



Scenario planning

Appendix D

Contents

Modeling tools 5

Comparative scenario.....7

Transportation scenarios 9

Land use scenario 13

Conclusion 14

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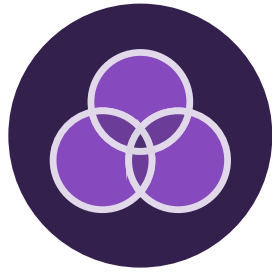
The Denver Regional Council of Governments has long been a leader in using scenario analyses to inform regional planning and decision-making. DRCOG's first scenario planning effort was in the mid-1990s. It guided the development of the original Metro Vision 2020 plan and laid out a long-range vision for sustainable growth and development of the region. As part of the update to the 2050 Metro Vision Regional Transportation Plan, DRCOG staff once again performed a scenario analysis to identify how various strategies may help meet the region's vision, goals and objectives.

The previous scenario planning effort conducted from fall 2019 to spring 2020 ultimately proved significantly impactful at the agency, region and state level. Within the Regional Transportation Plan, scenario planning prompted an expansion of the investment priorities solicited, evaluated and included in the plan to encompass new project types (active transportation, safety, freight and corridor planning) that had not been previously included individually in the fiscally constrained project list. At the regional level, the scenario planning findings informed the approach and strategies to achieve compliance with the state's Greenhouse Gas Transportation Planning Standard. And at the state level, scenario planning assumptions were leveraged to set levels for greenhouse gas emission reductions and led to the passage of numerous housing, land use and zoning laws.

Figure 1: Scenario planning objectives



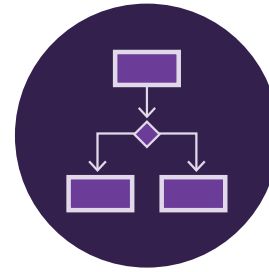
Explores **“what if”**
alternative futures



Makes **relative comparisons** between
scenarios and baseline



Doesn’t rigorously
evaluate scenarios,
or choose or judge
scenarios



Evaluates **choices and tradeoffs** from
individual scenarios



Provides **guidance and direction** for plan
development

In the scenario analysis performed for the update of the Regional Transportation Plan, each scenario allows an exploration of alternative futures. The alternative futures offer relative comparisons to one another and a baseline. The intent of the scenario analysis was not to choose a scenario or judge the various scenarios, but instead to evaluate the choices and tradeoffs that could occur with various transportation investment and development intensity strategies. Finally, the results from the scenario analysis provide guidance to the public, staff, committees and Board of Directors in the development of the Regional Transportation Plan.

The goal of the most recent scenario planning effort was to affirm the results from the last scenario planning effort, identify potential gaps for investment in the Regional Transportation Plan and evaluate the new state of the region based on recent land use efforts at the regional and state levels.

Modeling tools

The primary tools used to create and analyze scenarios are DRCOG's UrbanSim and Focus models. Staff have used both state-of-the-art models for several years and have continuously improved them since initial development.

UrbanSim model

DRCOG staff rely on a predictive model, the open source UrbanSim block model. UrbanSim is a microsimulation model designed to represent the behavior of individual agents (households, businesses and developers) and their interactions in real estate markets. UrbanSim simulates annual changes, capturing the dynamics of household moves, housing choices (renting versus owning), firm location decisions and developer activities such as new construction or redevelopment. It incorporates land use policies, transportation plans and accessibility changes, which influence market conditions, prices and rents.

Key features of UrbanSim include:

- Agent-based modeling: Represents individual households, firms, jobs and their decisions.
- Spatial detail: Models land, blocks and real estate at fine-grained levels.
- Dynamic timeframe: Simulates annual changes, reflecting the evolving urban system and market mismatches.
- Real estate market focus: Emphasizes interactions between consumer and supplier choices and their effects on prices and vacancies.
- Discrete choice models: Uses models like multinomial logistic regression to simulate decision-making.

UrbanSim uses a dynamic, path-dependent approach, allowing it to closely mirror real-world urban development processes, including the gradual pace of housing additions and the cyclical nature of real estate markets.

Focus model

DRCOG's activity-based travel demand model, Focus, uses socioeconomic outputs from the UrbanSim model along with numerous travel, demographic and human decision-making factors to represent an average weekday of travel within the Denver region. The Focus model is calibrated to data obtained from regional and national travel surveys, along with several other data sources, to replicate the 15.3 million person-trips made every weekday on the regional transportation system. The model replicates the planned transportation system and land use attributes to generate trips across travel modes and assigns applicable trips to the roadway and transit network. The Focus model is calibrated to match real-world observations of traffic volumes, transit boardings, and numerous other travel, demographic, and trip mode data metrics.

The key use of the Focus model is to forecast future travel metrics based on changes to the region's population, employment and transportation system. These changes can include edits to the Focus model such as:

- Modifying households and employment.
- Adding households and employment for a new development.
- Building a new road or widening an existing road.
- Incorporating tolls or transit fare changes.
- Reflecting new trends and influences such as telework opportunities.

Comparative scenario

Demographic assumptions

By 2050, the Denver region is projected to reach 4.1 million people, 1.8 million households and 2.8 million jobs — growth of 24%, 29% and 23%, respectively, from 2023. While regional and state growth rates continue to outpace national trends, the pace of growth is slowing significantly compared to the prior 30 years. The slowdown is driven by lower birth rates, an aging population and slowing net migration. The 65-plus age group will see the largest proportional increase (66%), driving up retirement rates and increasing the need for growth in the number of households to sustain the labor force.

Land use assumptions

The comparative scenario uses residential unit and employment development capacities based on existing zoning regulations across the region. DRCOG staff derived the estimated capacities from the number of existing housing units and jobs per acre within each jurisdiction's unique zoning types. The comparative scenario also incorporates housing developments that are under construction or planned and expected to be completed over the next few years. Staff manually added the developments into the model and allowed additional households to move to their locations.

Transportation network assumptions

The transportation network assumptions for the comparative scenario came from the investments in the Regional Transportation Plan adopted in 2022 and amended in 2024. The networks include fiscally constrained roadway and transit system improvements and resulting networks to be completed by the year 2050. The assumptions include:

- \$6.9 billion in multimodal capital projects.
- \$375 million in air quality improvement projects.
- \$2.2 billion in regional transit projects.
- \$548 million in safety projects.
- \$970 million in active transportation projects.
- \$220 million in freight projects.



Photo courtesy of Regional Transportation District

Transportation scenarios

Transit-intensive transportation scenario results

Goal: Provide more transit options and expand the region's rapid transit network.

DRCOG staff defined a transit-intensive transportation scenario to evaluate how robust and responsive the current Regional Transportation Plan is to the region's project growth. The components of the transit-intensive transportation scenario included:

- Completion of the unfinished FasTracks rail segments and additional rail connections to Watkins and Golden.
- An expanded bus rapid transit network, additional high-frequency transit corridors and increased transit service.
- Expanded microtransit service across the region.
- Implementation of zero-fare travel for all transit users.
- Improvements to more than 8,000 bus stops.

Staff modeled the transit-intensive transportation scenario with existing fares, as well as with zero fares. The results from this scenario showed:

- Large increases in transit, walking and bicycle trips compared to the comparative scenario.
- Even larger increases in transit, walking and bicycling under a zero-fare policy.

This shows the region can continue to absorb additional transit infrastructure and can expect to see continued increases in ridership.

Note that this scenario did not evaluate variation in timing, frequency or safety under the Regional Transportation Plan, nor did it evaluate the equity and accessibility benefits of expanding the transit network or adopting a zero-fare policy.

Microtransit

The region has experienced an increasing interest in microtransit options, and multiple services have been implemented. While the travel model cannot accurately capture trips due to microtransit's smaller scale, the transit-intensive scenario effort did review existing microtransit services in the region at the time of analysis and extrapolate some potential impacts of microtransit implementation at the neighborhood or community level.

Once fully implemented, microtransit services have the potential to provide residents with more freedom and better connections to everyday services. While not significant at a regional scale, an additional 150 to 250 rides per day could be possible at the neighborhood level, connecting residents to healthcare, grocery stores, laundromats, pharmacies and schools. Hiring preferences for drivers could also provide jobs to local residents who know the community best.

Microtransit services extend the reach of fixed-route transit service and present a convenient option for riders.

Complete Streets transportation scenario results

Goal: Provide a safe and comfortable transportation network for all modes and users.

Through the Complete Streets transportation scenario, staff explored the impacts of increased active transportation facilities and usage in the region. The individual components of the Complete Streets transportation scenario included:

- Active transportation encouraged through more bicycle and pedestrian infrastructure.

- More people using e-bikes and e-scooters.
- Increased telecommuting or work-from-home rates.
- Communities reconnected by building new overpasses or underpasses across select limited-access freeways.

Staff modeled the Complete Streets transportation scenario with select individual components to see the magnitude of change from each. The results from this scenario showed:

- Very large increases in transit, walking and bicycle trips.
- More modest benefits when staff modeled higher work-from-home rates alone, indicating that the substantial increases in transit, walking and bicycle trips were not all the result of higher work-from-home rates.

This implies that the region can continue to add active transportation infrastructure and can expect to see continued increases in walking and bicycle trips.



Photo by DRCOG staff

Reconnected communities

The Denver region has in recent years seen an increasing interest in reconnecting communities divided by previous highway construction. The Colorado Department of Transportation's recently completed Central Interstate 70 project and rescoped Central Interstate 25 project offer examples, as an element of both projects is additional local street connections. The Complete Streets scenario included the reconnection of 11 sites in the region either over or under the highway. While the results from these connections can't be seen at the regional level, at the neighborhood level, the model showed substantial modal shifts in how people traveled, with greater walking and bicycling.

Community connectivity is restored through a new connection across the highway.

Limited roadway capacity transportation scenario results

The limited roadway capacity transportation scenario evaluated the impacts of limiting roadway expansion, testing whether mobility choices would shift to other modes as a result. For the scenario's individual components, DRCOG staff used the adopted Regional Transportation Plan, removed regionally funded roadway capacity projects and assumed no additional locally funded roadway capacity projects wider than four lanes.

The results from this scenario showed:

- Minimal changes in vehicle miles traveled compared to the comparative scenario.
- Reduced transit, walking and bicycle trips, likely a result of increasing congestion.
- Increased delay compared to the comparative scenario.

This implies that trips taken in the region will not naturally transfer from motor vehicles to walking, biking and transit trips by limiting roadway expansion.

Land use scenario

Transit-focused land use scenario results

Goal: Allow for more residential development around transit corridors and stations.

The transit-focused land use scenario evaluated whether the Regional Transportation Plan's base land use assumptions would be drastically altered by an aggressive implementation of recent land use legislation. For this scenario, staff used the adopted Regional Transportation Plan's fiscally constrained transit investments and increased capacity to 40 dwelling units per acre in high-frequency transit corridors. Staff also decreased capacity outside high-frequency transit corridors.

The results from the transit-focused land use scenario do not show a significant difference in transit, walking and bicycle trips or vehicle miles traveled compared to the comparative land use scenario.

The Regional Transportation Plan is already incorporating increased density along corridors identified for transit investments.



Photo courtesy of RTD

Conclusion

The most recent scenario effort conducted for the update to the 2050 Metro Vision Regional Transportation Plan affirmed the results from the last scenario modeling effort conducted in 2020. The results showed that the region is well equipped to absorb additional multimodal investments, and the Regional Transportation Plan includes a robust transit and active transportation investment mix.