METROPOLITAN COUNCIL'S FORECASTS METHODOLOGY

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METROPOLITAN COUNCIL

The Council's mission is to foster efficient and economic growth for a prosperous metropolitan region

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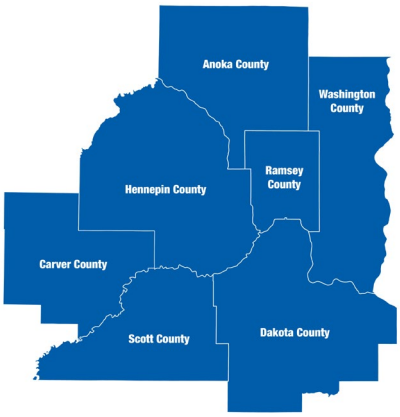

The Metropolitan Council is the regional planning organization for the seven-county Twin Cities area. The Council operates the regional bus and rail system, collects and treats wastewater, coordinates regional water resources, plans and helps fund regional parks, and administers federal funds that provide housing opportunities for low- and moderate-income individuals and families. The 17-member Council board is appointed by and serves at the pleasure of the governor.

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FORECASTS METHODOLOGY

The regional and local forecasts prepared by the Metropolitan Council express future expectations based on an understanding of regional growth dynamics, land policies, and plans. Consistent with *Minnesota Statutes* 473.146 and 473.859, long-range forecasts provide a foundation for coordinated planning by the Council and local governments.

Met Council staff prepare a major update of region-level and local forecasts at the start of each decennial planning cycle. The regional forecast is a macro-level control, providing regional totals for allocation to all the cities, townships, and zones in the region. We emphasize an integrated approach to economics and demography: Our regional economic situation and competitiveness factors determine interregional migration flows and economic outcomes in the same model.

A regional forecast and local forecasts were included in the *Thrive MSP 2040* regional plan, adopted by the Metropolitan Council on May 28, 2014.

The regional forecast prepared now, in April 2023, will provide regional totals for the preliminary (version 1) local forecast set prepared later this year. Met Council staff intend to make the preliminary local forecast set available to regional system planners and external stakeholders in fall 2023. Subsequent analysis and modeling are expected to yield some revision of data inputs and assumptions. A second phase of forecast modeling in 2024 will make use of the revised data inputs, revised setting, and regional policy changes brought to the forecast modeling team. The end-product of the second phase of work will be a public-hearing (version 2) local forecast set, to be published in summer 2024. Finally, the Metropolitan Council will include a final (version 3) local forecast set in its 2050 regional development guide.

Overview of forecasting program

The Metropolitan Council's regional forecast considers the Twin Cities' situation within the national economy: An analysis of regional economic competitiveness determines forecasted economic activity and employment, which in turn prompts population change through interregional migration.

Subsequent to the *regional* forecast, a *local* forecast set describes geographic pattern of expected future growth. Regional population, households and employment will locate in specific places. Met Council assumes that real estate dynamics, location characteristics, activity patterns and accessibility mainly determine spatial outcomes. Land use policies and local plans also shape the results.

Considering the multi-scale aspects of future planning, Met Council employs multiple forecast modeling tools:

- A regional economic model for forecasting region-level economic activity and migration flows
- A land use model projecting real estate dynamics, in order to locate future land use, households and employment to communities and zones
- A travel demand model for predicting modes, network paths and network conditions
- A hydrogeologic model for projecting water demand and water resource impacts.

This document addresses the first two models.

Methodology of REMI PI

Following a review of best practices in regional economic modeling, the Council selected REMI PI as the model best fitting the Council's understanding of regional growth. REMI PI utilizes computable general equilibrium techniques (CGE) to project forward time-series of economic activity. Simulation and projection of economic activities (production, consumption, and trade) are central to the model. Finally, the model seeks equilibrium between total workforce demand, wage levels, and workforce supply.

Population changes are projected simultaneously using detailed cohort-component demographic techniques to project fertility and survival rates, and new economic geography techniques to project migration responding to economic opportunity. If workforce demand intensifies (or slackens), then supply adjusts up (or down) through migration. Thus, economic growth and competitiveness are the major determinants of migration in the REMI PI model.

A more detailed description can be found in the model documentation:

> Regional Economic Models Inc. (2022), *REMI PI+ Model Equations*, available at www.remi.com/wp-content/uploads/2022/08/Model%20Equations.pdf

The model delivered by Regional Economic Models Inc. assesses the Twin Cities region having factor cost advantages, resource advantages, a high level of workforce productivity, and breadth of workforce supply. The model also finds under-performance in noneconomic attraction of population. In past revision cycles, these characteristics have led to a forecast of steady growth for the Twin Cities region. However, for the current forecast, changes in the regional situation are observed.

The COVID-19 pandemic badly disrupted economic and demographic patterns. The 2023 update of Met Council's regional forecast reveals very different conditions, and changed trends:

- Higher mortality rates and lower birth rates and incorporated into time-series. The higher mortality rates will mainly impact results in the current decade. The lower birth rates are more serious, resulting in a long-lasting muting of population growth.
- Reduced international immigration to the US; MSP region is proportionately affected by the reduced national total.
- Net domestic migration projections have flipped from "break-even" in the previous decade to negative outflow for the current and next decade.
    - Historically, economic opportunity and low unemployment have driven MSP region's migration attraction; this characteristic has less leverage now that many more competing metros and states have comparably low unemployment.

The cumulative result is a sharply lower employment and population forecast.

Modifications to the as-delivered REMI PI model

In the implementation of REMI PI, we modify some settings and data inputs to the "as delivered" model.

First, the national forecast in our model is controlled to match nation-level GDP and income projections from IHS Markit's 30-year Trend forecast; this is the same forecast used by the Minnesota State Economist as a baseline for long-term, national economic expectations. The Twin Cities region's growth is substantially tethered to national economic conditions. For more information, see:

- Minnesota Management & Budget (2023, and updated bi-annually), *Minnesota and U.S. Economic Outlook*, online at http://mn.gov/mmb/forecast/forecast/

Second, Met Council updates regional time-series with observed actuals and short-term trends:

- The most recent two years of industry employment statistics are updated with current data from Minnesota Department of Employment and Economic Development.
- Fertility rates schedules (fertility rates by race and by age of mother) are re-leveled so that the base year matches region-specific rates calculated from the most recent 5 years of births data tracked by the Centers for Disease Control (CDC). In the Twin Cities region, the 2017-21 total fertility rate for white mothers is 1.45 children; the rate for Black mothers is 2.55; the rate for Hispanic or Latino mothers is 2.02; the rate for Asian mothers is 1.84.
- For 2020-2026 timepoints, adjustments are made to international immigration rates.
- For 2020-2029 timepoints, adjustments are made to U.S. and Minnesota death rates, guided by CDC excess mortality preliminary estimates.

Model vendor-provided assumptions and time-series data are reviewed and modified as necessary. There are variables in the model that are recognized as difficult to project. Generally, we assume a stable status quo or median values within the range of possibilities. Specifically:

- Components of statewide income for the next four years are adjusted to match the Minnesota State Economist's economic forecast.
- College-going population by race is projected to grow in tandem with a moving average of the pre-college resident population—that is, the resident population of 17-year-olds.
- The region's prison population is adjusted with decelerating incarceration rates instead of constant rates.
- Domestic migration attraction rates are adjusted to maintain balance between workforce supply and employers' demand.
- Additionally, Met Council staff have introduced an additional increment of domestic migration prompted by climate change: We use the Hauer (2017) projections of metro-to-metro population migration flows driven by sea-level-rise. Cumulative gains to the Twin Cities region between 2015 and 2050 amount to 3,000 migrants due to sea-level rise in coastal parts of the U.S.; the numbers are higher in future decades, beyond Met Council's 2050 forecast horizon.
- We assume there may be another 3,000 migrants due to increased heat, super-tropical effects, drought, crop-failure, and fire-risk. this assumption is speculative at present and may be revised as peer-reviewed projections sets are identified.

A few model vendor-provided projections that are reviewed, but are *not* adjusted in the 2023 modeling, include the following:

- Regional receipt of international immigration to the U.S. is projected to remain near 1% of the national total.
- Regional average housing price relative to the national average is projected to remain in the range: 95 to 100% of the national average.
- Regional consumer prices relative to the national average do not need to be adjusted in the latest modeling.
- Tax rates for Minnesota are projected to remain level.

Regional households projection

To obtain household counts, the REMI PI population projection is parsed into households and household types using a schedule of age-specific head-of-household incidence rates. The base year schedule is obtained from analysis of Census Bureau's American Community Survey microdata.

We are allowing head-of-household incidence rates to shift over time. This is necessary because of the shifts in household formations observed during the past decade.

- During years 2010-2018, we observed a phenomena of "doubling up", with more households including adult children, extended family members and unrelated persons (roommates, etc.). Cumulatively, "doubling up" and delayed household formations amounted to a 2% reduction in overall housing consumption. In other words, the region's population is occupying 24,000 fewer housing units in 2018 than was previously forecasted at the time of the Thrive MSP 2040's adoption.
- In the years since 2018, an acceleration of new housing developments has reversed this trend and allowed a rebound of household formations, thus a rise in head-of-household incidence rates.
- Future changes in head-of-household incidence rates are difficult to project beyond the short-term. Therefore, our conversion of population to households uses a constant set of head-of-household incidence rates starting in projection year 2025.

Methodology of UrbanSim

The forecast model described above provides details on future demographics and industry composition at a macro-level, without local geographic detail. Additional modeling at a local scale is necessary to project the geographic distribution of households and employers.

In 2020, we selected and began implementing the UrbanSim model, a market simulation model which produces detailed small-area assignment of households, population, and employment through 2050.

The logic of UrbanSim is the market sorting and equilibration of real estate demand and supply, and the addition of new supply, assuming best-use and value-maximizing decisions of developers, employers, and households. UrbanSim assumes that developers will build where households or firms find the greatest place-value, and where policies and land capacity allow for development. UrbanSim includes three submodels for the residential sector, and three for the nonresidential sector:

- The *location-choice submodels*—for the residential and nonresidential sectors—allocate movers and new entrants into locations and real estate types probabilistically, generally following the pattern of each market segment's observed preferences for arrays of real estate and neighborhood characteristics.
- The *development submodels* project new real estate development, locating new development based on marketability, rent potentials (or sale price potentials), and land supply availability.
- The *rent and price submodels* estimate market-clearing rents (or sale prices) for different real estate types at specific locations.

In summary, households and employers choose real estate in specific locations to maximize realized value, responsive to different market segments' preferences. Developers respond by supplying real estate responsive to the demand, within the limits established by policies.

The location-choice submodels mathematically represent the location choices of different household market segments and industry sectors using variables identified and estimated through logistic regression analysis. Variables include neighborhood characteristics and accessibility to destinations.

Some of the factors that matter to site selectors and households can change over time: Summarized land use and remaining available land supply, industry mix, and socioeconomic mix of zones are dynamically updated within the model. Accessibility measures for the start, middle, and end of the forecast period are calculated with a linked travel demand model.

Concurrently, the rent models update market-clearing rents within the model. Where locations are highly desirable to one or more market segments rents can change, altering estimated distributions (or probabilities) of household and worksite location choices, and prompting substitutions. Ultimately, the model seeks a solution where all forecasted future households and employment are sorted into locations, proportionate to choice probabilities.

Importantly, UrbanSim allows supply response to growing and changing market demand. To accommodate growth in households and employment—which has been forecasted using the region-level forecast model—the UrbanSim development submodels project the addition of new housing and built space. In the Twin Cities implementation of UrbanSim, the major determinants of such development are land supply and estimated rents for each zonal location.

Data and Variables Used in our UrbanSim Modeling

The Twin Cities implementation of UrbanSim segments worksites and employment into industry sectors; these groups have varying preferences for five types of employment-bearing real estate. Households are segmented by socioeconomic characteristics into major household types (and additional subtypes), which then select housing from seven housing product types. This segmentation enables representation of how real estate and location preferences vary among different household and industry types.

The UrbanSim system allows flexibility in defining the set of variables that comprise preferences and valuations of real estate. Variables were assembled for all census blocks in the region. Block characteristics include:

- Real estate characteristics:
  - Start-year land use mix and undeveloped land supply
  - Average land consumption per real estate unit
  - Average land values
  - Average real estate prices and rents
- Surrounding land uses:
  - Proximity to lakes and rivers
  - Block demographics
  - Employment levels
  - Housing type mix
- Regional systems and services:
  - Proximity to parks

    - Wastewater service availability
    - High-frequency bus stops and Light-Rail Transit (LRT) stations

- Transportation Accessibility, obtained through interaction with the Metropolitan Council's travel demand model:
    - Number of jobs within 20-minute travel time (by automobile and by transit)
    - Number of households within 20-minute travel time (by automobile and by transit)

The UrbanSim model also uses local planned land use and regional policies when forecasting future real estate and land supply, including:

- Planned land use acreage (from analysis of local comprehensive plans)
- Allowable real estate types
- Maximum housing capacities and densities (from local comprehensive plans)

In summary, the UrbanSim model is informed about base year conditions and the envelope of future possibilities.

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