The Ultimate What If….
Adventures in Scenario Planning

Agenda Overview

1. Introduction to Types of Scenario Planning
2. Normative
3. Predictive
4. Exploratory
5. Lessons Learned
What is Blueprint Denver?

- Denver’s land use and transportation plan
- Originally adopted in 2002
- “Big Picture” view on how community values inform how a future Denver looks, feels, and functions
- Establishes policy direction on land use, transportation and urban design
- Strategy for future growth

Blueprint Denver Update

- Major overhaul to existing document
- Process kicked off in 2016 and is still underway
- Why now?
  - Denver is one of the fastest-growing large cities in the U.S. (18,582 growth from July 2014 to July 2015)
  - Denver has evolved considerably in the past 15 years & needs policy updates related to land use, mobility, parks and recreation
Normative Scenarios

- Definition
  - Describes a predetermined future, often are desirable future outcomes or conditions. **What we want to happen?**
  - Assumption is the future is malleable and actions can be taken to achieve the desired outcome

- Use in Urban Planning
  - Often used to help define a desired vision for a community
  - In-ward bound approach working backward from desired future to determine the course of action to achieve it

Predictive Scenarios

- Definition?
  - Estimated future condition based on present knowledge and past trends
  - **What is most likely to happen?**

- Use in Urban Planning
  - Often based on forecasted growth for a community
  - Use of demographic, market, and development conditions and trends to predict future demand
Exploratory Scenarios

• What is a scenario?
  • Describes a range of future possibilities and the common paths and decision points

• Use in Urban Planning
  • More often used in relation to resiliency planning around natural resources
  • Outward bound approach focused on reacting to events/decisions outside of your control. **How can we be prepared for whatever happens?**

Exploratory Scenarios

• Difference from traditional approach
1. Normative

Normative Scenario Modeling

- Paint visions of a future condition
- Identify key goals, metrics and/or indicators that may vary under various future conditions
- Develop mechanisms to quantify differences
- Run the models and compare results
- Communicate pros and cons/trade-offs associated with various visions for the future
Introduction to the RapidFire Model

- Programmatic modeling based on spatial data and analysis inputs
- Existing development and future growth represented in terms of land development categories
- Provides multi-metric analysis to frame critical land use and transportation planning issues

Built Form Types

Place and building studies

DEVELOPMENT TYPES – PLACES and BUILDINGS
RapidFire
Land Development Categories

Density
Mix of Uses
Street Connectivity
Location/Accessibility

+ variants
Development condition
• Infill/redevelopment
• Greenfield
Accessibility condition
• Transit proximity
• Job or urban center proximity

Scenario Development Process

Vision Framework
Task Force Input
Coordination with other Denveright planning efforts

Scenario Concepts
Draft RapidFire Scenarios and Results
Final RapidFire Scenarios and Results

Scenario Modeling to Test Plan Construct and Tools
Review
Implementation Tools, Strategies and Policies
“Preferred” Scenario

Review
Baseline 2040 – Regional Forecast

- Modeled regional growth forecast
- Moderate growth Downtown and in urban centers
- Continued growth in outer Denver areas
- Regional Growth = 1,369,521
Evaluating the Baseline Scenario

Vehicle Miles Traveled
Annual per capita: 3,960 miles

Energy Use
Residential and commercial per capita: 47.3 tril Btu

Water Use
Residential and commercial per capita: 26,400 gallons

Greenhouse Gases
Per capita from cars and buildings: 7.1 metric tons

Household Costs
Driving and utility costs per new household: $10,100

Case Study Scenarios

Development Intensity and Mix
Baseline 2040

Housing Type Mix

Transit Investment

2040 Population
Baseline 2040: 858,000 Medium
A Limited Development: 858,000 Medium
B Expand City Center: 812,000 Low
C Multiple Urban Centers: 858,000 Medium
D Corridors and N’hood Centers: 858,000 Medium
E Embrace Growth: 939,000 High
Case Studies: Growth Strategies

A. Limit Development Throughout the City
B. Expand and Intensify the City Center
C. Focus Density and Investment in Multiple Urban Centers
D. Enhance Corridors and Grow Neighborhood Centers
E. Embrace Multiple Growth Strategies

Limit Development Throughout the City: Boulder, CO

- Growth Strategy:
  - Limit population
  - Limit land supply
  - Limit building heights

- Lessons Learned:
  - Limited housing supply
  - Lack of affordable housing
  - 60,000 commuting in each day
How does Scenario A measure up for Denver?

**VEHICLE MILES TRAVELED**
- Annual per capita: 4,120 miles
  - 4.2% over Baseline

**ENERGY USE**
- Residential and commercial per capita: 48.6 million Btu
  - 2.9% over Baseline

**WATER USE**
- Residential and commercial per capita: 28,800 gallons
  - 8.9% over Baseline

**GREENHOUSE GASES**
- Per capita from cars and buildings: 7.3 metric tons
  - 3.1% over Baseline

**HOUSEHOLD COSTS**
- Driving and utility costs per new household: $11,800
  - 17% over Baseline

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**Case Studies: Growth Strategies**

A. **Limit Development Throughout the City**
B. **Expand and Intensify the City Center**
C. **Focus Density and Investment in Multiple Urban Centers**
D. **Enhance Corridors and Grow Neighborhood Centers**
E. **Embrace Multiple Growth Strategies**
Expand and Intensify the City Center: Vancouver, BC

Growth Strategy:
- Concentrate growth in downtown core
- Invest in transportation

Lessons Learned:
- Solar access
- Neighborhood amenities
- Creative mix of uses within buildings
- Reverse commute pattern created

How does Scenario B measure up for Denver?

<table>
<thead>
<tr>
<th>Category</th>
<th>Measurement</th>
<th>Baseline</th>
<th>Scenario B</th>
<th>Improvement</th>
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</thead>
<tbody>
<tr>
<td>Vehicle Miles Traveled</td>
<td>Annual per capita</td>
<td>3,790</td>
<td>4.3% below</td>
<td>3,650</td>
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<tr>
<td>Energy Use</td>
<td>Residential and commercial per capita</td>
<td>45.6 million Btu</td>
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<td>43.9 million Btu</td>
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<td>Water Use</td>
<td>Residential and commercial per capita</td>
<td>25,700 gallons</td>
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<tr>
<td>Greenhouse Gases</td>
<td>Per capita from cars and buildings</td>
<td>6.8 metric tons</td>
<td>3.4% below</td>
<td>6.5 metric tons</td>
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<tr>
<td>Household Costs</td>
<td>Driving and utility costs per new household</td>
<td>$8,500</td>
<td>16% below</td>
<td>$7,000</td>
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</tbody>
</table>
Case Studies: Growth Strategies

A. Limit Development Throughout the City
B. Expand and Intensify the City Center
C. Focus Density and Investment in Multiple Urban Centers
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E. Embrace Multiple Growth Strategies

Focus Density and Investment in Multiple Urban Centers: Los Angeles, California

Growth Strategy:
• Focus growth in multiple centers
• Invest in multi-modal transportation

Lessons Learned:
• Multiple centers mitigates some impacts of large population
• Difficult to retrofit transportation networks
• Creation of layered networks
How does Scenario C measure up for Denver?

**VEHICLE MILES TRAVELED**
Annual per capita
3,860 miles

**ENERGY USE**
Residential and commercial per capita
46.1 million Btu

**WATER USE**
Residential and commercial per capita
25,800 gallons

**GREENHOUSE GASES**
Per capita from cars and buildings
6.9 metric tons

**HOUSEHOLD COSTS**
Driving and utility costs per new household
$9,100

Case Studies: Growth Strategies

A. Limit Development Throughout the City
B. Expand and Intensify the City Center
C. Focus Density and Investment in Multiple Urban Centers
D. Enhance Corridors and Grow Neighborhood Centers
E. Embrace Multiple Growth Strategies
Enhance Corridors and Grow Neighborhood Centers: Portland, OR

Growth Strategy:
• Revitalize commercial corridors
• Regional and local transit investment
• Strong emphasis on bike network

Lessons Learned:
• Smaller-scaled developments are easier to facilitate
• Neighborhood tensions along corridors
• Strong regional collaboration

How does Scenario D measure up for Denver?

<table>
<thead>
<tr>
<th>Category</th>
<th>Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle Miles Traveled</td>
<td>1.5% below Baseline</td>
</tr>
<tr>
<td>Energy Use</td>
<td>1.1% below Baseline</td>
</tr>
<tr>
<td>Water Use</td>
<td>1.0% below Baseline</td>
</tr>
<tr>
<td>Greenhouse Gases</td>
<td>1.2% below Baseline</td>
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<tr>
<td>Household Costs</td>
<td>6% below Baseline</td>
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Case Studies: Growth Strategies

A. Limit Development Throughout the City
B. Expand and Intensify the City Center
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Embrace Multiple Growth Strategies: Chicago, IL

Growth Strategy:
• Growing is a goal to fund infrastructure and neighborhood reinvestment
• Invest in multiple layers of transit

Lessons Learned:
• Parking management
• Acceptance of congestion
• Access to amenities
• Retain neighborhood character while growing
How does Scenario E measure up for Denver?

**VEHICLE MILES TRAVELED**
- Annual per capita: 3,750 miles
- **5.3% below Baseline**

**ENERGY USE**
- Residential and commercial per capita: 44.3 million Btu
- **6.3% below Baseline**

**WATER USE**
- Residential and commercial per capita: 25,000 gallons
- **5.2% below Baseline**

**GREENHOUSE GASES**
- Per capita from cars and buildings: 6.7 metric tons
- **5.9% below Baseline**

**HOUSEHOLD COSTS**
- Driving and utility costs per new household: $8,200
- **19% below Baseline**

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Case Study Scenarios

**Best – Embrace Multiple Growth Strategies**

**VEHICLE MILES TRAVELED**
- Annual per capita: 3,750 miles
- **5.3% below Baseline**

**ENERGY USE**
- Residential and commercial per capita: 44.3 million Btu
- **6.3% below Baseline**

**WATER USE**
- Residential and commercial per capita: 25,000 gallons
- **5.2% below Baseline**

**GREENHOUSE GASES**
- Per capita from cars and buildings: 6.7 metric tons
- **5.9% below Baseline**

**HOUSEHOLD COSTS**
- Driving and utility costs per new household: $8,200
- **19% below Baseline**

**Worst – Limit Development Throughout the City**

**VEHICLE MILES TRAVELED**
- Annual per capita: 4,120 miles
- **4.2% over Baseline**

**ENERGY USE**
- Residential and commercial per capita: 48.6 million Btu
- **2.9% over Baseline**

**WATER USE**
- Residential and commercial per capita: 28,800 gallons
- **8.9% over Baseline**

**GREENHOUSE GASES**
- Per capita from cars and buildings: 7.3 metric tons
- **3.1% over Baseline**

**HOUSEHOLD COSTS**
- Driving and utility costs per new household: $11,800
- **17% over Baseline**
2. Predictive

Predictive Scenario Modeling

- Utilizes data to develop an estimate of the most likely outcome(s)
- Most often utilizes in depth data analysis and econometric models
- Key questions data is used answer:
  - How much growth?
  - Where is most likely to occur?
  - What form will/can it take?
Growing prevalence

Predictive Modeling Tools

UrbanSim

envision tomorrow

UrbanFootprint
Reimagine Reno

- Predictive approach can model variable rates of growth
- What if growth continues at this break neck pace?

Reimagine Reno

- Translate forecasted growth to development and land demand
- Do we have enough land?
Reimagine Reno

- Model “Dials”
  - Industry Growth Rates
  - Development Types
  - Density Assumptions
  - Capture Rate Assumptions

Use in Blueprint Denver

- Targeted use of predictive modeling
- Estimated demand for industrial uses to understand the need to preserve industrial land

<table>
<thead>
<tr>
<th>Description</th>
<th>Emp. Growth 2015-2035</th>
<th>Demand Factors</th>
<th>Demand Projections (Sq. Ft.)</th>
<th>Building Area</th>
<th>Land % Total</th>
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<tbody>
<tr>
<td></td>
<td>Sq. Ft./Emp.</td>
<td>FAR</td>
<td></td>
<td></td>
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<tr>
<td>Manufacturing</td>
<td>4,171</td>
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<td>500</td>
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<td>6,805,447</td>
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<td>Total</td>
<td>23,186</td>
<td>706</td>
<td>0.30</td>
<td>16,368,550</td>
<td>54,561,834</td>
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</table>

Source: Economic & Planning Systems
Use in Blueprint Denver

• Using UrbanSim late in the process to “test” the growth framework
• What areas/land use designations are not producing desired development or allow development where it may not be desired
• Assess the impact of tools/policies/incentives identified to achieve the desired growth framework

3. Exploratory
Exploratory Scenario Planning: Blueprint Denver

- Received grant from Sonoran Institute/Western Lands and Communities (WLC) to integrate exploratory scenario planning into Blueprint Denver
- Early 2016: we got the grant!! Now how do we use it??
- Unique test case to integrate into a comprehensive planning process

WLC: Typical Use of Exploratory Scenario Planning

- Planning for environmental resources, such as:
  1. White Mountains Land Trust: forest management, water resources, climate change
  2. State-wide water plan for State of Colorado
  3. Southwest Colorado Council of Governments used to assess potential impacts of long-term drought on regional economy
**WLC: Exploratory Scenario Planning**

Exploratory Scenario Planning is about **BEING PREPARED for whatever happens in the Future**

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**WLC: Exploratory Scenario Planning Process**

1. Frame the question, set the horizon, & conduct onsite interviews
2. Identify the driving forces
3. Rank the driving forces
4. Identify the most critical uncertainties
5. Create the scenario / future matrix
6. Develop the scenario narratives
7. Explore the implications of each future
8. Create a path of actions that addresses the emerging needs of each future
9. Identify actions common to multiple futures
Exploratory Scenario Planning: Blueprint Denver

- Key decision: use internal staff team and Blueprint Denver task force chairs as the “stakeholder group”
- Conducted exploratory scenario planning very early in planning process so it could inform staff’s approach to the public planning process

Exploratory Scenario Planning: Blueprint Denver

- Multiple meetings by stakeholder/staff group
  - Community Planning and Development staff
  - Public Works staff
  - Blueprint Denver task force co-chairs
Step 1: Defining the Focal Question

As Denver continues to change and evolve over the next 25 years, how can the city provide greater access to opportunities, services and amenities for its current and future residents?

Steps 2-4: Identifying the Key Driving Forces

- Driving Forces = forces outside of the community’s control that may impact the community in the future
- The options are endless!
  - Climate change
  - Local, state, and national politics
  - Aging infrastructure
  - Demographic Changes
  - And many more . . .
Step 2-4: Identifying the Key Driving Forces

• What don’t we have control over in the future?
• Critical driving forces with the most uncertainty:
  • Development rights/capacity
  • Political will
  • Population growth and demographic changes
  • Mode shift

Step 5: Create the Scenario Matrix
### Step 6: Develop Scenario Narratives

<table>
<thead>
<tr>
<th>Denver Today</th>
<th>Boom!</th>
<th>Brown Cloud</th>
<th>Deverisco</th>
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</thead>
<tbody>
<tr>
<td>Little Mode Shift</td>
<td>Right Use, Right Place</td>
<td>Little Mode Shift</td>
<td>Vibrant Growth</td>
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<tr>
<td>Right Use, Right Place</td>
<td>Vibrant Growth</td>
<td>Absent Political Will</td>
<td>Mucho Millennials</td>
</tr>
<tr>
<td></td>
<td>Mucho Millennials</td>
<td></td>
<td>Absent Political Will</td>
</tr>
</tbody>
</table>

### Step 7: Explore Implications of Each Future

- More homogenized economy/culture
- Continued displacement from urban neighborhoods
- Government spread to thin and cost of services becomes very high
Steps 8-9: Identifying Actions and Strategies

• Focus on actions and strategies that can address the needs of more than one future scenario

• Examples:
  • Increase access to and improve quality of public transit
  • Foster public private partnerships
  • Incentivize affordability through zoning

The Benefits Continue . . .

• The possibility of multiple future scenarios continues to influence our thinking about the plan

• Strategies identified will be considered as we start to draft plan recommendations
How have you used scenario planning?
• Examples of good or bad applications?

4. Lessons Learned
Normative

- Establish a strong rational approach to developing future visions and avoid dummy scenarios
- Identify the key indicators/metrics to compare and ensure that your tool measures those well
- Decide how robust the analysis needs to be and determine whether tool needs to be fully spatial or not
- Ultimately the value comes down to how well you are able to communicate the trade-offs between different options

Predictive

- Quality of the predictive model results are a direct result of the quality of the inputs
- Can have utility in different parts of the planning process
- Well suited to answer specific issues or test approaches
- Modeling tools may not have desired flexibility and can be too costly to make it useful
- Predictions/Modeling may not forecast a catalytic impact
Exploratory

- Make sure you pick the right group of stakeholders to fit your process
- Contemplating more than one future scenario, and remembering how much is out of our control, adds value to the planning process
- Even if the public planning process is still driven by a more normative approach, exploratory planning brings helpful insights

The Ultimate What If….
Adventures in Scenario Planning

APA Colorado 10.03.17