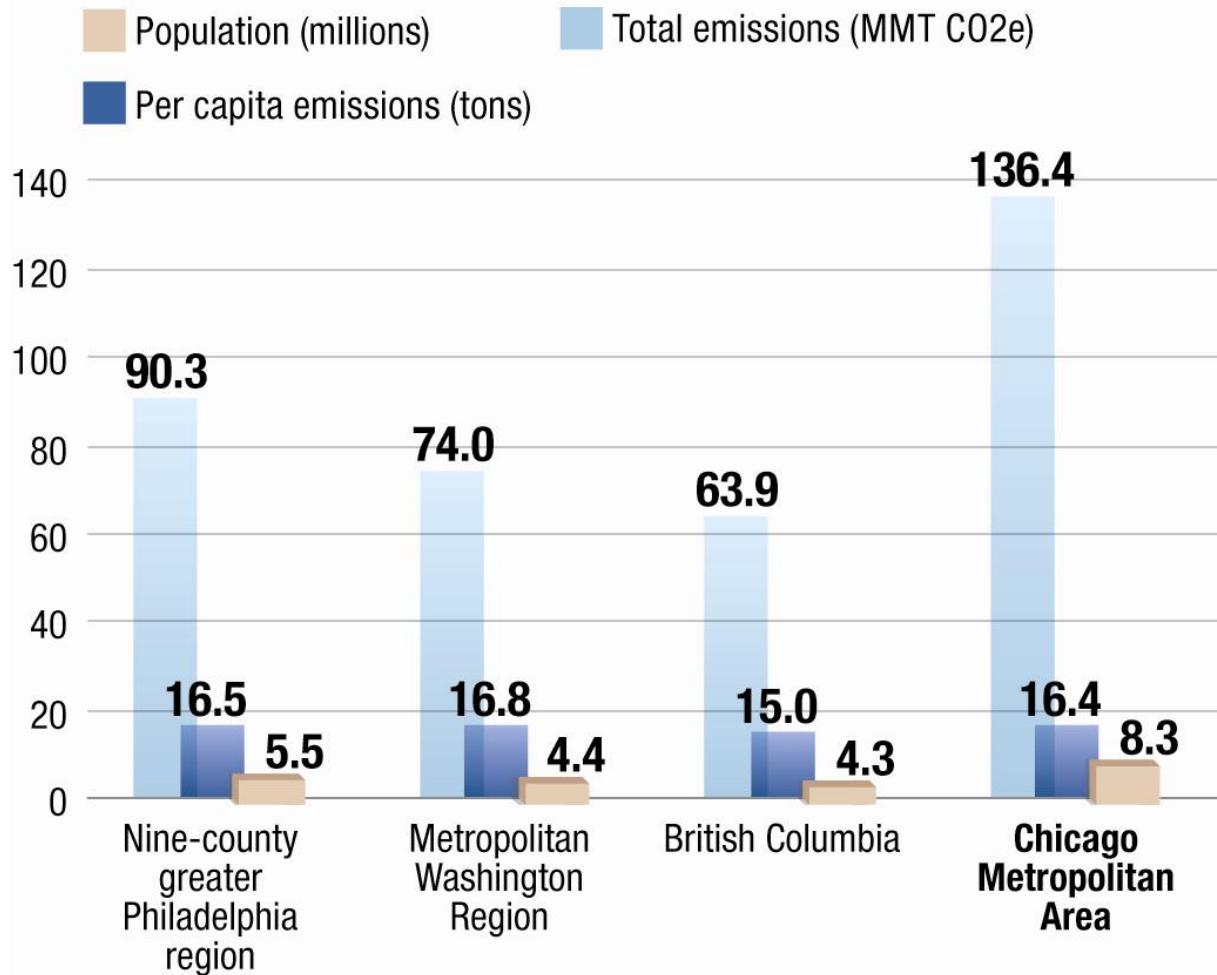
Transportation sector



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95% of surface transportation emissions from on-road sources

Regional total and per capita emissions rate (with aviation)



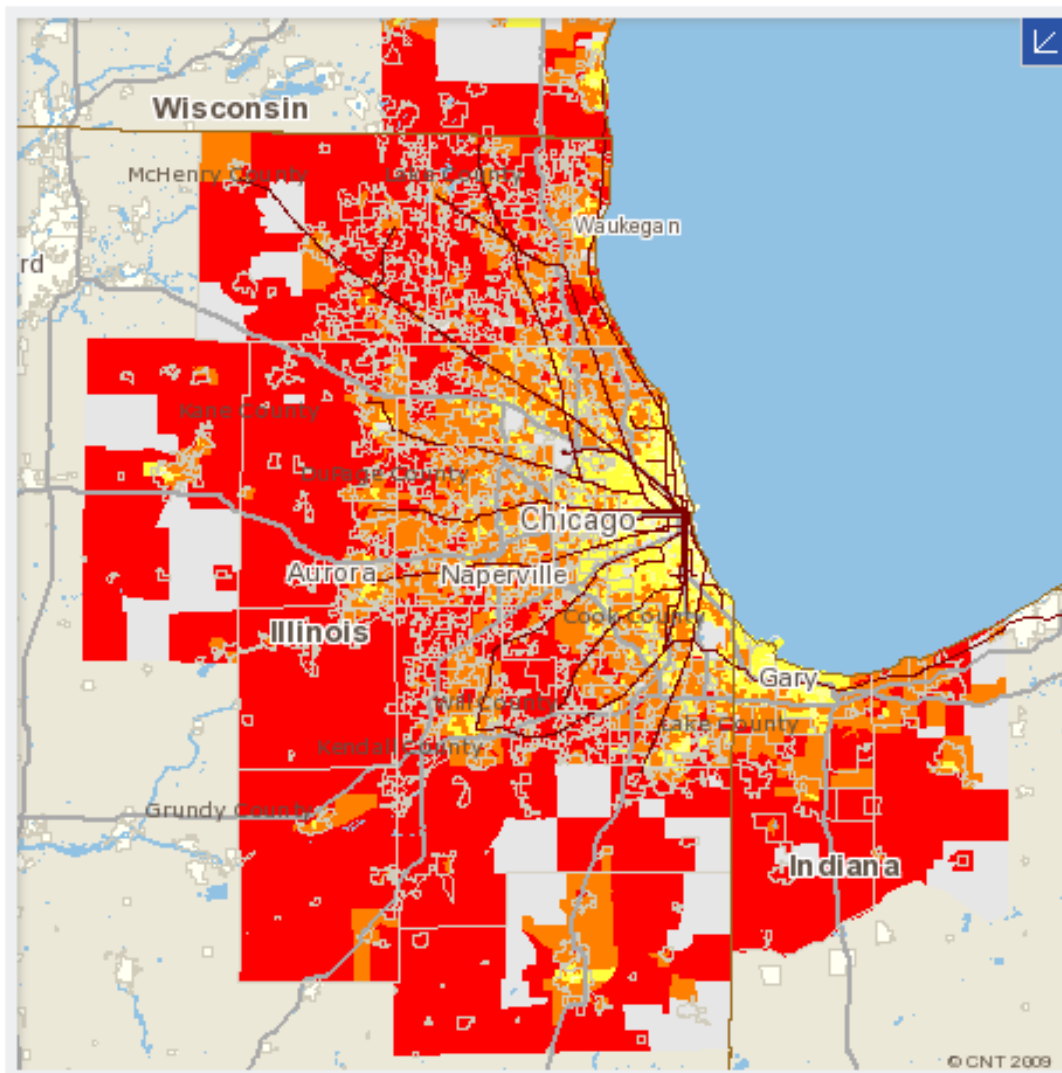
Source: Center for Neighborhood Technology



CO2 per Household From Household Auto Use [CHANGE](#)

- Data not available
- 0 to 3.3 Metric Tons/HH
- 3.3 to 5.1 Metric Tons/HH
- 5.1 to 6.5 Metric Tons/HH
- 6.5 to 8.6 Metric Tons/HH
- 8.6+ Metric Tons/HH

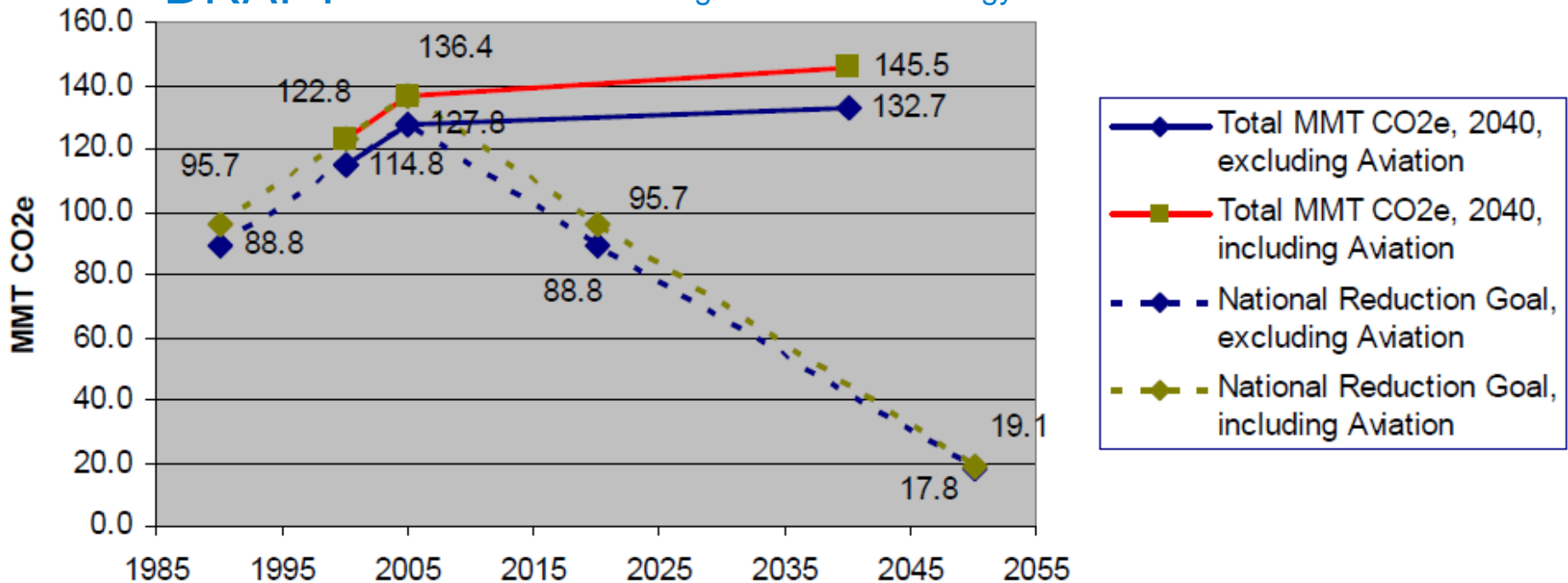
Total CO2 emissions are calculated for the **Block Group** and then divided by the total number of households in the **Block Group**. This method of measuring emissions shows that in areas where there are more households, average emissions tend to be lower per household.



Source: Center for Neighborhood Technology

Forecast and potential goals

DRAFT Source: Center for Neighborhood Technology

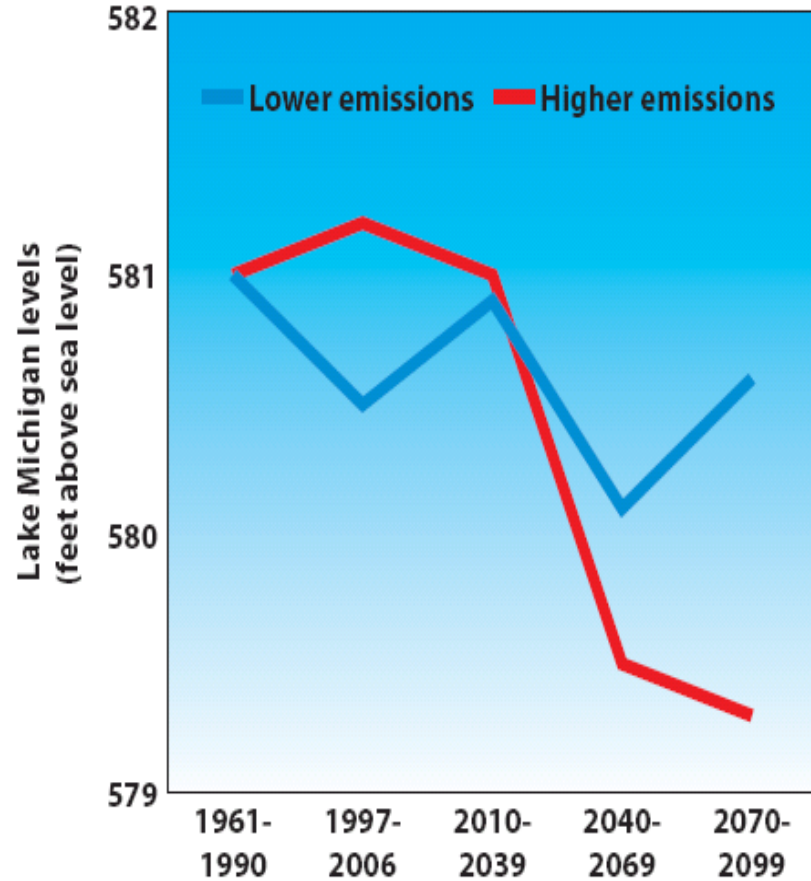
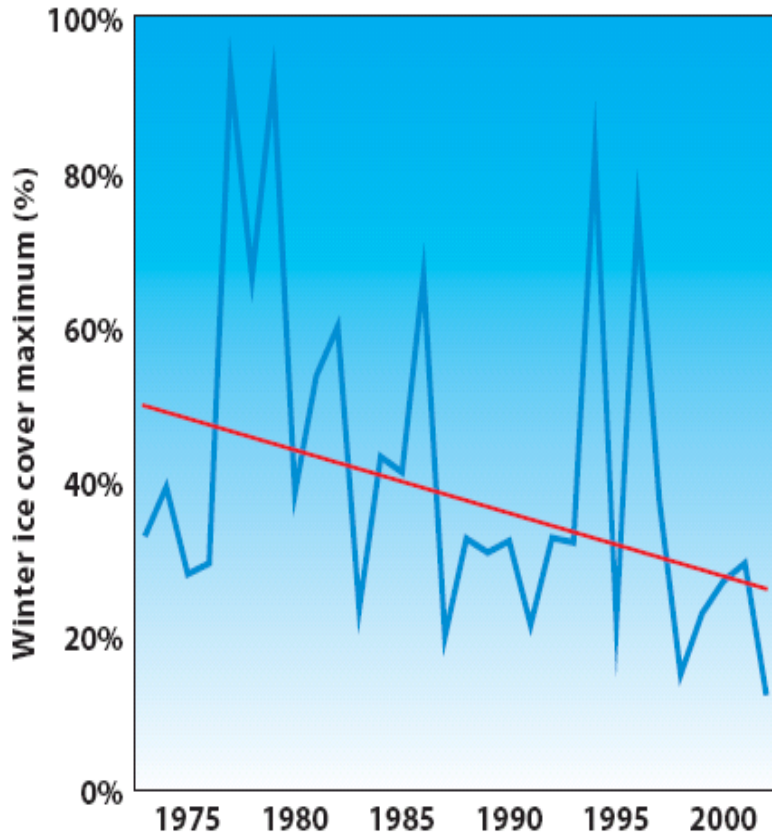


GHG inventory findings

1. Electricity, natural gas, and transportation make up 91% of the region's emissions. Most emission reductions must come from these areas as well.
2. If no action is taken, the region's GHG emissions will continue to grow. The region's annual emissions will grow by 18.4% by 2040.
3. To achieve [proposed national reduction targets](#), annual emissions will have to be reduced 23% in order to meet the goal to reduce annual emissions to 1990 levels by 2020.
4. Household emissions rates vary across the region and are related to urban form; there is potential to mitigate household transportation emissions by encouraging more mixed use compact development in proximity to transit.



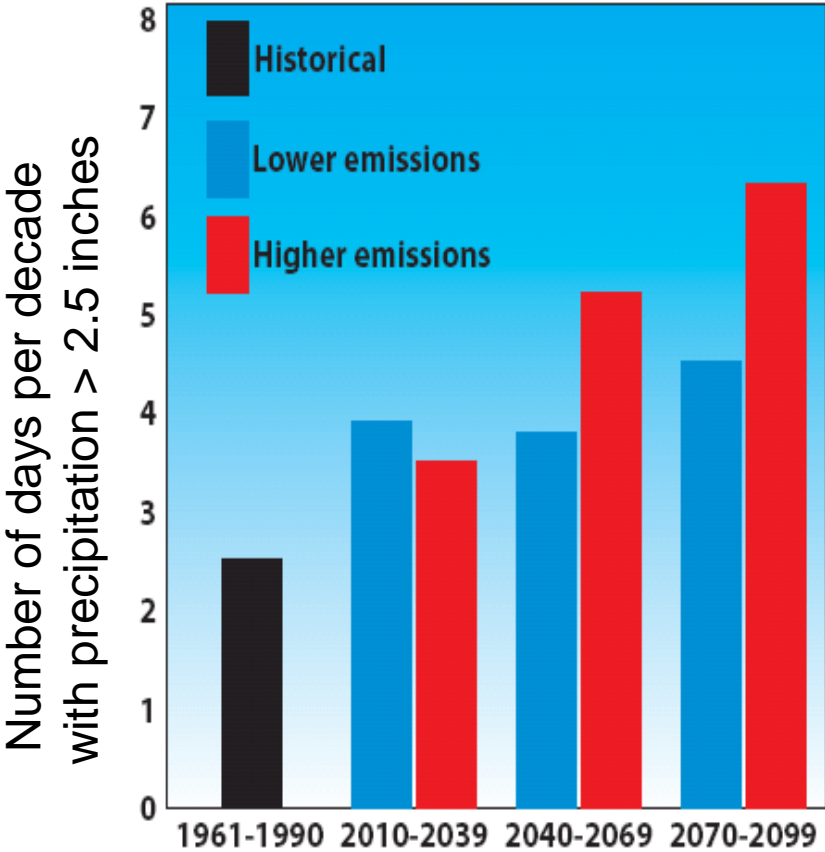
Lake Michigan water level



Source: Hayhoe and Wuebbles,
www.chicagoclimatereaction.org



More extreme storm events

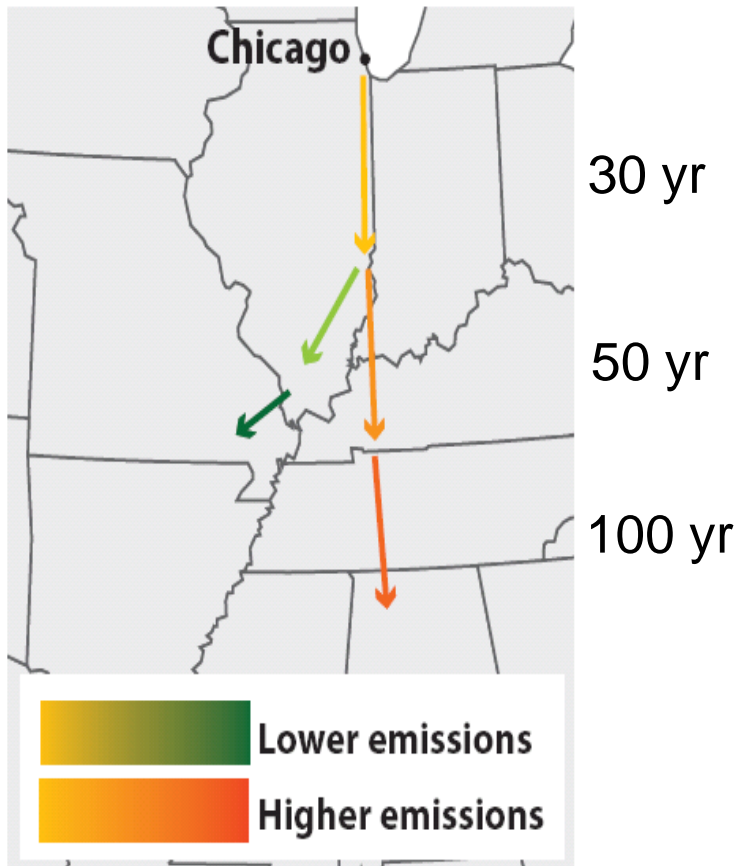


Source: Hayhoe and Wuebbles,
www.chicagoclimatereaction.org



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Ecosystem impacts



Plant Hardiness Zones

Source: Hayhoe and Wuebbles,
www.chicagoclimatereaction.org

Responses



- Transportation:
 - Vehicle fuel economy
 - Carbon content of fuel
 - Amount of driving (VMT)
 - Energy use in buildings (natural gas and electricity):
 - Code improvements
 - Building retrofits
 - Appliance trade-in programs
 - Household renewable energy
 - Behavior change
 - Offsets?
 - Adaptation?
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Initial lessons from scenario analysis

- Hypothesis: reasonable density increases and supportive transportation policies/investments will decrease GHG emissions
- Results: total VMT reduction relative to trend is insignificant ($\pm 3\%$), although congested VMT and VHT can be reduced substantially
 - Not showing much GHG reduction using current methods, which are a simple multiplier of VMT
- Vehicle efficiency and alternative fuels likely more effective at GHG reduction
- Strategies to reduce energy use in buildings may be more important locally

Sample of nationwide studies

→ TRB 2009. *Driving and the Built Environment*, Special Report 298.

	Scenario 1	Scenario 2
Density	Doubled in 25% of new housing	Doubled in 75% of new housing
VMT per HH reduction associated with density	-12%	-25%
30 year change in CO ₂ e (2000-2030) relative to base case	-1.0 to -1.2%	-6.7 to 7.7%

→ ULI 2008. *Growing Cooler*. Suggests potential reduction of 38% in VMT and ~35% in CO₂e relative to trend (2007 – 2030)

Summary

- CMAP efforts:
 - GHG inventory
 - Regional energy profile
 - Modeling effects of land use and transportation policy on GHG emissions
 - Developing strategies for reduction of energy use in buildings
- GHG emissions are related to urban form, but the incremental effects in the Chicago region based on scenario planning are small
- May need to improve GHG projection methods to incorporate number of trips and operating speed
- Regional planning needs to consider improving energy efficiency of existing and projected new building stock



Questions?

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