

Updating the Regional Water Demand Forecast

CMAP Environment and Natural Resources Working Committee

May 3, 2018

Agenda

- Purpose and timeframe
- Water 2050 Demand Forecast Summary
- ON TO 2050 Water Demand Forecast Overview
- Potential users of the forecast
- Next steps

Purpose and timeframe

Purpose

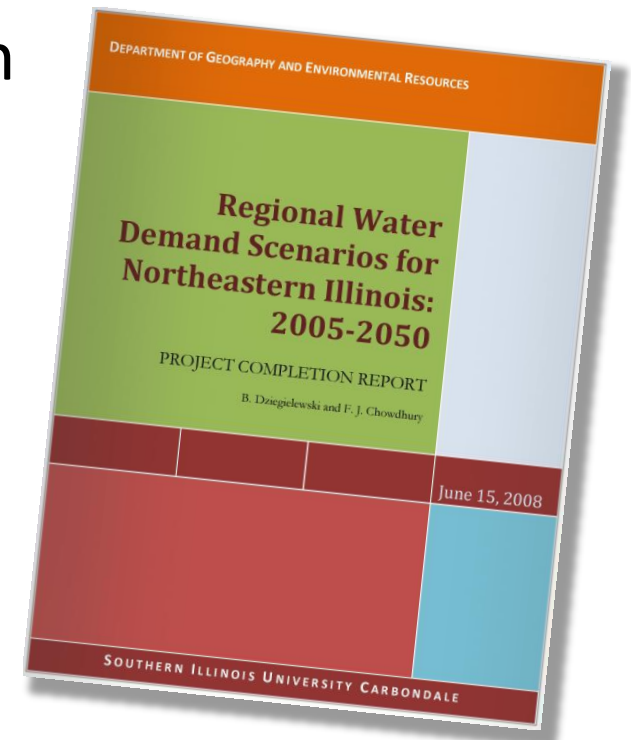
Provide an updated baseline water demand forecast for the 7-county region to the year 2050.

Timeframe

Complete analysis by end of June, 2018

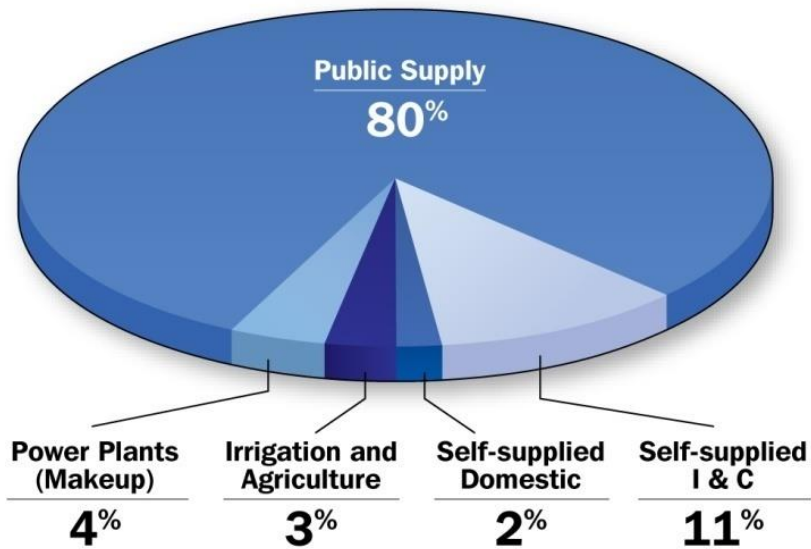
Water 2050 Demand Forecast Summary

- Prepare future water-demand scenarios for the 11-county regional planning area of Northeastern Illinois
- Include estimates of water use by major sectors in 5-year increments for the period 2010-2050
- Allocate future water use to major withdrawal points within the region



Source: Dziegielewski, B. Water Demand Scenarios for NE Illinois Study Area Progress Report #1
RWSPG Meeting CMAP – June 26, 2007

Water Use



Source: B. Dziegielewski and F.J. Chowdhury, 2008

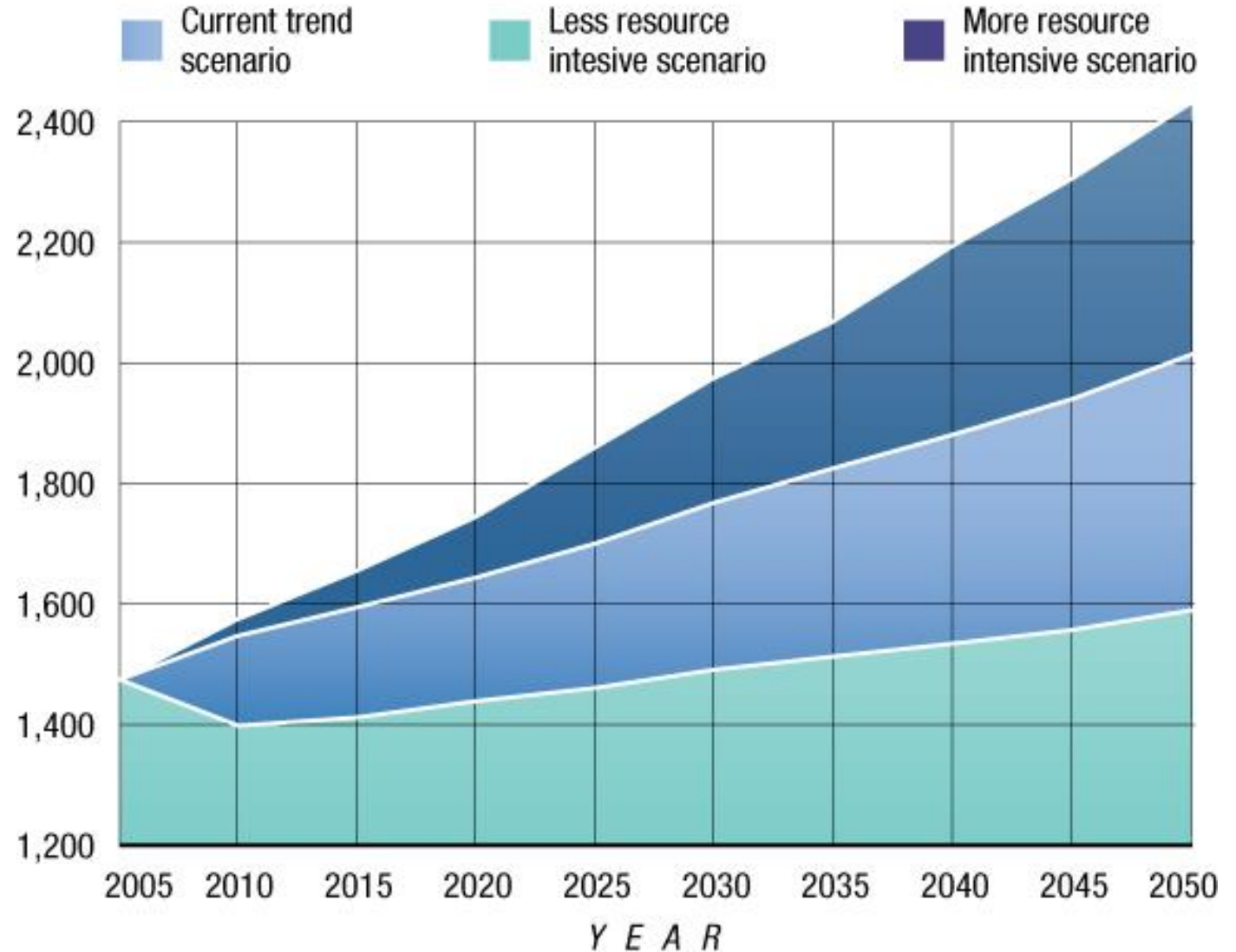
Excluding once-through power

- Public Supply
 - all publicly supplied customer classes (residential, industrial, commercial)
 - 26 water supply service areas
 - 11 county metro areas
- Self Supply (11 counties)
 - Domestic
 - Industrial & Commercial
 - Irrigation & Agriculture
 - Power Generation
 - Individual (9+) thermoelectric power plants

Water 2050

Three scenarios

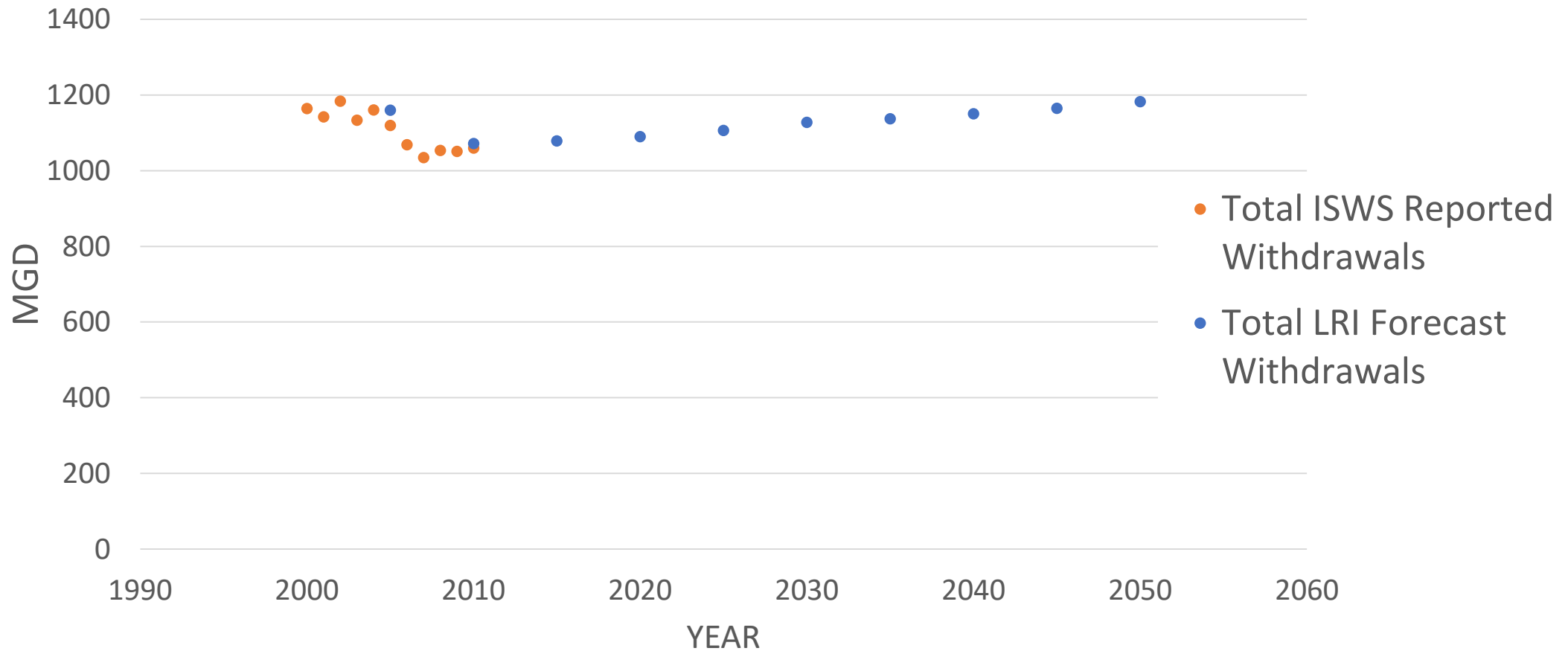
Scenario water withdrawals: 2005 - 2050,
in million gallons per day



Source: B. Dziegielewski and F.J. Chowdhury, 2008, Southern Illinois University Carbondale

Current data on water withdrawals

Public supply withdrawals (mgd) for 7-county region,
ISWS (2000-2013) and Water 2050 LRI Forecast (2005-2050)



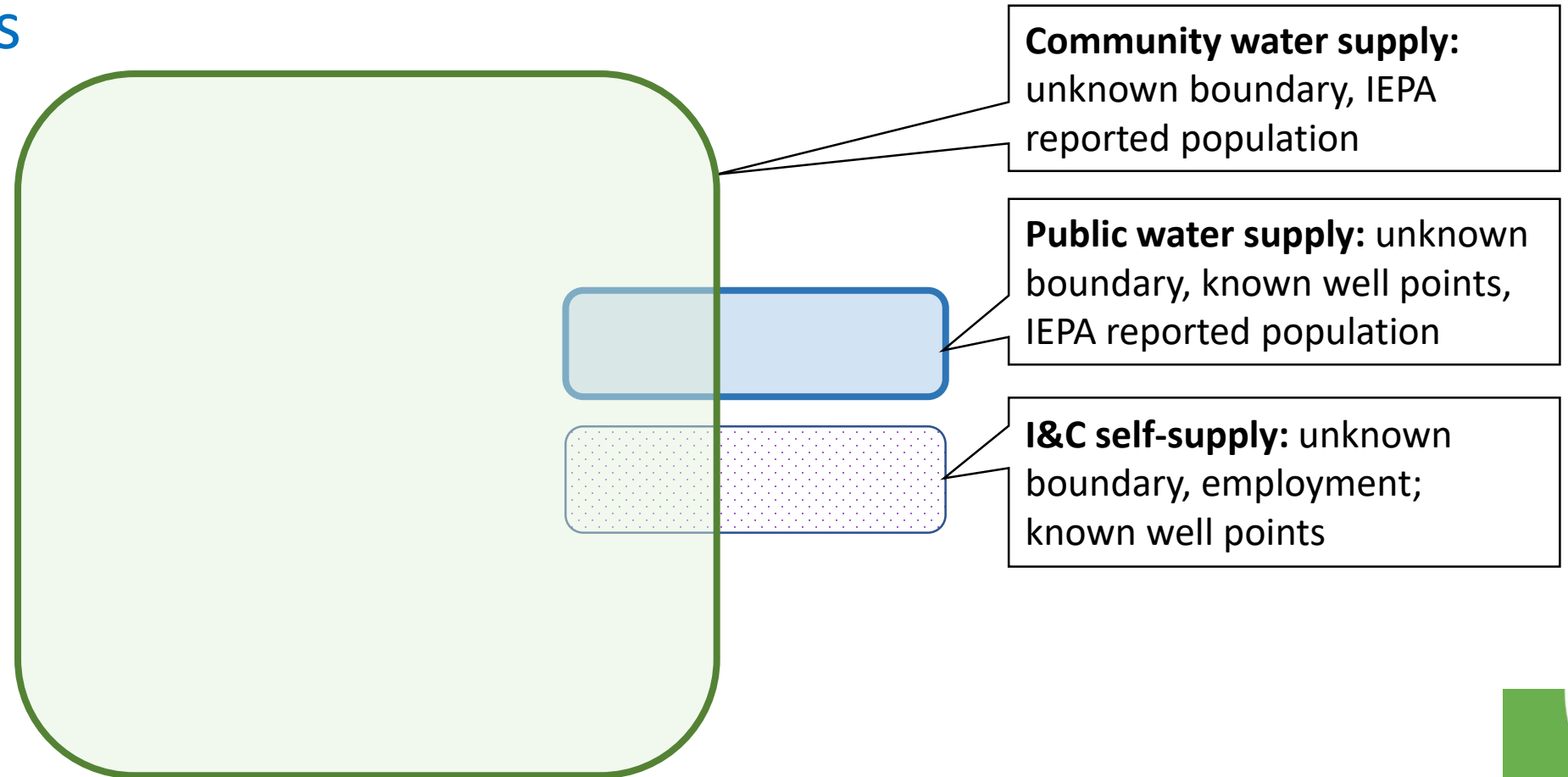
ON TO 2050 Water Demand Forecast Overview

Goals:

1. Provide a municipal-scale forecast to promote integration of water demand considerations into land use and infrastructure planning.
2. Develop a transparent methodology that allows stakeholders to update their municipal-scale forecast based on new/updated data or potential alternatives.

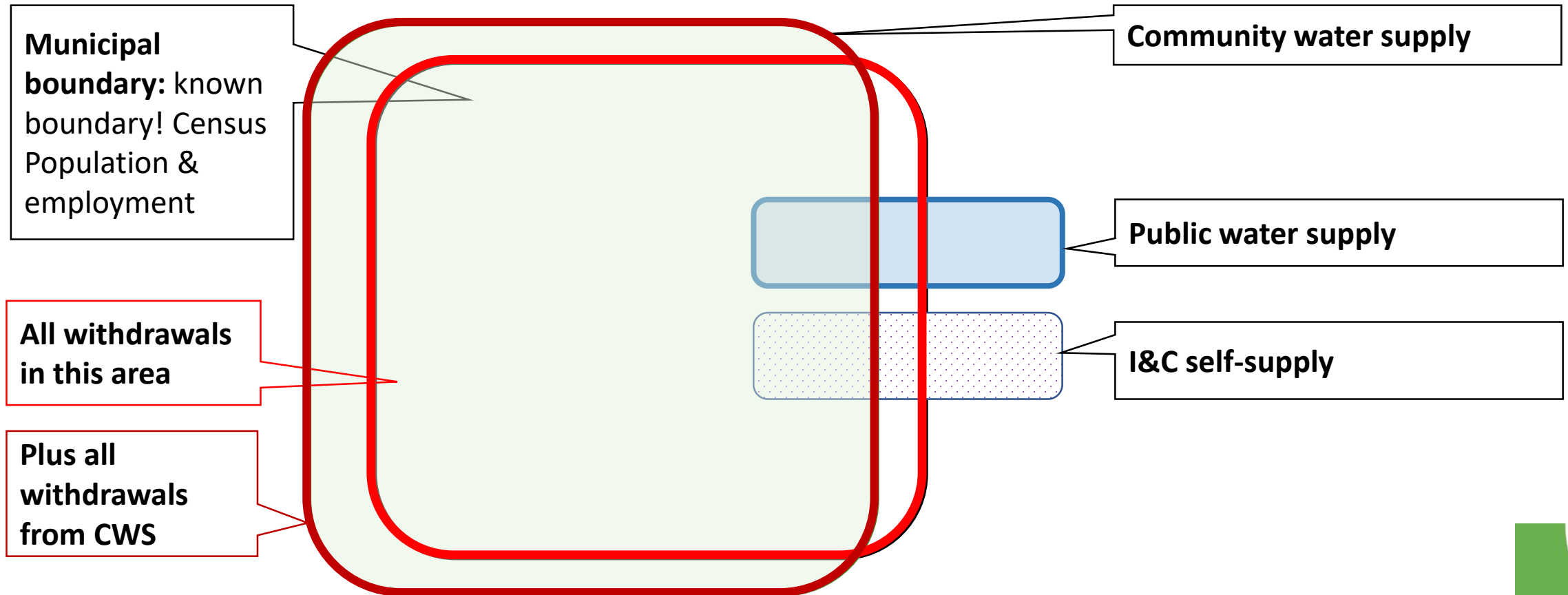
Goal 1: Provide municipal-scale forecast

Challenges



Goal 1: Provide municipal-scale forecast

Geography of the forecast



Goal 1: Provide municipal-scale forecast

Benefits: Municipal decision makers are making decisions that impact water demand overall, not just with demand levels within the CWS.

Drawback: Unknown service area boundaries requires assumptions based on well/intake locations

Goal 2: Develop transparent methodology

Three water use sectors:

1. Residential Water Supply (CWS and PWS)
2. Non-residential Water Supply (CWS, PWS, and Self-Supply)
3. Domestic Self Supply

Three forecast types:

1. Reference forecast (baseline unit use X ON TO 2050 Socioeconomic Forecast)
2. Baseline forecast (adjusted baseline unit use based on simple assumptions)
3. Updated Coefficients for Baseline Forecast using Demand Estimation

Goal 2: Develop transparent methodology

2. Baseline Forecast:

Simple assumptions can be made to adjust unit water use over time.

Demand driver assumptions for baseline forecast

Demand Drivers	Assumptions
Housing Density (-)	ON TO 2050 Population Forecast
Conservation trend* (-)	Historic trend of 0.7 annually 50% higher than historical trend
Sectoral Employment (%)	ON TO 2050 Employment Forecast

Goal 2: Develop transparent methodology

3. Updated Coefficients for Baseline Forecast using Demand Estimation

- As project capacity and available data permits, develop updated demand equations using historic data (from 2000-2014)
- Resulting coefficients from these models will be applied to unit use calculations for gpcd/gped, and incorporated into the forecast.

Goal 2: Develop transparent methodology

3. Updated Coefficients for Baseline Forecast using Demand Estimation

- Priority 1: Residential Municipal-Scale Water Supply (CWS, PWS)
- Priority 2: Non-Residential Municipal-Scale Water Supply (CWS & PWS & Self-Supply)

Residential Municipal-Scale Water Supply (CWS & PWS) Demand Estimation Variables

Dependent Variables:

- GPCD

Independent Variables:

- Price
- Housing density
- Conservation trend
- Income
- Dummy variables

Non-Residential Municipal-Scale Water Supply (CWS, PWS, SS) Demand Estimation Variables

Dependent variable:

- GPED

Independent variables:

- Price
- Sectoral employment
- Conservation trend
- dummy variables

Format of results

Sector	Geography (input)	Format of results (output)
Residential Water Supply (CWS & PWS)	Municipality/service area and unincorporated county	Municipality and unincorporated county
Non-Residential Water Supply (CWS, PWS & Self-Supply)	Municipality/service area and unincorporated county	Municipality and unincorporated county
Domestic self-supply	County	Potentially reassigned to municipalities / unincorporated county based on location
Total	Region	7-county regional total; further broken down by county and water source.

Format of results

Spreadsheet with information for each municipality or the 7 unincorporated counties:

- Provides the historical data on annual water withdrawals, and other variables used in the forecast
- Provides the forecast equations

Potential users of the forecast

Long-range forecast for planning purposes (water & land use)

- Provide water demand information at the municipal scale, for incorporation in planning efforts
- Provide inputs to Lake Michigan allocation, groundwater flow model, and other source assessment analysis
- Others?

Next steps

- Review draft forecast results in mid-May
- Finalize forecast based on **draft** ON TO 2050 Socioeconomic forecast in June
- Finalize based on **approved** ON TO 2050 Socioeconomic forecast in October

Comments, questions?

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Background information

Key similarities and differences

- Sectors
- Population forecast
- Geography
- Fixed effects

Sectors

Public water supply by customer class:

Residential

Non-residential

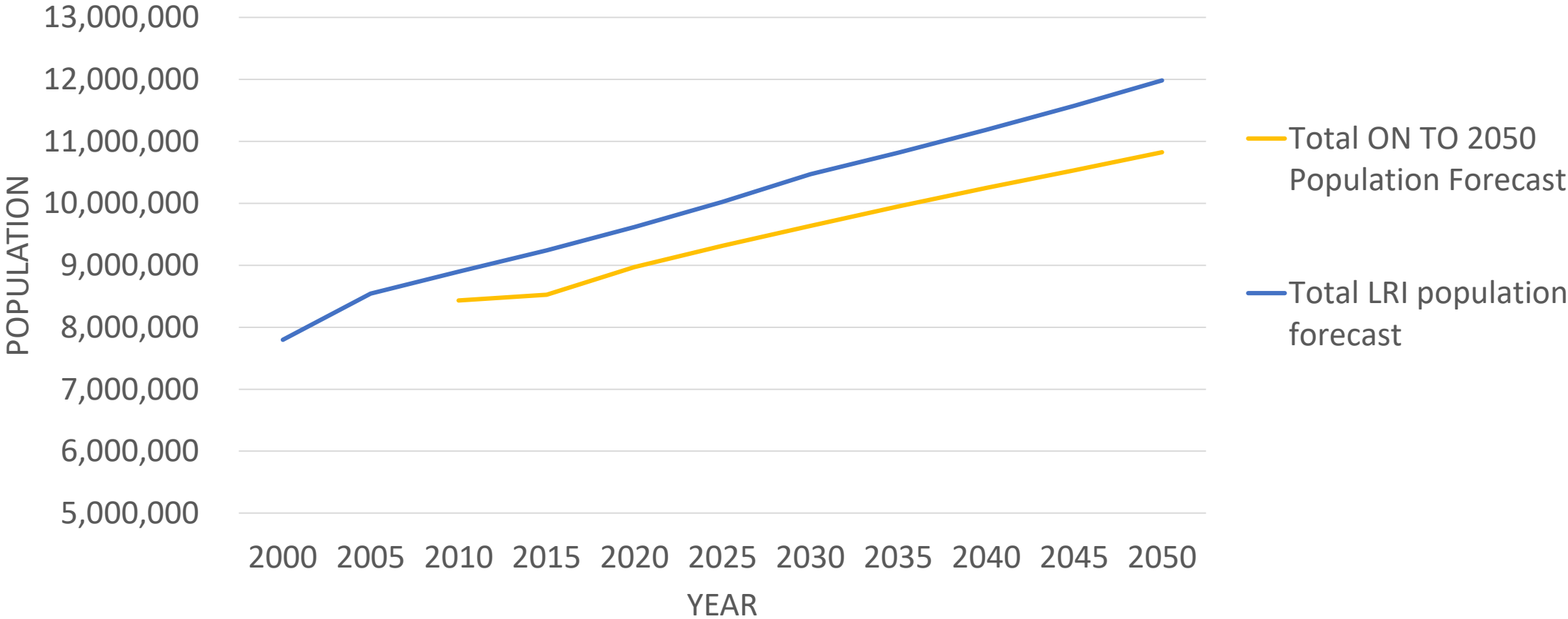
Self supply:

Domestic

Non-residential

Population forecast comparison

Population Projections, Water 2050 LRI Forecast and ON TO 2050 Total



Results by geography

Region

- Totals for each sector

County

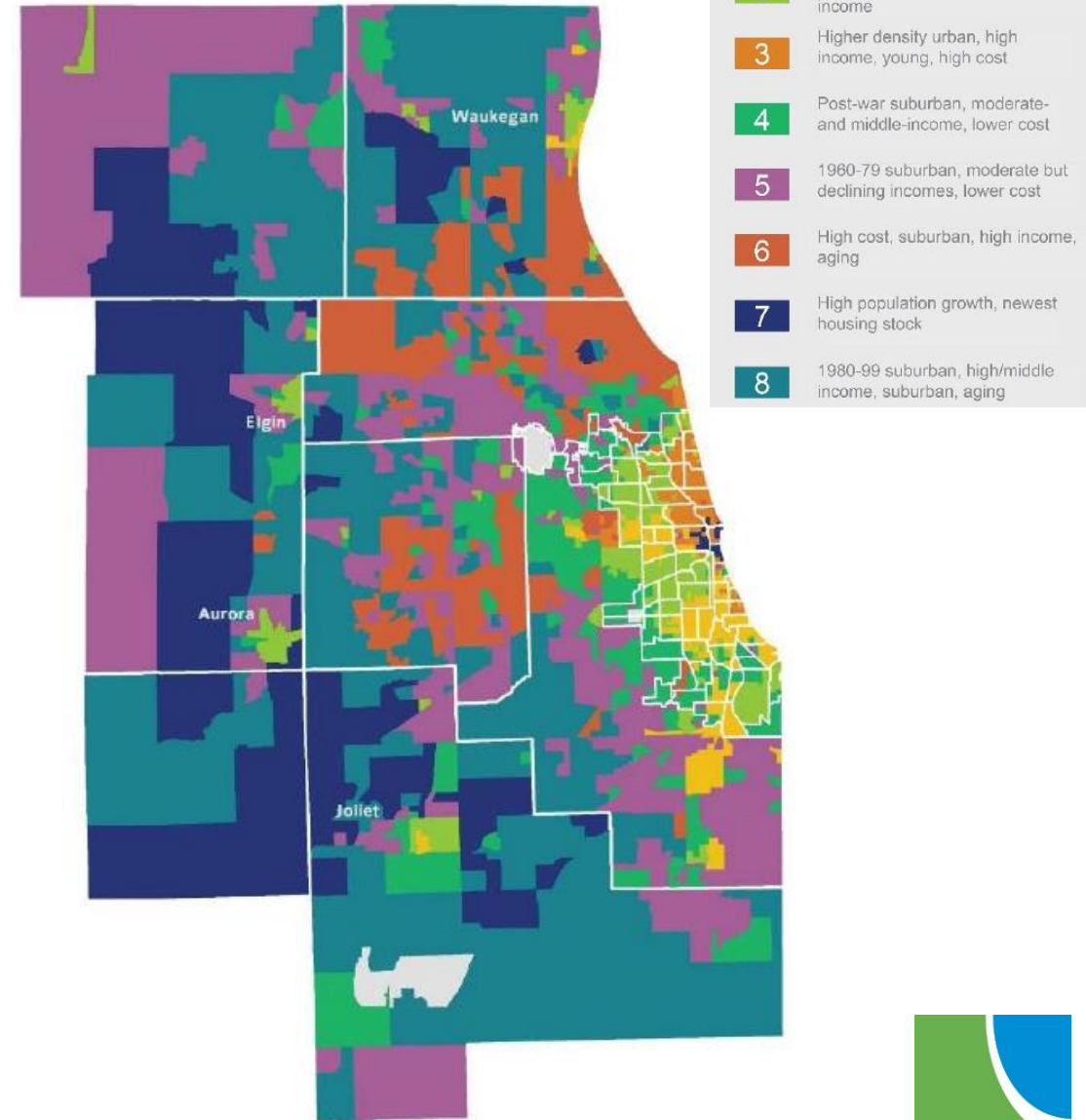
- Totals for each sector

Municipality -- may not include all sectors:

- Residential CWS
- Non-residential (CWS+SS)
- Municipal PWS (non-community)
- Domestic self-supply

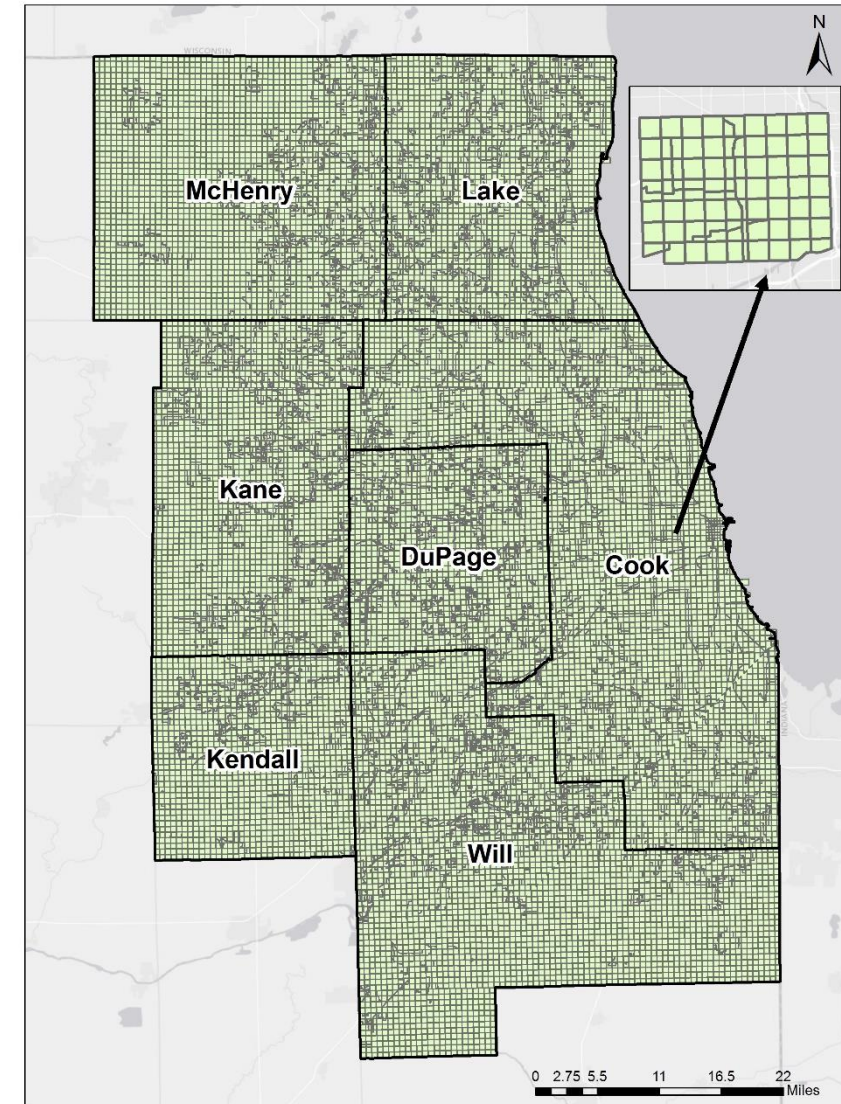
Fixed Effects

- Grouping analysis
 - Statistical technique that categorizes data into groups
 - Based on 1 or more input variable
 - Ex: Housing submarkets
- Anticipated input: GPCD



ON TO 2050 Socioeconomic Forecast

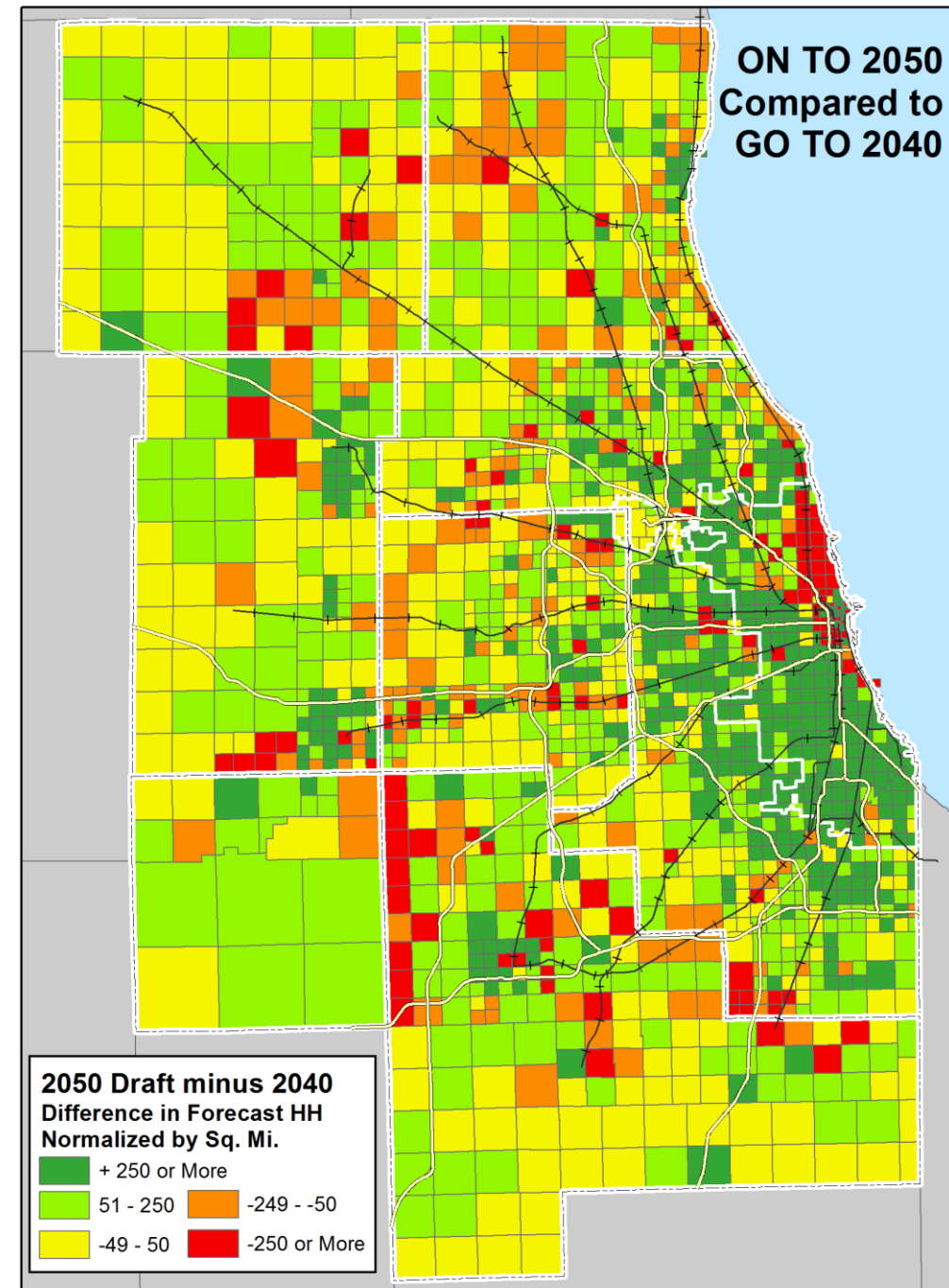
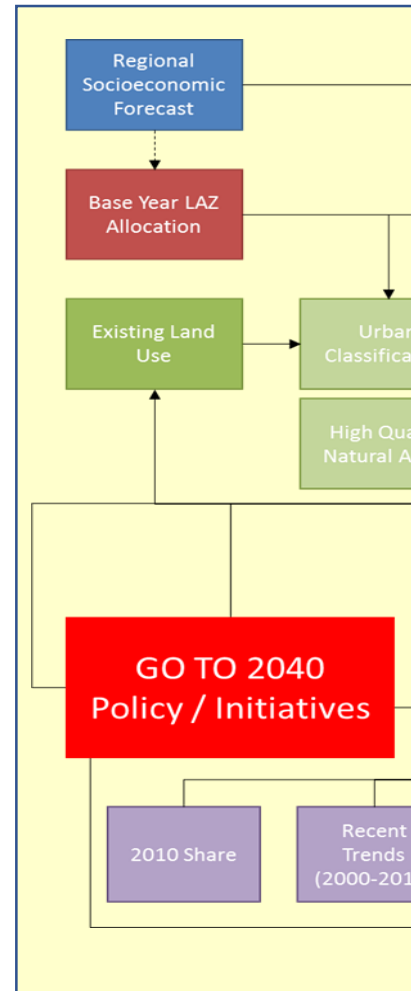
- Report at 5-year intervals
- Report employment by industry (2-digit NAICS)
- Local Area Allocation Tool
 - 21,977 Local Area Zones (LAZ) in region
 - Existing population and employment
 - Available capacity (Land Use and Development database)
 - Incremental (5-yr) growth
 - Planned land use and transportation projects
 - Policy & market considerations



Local Area Allocation Tool

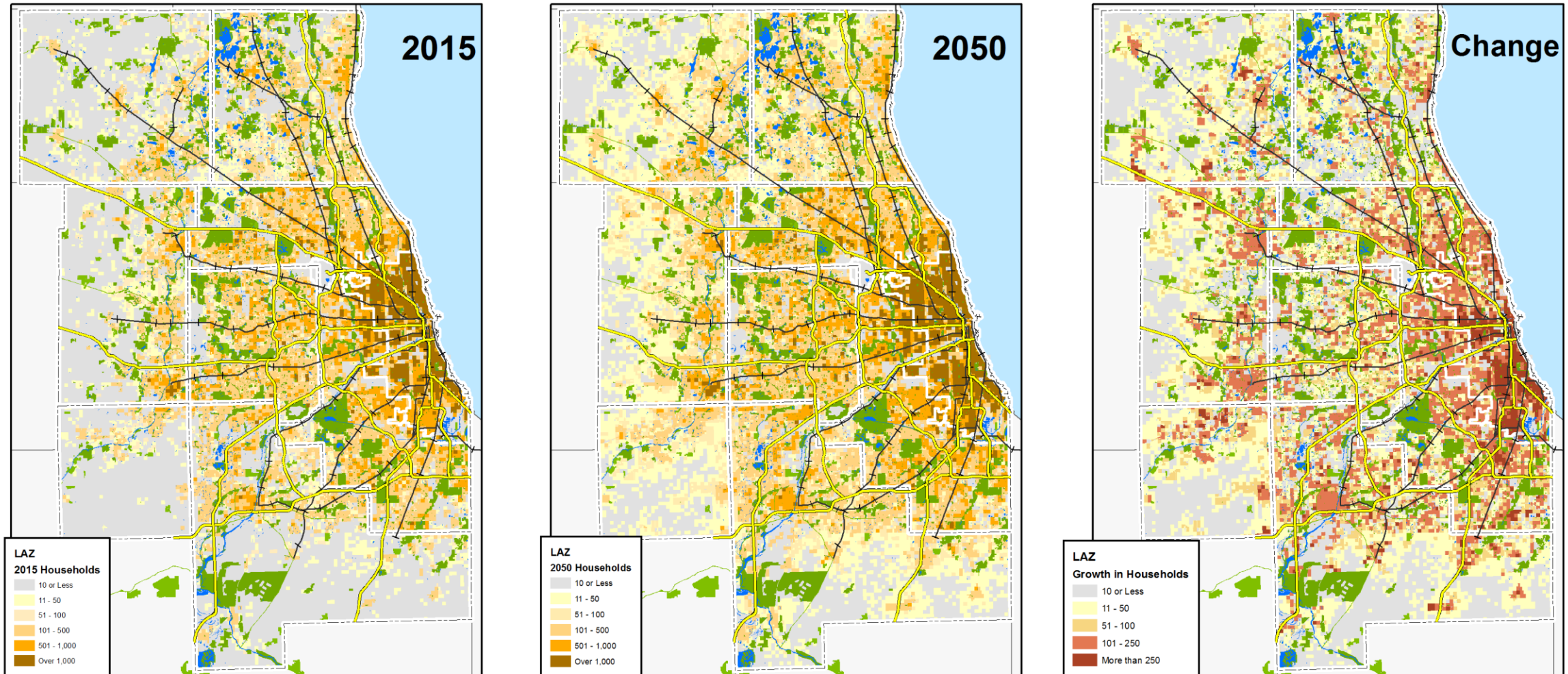
Policy & market considerations

- 2010 share
- Recent trends
- Infill opportunity areas
- Disinvestment areas
- Transit/highway accessibility
- Land value
- Municipal envelope



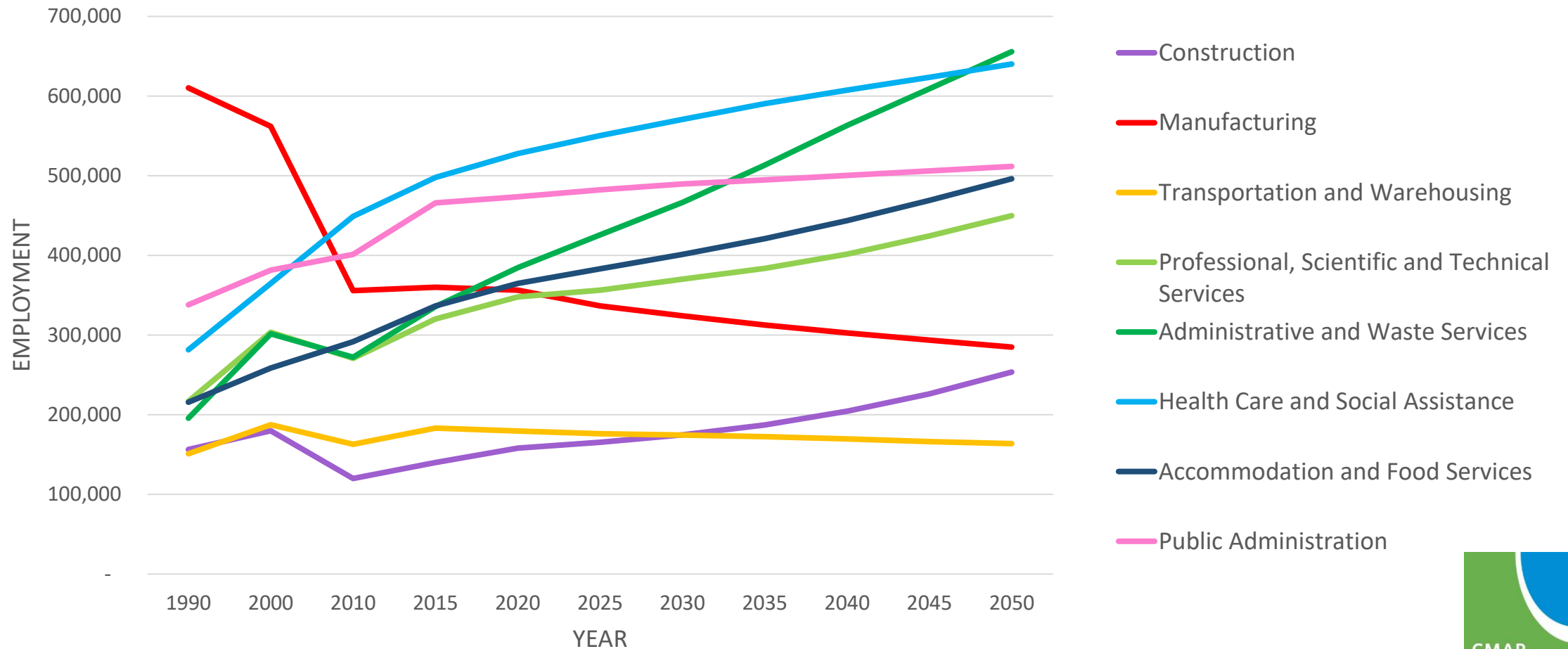
ON TO 2050 Population Forecast

ON TO 2050 Draft Forecast: Households by Local Allocation Zone



ON TO 2050 Employment Forecast

Employment by Select Industry, Recent Past (1990-2015) and ON TO 2050 Socioeconomic Forecast



Data Attributes

Primary inputs available to us:

- ISWS annual withdrawals by well/intake (~3922): 1980 – 2014
- ISWS annual withdrawals by public supply (~503): 2000-2014
 - Account breakdown (Residential, Commercial, Industrial)
 - LMO-2 details (account breakdown, Non-revenue and UFF/MUL, etc)
- CMAP ON TO 2050 Socioeconomic Forecast, 5-yr increments: 2015-2050
 - By municipality boundary
 - By local area allocation zone (LAZ)