Long-Range Forecasting for Transportation Planning

• Its purpose is to provide the likely socioeconomic environment in which land use policy and transportation investments will play out.

• The first step is to forecast the Kansas City region’s total population and employment.

• Such a forecast should be understood as representing the mid-point of a wide variety of possible outcomes.

• Subsequent steps allocate the overall totals (known as “control totals”) to counties, census tracts and other planning areas.
Regional forecasting model

• *Policy Insight*, from Regional Economic Models, Inc. ("the REMI model")

• REMI assumes growth is driven by employment
  • 2000 equations solved simultaneously each year from 2015 to 2050, looking at the region’s economic competitiveness relative to the nation.
  • Employment determines labor demand
  • Demographics and labor force participation rates determine labor supply
  • If demand is greater than supply, wages and the likelihood of employment increase relative to the rest of the nation.
  • Labor is attracted here in the form of net migration.
Employment history and forecast, 1969-2050
Is this reasonable in light of historical performance?
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Comparison of Forecast to Growth by Decade

- 1990-2000
- 2000-2010
- Forecast
- 2010-2020

Chart shows growth over decades with forecast line compared to historical performance.
Is this reasonable in light of historical performance?
Population, Employment and Labor Force Forecast
Employment Change by Decade

Total Employment Change by Decade (thousands)

- 1970-80: 147
- 1980-1990: 164
- 1990-2000: 217
- 2000-2010: 35
- 2010-20: 192
- 2020-30: 77
- 2030-40: 100
- 2040-50: 117
Population Change by Decade

Population Change by Decade (thousands)

- 1970-80: 65
- 1980-1990: 132
- 1990-2000: 197
- 2000-2010: 198
- 2010-20: 143
- 2020-30: 129
- 2030-40: 163
- 2040-50: 188
2001 Population by 5-Year Age Group

Females | Males
---|---
0-4 | 100
5-9 | 90
10-14 | 80
15-19 | 70
20-24 | 60
25-29 | 50
30-34 | 40
35-39 | 30
40-44 | 20
45-49 | 10
50-54 | 0
55-59 | -10
60-64 | -20
65-69 | -30
70-74 | -40
75-79 | -50
80-84 | -60
85-89 | -70
90-94 | -80
95-100 | -90

Legend: Females in blue, Males in orange.
2040 Population by 5-Year Age Group

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Females</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>10-14</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>20-24</td>
<td>70</td>
<td>30</td>
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<td>30-34</td>
<td>80</td>
<td>20</td>
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<tr>
<td>40-44</td>
<td>90</td>
<td>10</td>
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<tr>
<td>50-54</td>
<td>100</td>
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<td>60-64</td>
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<tr>
<td>70-74</td>
<td></td>
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<tr>
<td>80-84</td>
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</tbody>
</table>
Change in Population by Five Age Groups
Change in Population by Five Age Groups

Change in Population by Five Age Groups

<table>
<thead>
<tr>
<th>Age Group</th>
<th>2001-20</th>
<th>2020-50</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-19</td>
<td>-50</td>
<td>-50</td>
</tr>
<tr>
<td>20-34</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>35-49</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>50-64</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>65+</td>
<td>200</td>
<td>250</td>
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</tbody>
</table>
Older adults will account for 49% of the region’s total population growth between 2020 and 2050.
Components of Population Change

Components of Population Change, All Races (thousands)

Natural Growth
Migrants
Components of Population Change – White, Non-Hispanic

Components of Population Change, White, Non-Hispanic (thousands)
Components of Population Change – Black, Non-Hispanic
Components of Population Change – Asian and other, Non-Hispanic

Components of Population Change, Asian and other, Non-Hispanic (thousands)

- Natural Growth
- Migrants
Components of Population Change – Hispanic

Components of Population Change, Hispanic (thousands)

- Natural Growth
- Migrants
By 2035, Hispanics will exceed Blacks as the region’s largest minority group.
Whites are projected to be 62 percent of the population in 2050, down from 73 percent today.
Population Growth by Race/Ethnicity

Population Growth by Race/Ethnicity (thousands)

- White
- Black
- Asian and other
- Hispanic

2001-10
2010-20
2020-30
2030-40
2040-50
Population Growth by Race/Ethnicity

Population Growth by Race/Ethnicity (thousands)

- White
- Black
- Asian and other
- Hispanic
Population Growth by Race/Ethnicity
Whites account for 17 percent of the population growth between 2020 and 2050
UrbanSim Input Development
<table>
<thead>
<tr>
<th>Input</th>
<th>Description</th>
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<tbody>
<tr>
<td>Travel zones, skims</td>
<td>Model Calibration</td>
</tr>
<tr>
<td>Place Types</td>
<td>Maximum pop., emp., units</td>
</tr>
<tr>
<td>Capacity Data</td>
<td>Model adjustments</td>
</tr>
<tr>
<td>Development Projects</td>
<td>Block-level capacity limits</td>
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<tr>
<td>Constraints</td>
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</tr>
<tr>
<td>Scenario Tags</td>
<td></td>
</tr>
</tbody>
</table>
UrbanSim Calibration: Place Types
Initial Versions

UrbanSim staff version

Based on household change regression variables

Variables:
- 2000-2010 household change
- Total households
- Proportion of units built in 1990s
- Mean income
- Density of residential units
- Sum of workers
- Median race of head of household

Based on similarity to high employment gain & loss, and unit gain

Variables:
- Employment loss similarity index
- Employment gain similarity index
- Housing unit gain similarity index
- SimIndex
- Tract acres

Initial Versions
Draft place types

Variables used:
- HBA housing permits (2010-2017)
- % non-white population
- Mean income
- Proportion of units built in 1990s
- Housing units per acre (2010)
- Jobs per acre (2015)
- Employment change per acre 2002-2010
Variables used in draft place types

- % non-white pop. 2010
- Proportion of units built in 1990s
- Mean income
- Units permitted per acre (HBA, 2010-2017)
- Units per acre (2010)
- 2002-2010 emp. change per acre
- Jobs per acre (LEHD, 2015)
Mean values per group
Alternate visualization of draft place types: group-level data

Group employment per acre

Group permits per acre
UrbanSim Calibration: Capacity Data
A previous version of model capacity data, which provides maximum values for population, unit, and employment density, replaced single-family areas in future land use data at left with population and unit limitations based on existing parcel size, illustrated by the light yellow low density to dark yellow high density single-family parcels at right. The version of capacity data currently tested in the model is based on city and county future land use plans alone.
Future land use plans were collected from cities and counties and converted to a common set of land use classes. The data are a mix of parcel boundaries and local plan polygons.

Since development capacity is measured in population, housing units, and employment per acre, the acres available for development or redevelopment per block was made more accurate by removing the road right-of-way area.
‘Net’ polygons (red) are in areas with fully developed roads, and the right-of-way is not included in the developable area. ‘Gross’ polygons (tan) are assigned a lower density of population, housing units, and employment because the right-of-way, once roads are built, will decrease the area available for development.
Add block boundaries to future land use data

Sum net or gross future land use population, employment, and housing units by block
Employment capacity per block
Employment per acre
Population per acre
UrbanSim Inputs:
Development Projects
# Development project employment:
determined by rentable area, building use, and sq. ft. per worker

<table>
<thead>
<tr>
<th>Building Use</th>
<th>Mean sq. ft. per worker</th>
<th>CoStar property type</th>
<th>CoStar secondary type</th>
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</thead>
<tbody>
<tr>
<td>Education</td>
<td>1,124</td>
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<tr>
<td>Food sale</td>
<td>1,067</td>
<td>Supermarket</td>
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<tr>
<td>Food service</td>
<td>530</td>
<td>General retail</td>
<td>Restaurant, Fast Food Medical, Assisted Living, Continuing Care, Congregate Senior Housing</td>
</tr>
<tr>
<td>Health care</td>
<td>546</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inpatient</td>
<td>555</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outpatient</td>
<td>535</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lodging</td>
<td>1,894</td>
<td>Hospitality</td>
<td>Hotel</td>
</tr>
<tr>
<td>Mercantile</td>
<td>1,243</td>
<td>General retail</td>
<td>Storefront Retail/Office</td>
</tr>
<tr>
<td>Retail other than mall</td>
<td>1,352</td>
<td>General retail</td>
<td>Convenience Store, Freestanding</td>
</tr>
<tr>
<td>Enclosed and strip malls</td>
<td>1,156</td>
<td>General retail</td>
<td></td>
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<tr>
<td>Office</td>
<td>473</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public assembly</td>
<td>1,716</td>
<td>Sports &amp; Entertainment</td>
<td>Theater/Concert Hall</td>
</tr>
<tr>
<td>Public order and safety</td>
<td>756</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religious worship</td>
<td>2,295</td>
<td>General retail</td>
<td>Religious Facility</td>
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<tr>
<td>Service</td>
<td>1,086</td>
<td>General retail</td>
<td>Bank</td>
</tr>
<tr>
<td>Warehouse and storage</td>
<td>1,843</td>
<td>Industrial</td>
<td>Warehouse, Manufacturing</td>
</tr>
<tr>
<td>Other</td>
<td>1,193</td>
<td>Movie Theatre, Specialty</td>
<td>Car Wash, Public Library, Golf Course</td>
</tr>
<tr>
<td>Vacant</td>
<td>3,309</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Multi-Family</td>
<td></td>
<td>Multifamily</td>
<td>Apartments</td>
</tr>
</tbody>
</table>

Source of mean sq. ft. per worker by building use:

https://www.eia.gov/consumption/commercial/data/2012/bc/pdf/b1-b2.pdf