Rapid Transit Station Areas and Transit Corridors:
Sustainable Mode Share Study

Rail~Vololution 2013
October 22, 2013
Lyle Walker, TransLink
and
Michael Iswalt, Arup
Policy Context

• **Regional Growth Strategy (Metro Vancouver)**
  - Focus growth in:
    • Urban Centres
    • Frequent Transit Development Areas

• **Regional Transportation Strategy (TransLink)**
  - Targets by 2045:
    • Most trips by sustainable modes
    • Reduce average trip lengths by 1/3rd

• **Other Targets:**
  - Many municipalities set mode share and GHG targets
  - Province has transit mode share targets for Metro Vancouver region
Problem Statement

• How do we get more out of transit investments and neighbourhood design?

• What are the built environment factors that matter and within control of partners?

• What combination of built environment characteristics and transit investments move us towards achieving our goals?
FTN Corridors are also Strong Performers

Inside

| FTN 38% | vs. | Beyond FTN 18% |

For all trip purposes. TransLink 2011 Trip Diary Survey
Creating Transit-Oriented Communities: The 6 “D”s

Places that facilitate a **decreased reliance on driving** by providing:

- Good **Destination** accessibility
- Short **Distance** to transit
- Pedestrian-friendly **Design**
- **Density** of jobs & residents
- **Diversity** of uses
- **Demand** management
TransLink’s Need

• Lack of empirical local research into the impact of the 6Ds on transport outcomes

• Importance of developing analytical tools to evaluate a range of urban form factors

• Desire to develop quantitative guidelines for characteristics that support transit
Develop Two Models

Each rely on different methods to estimate travel behaviour and the built environment

Focus:
- VMT/VKT
- GHGs
Station Area Modeling

Sustainable Mode Share Model
What Drives Travel Behaviour?

- Travel is a **derived** demand
- Travel behaviour is **difficult** to measure and **explain**
- Extensive research into the “Ds” and travel demand
- We **affect** the built environment
Station Areas and Corridors

1. 56 station areas

2. 74 Frequent Transit Network (FTN) corridors
Why Focus on Station Areas?

- Focal areas for growth and change

- ~16% of region’s population and ~33% employment within 800m (1/2 mile) of a rapid transit station by 2016

- Even higher when include B-line stop areas

- Strong interest in rapid transit expansion but needs supportive land use and funding
### Station Area Mode Share Data Sources

<table>
<thead>
<tr>
<th>2011 Trip Diary Survey</th>
<th>2006 Census of Canada Journey-to-Work</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>All trip purposes, all day</strong></td>
<td><strong>Work travel only</strong></td>
</tr>
<tr>
<td>• Not enough sample respondents for individual station areas</td>
<td>• Place of Residence</td>
</tr>
<tr>
<td>• Developed station typology groupings to avoid sampling issue</td>
<td>• Place of Work</td>
</tr>
<tr>
<td></td>
<td>• Aggregated and summarized for each station area</td>
</tr>
<tr>
<td></td>
<td>• Useful for more detailed regression modeling</td>
</tr>
</tbody>
</table>
2011 Trip Diary and Station Typologies

**Employment**
- Aberdeen
- Bridgeport

**Other Station Types (See Figure 3)**
- Stadium - Chinatown
- Yaletown-Roundhouse

**Regional Downtown/CBD**
- Waterfront
- Granville
- Burrard
- Vancouver City Centre

**Graph Details**
- Ratio of Jobs to Population (0-800m, 2011)
- Population + Employment Density (0-800m, 2011), persons / ha
2011 Trip Diary and Station Typologies
2011 Trip Diary Mode Shares by Station Type

Sustainable Mode Share %

<table>
<thead>
<tr>
<th>Station Type</th>
<th>CBD</th>
<th>Employment</th>
<th>HD Centre</th>
<th>MD Centre</th>
<th>MU: Low-Med</th>
<th>Neighbourhood: Med-High</th>
<th>Neighbourhood: Low</th>
<th>All Station Areas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sustainable Mode Share %</td>
<td>60.0%</td>
<td>20.0%</td>
<td>50.0%</td>
<td>40.0%</td>
<td>50.0%</td>
<td>30.0%</td>
<td>40.0%</td>
<td>30.0%</td>
</tr>
</tbody>
</table>
2006 Sustainable Work Mode Share for Station Area Residents
2006 Sustainable Work Mode Share for Station Area Residents
2006 Sustainable Work Mode Share for Station Area Residents

Sustainable Mode Share
- <20%
- 20-30%
- 30-40%
- 40-50%
- 50-64%
2006 Sustainable Work Mode Share for Station Area Residents
2006 Sustainable Work Mode Share for Station Area Residents
2006 Sustainable Work Mode Share for Station Area Residents
2006 Sustainable Work Mode Share for Station Area Workers
2006 Sustainable Work Mode Share for Station Area Workers
2006 Sustainable Work Mode Share for Station Area Workers
2006 Sustainable Work Mode Share for Station Area Workers
2006 Sustainable Work Mode Share for Station Area Workers
Multiple regression model

- 800m station area catchments
- Place of Residence (POR) model
- Place of Work (POW) model

**Dependent variable** = sustainable mode share for work trips

**Explanatory variables** = built environment measures
Station Area Residents: Sustainable Mode Share v Density
Station Area Workers: Sustainable Mode Share v Density

- CBD
- High-Density Centres
- Medium Density Centres
- Employment Centre
- Mixed Use: Low-Med Density
- Neighbourhood: Med-High
- Neighbourhood: Low
# Models for Residents and Workers

*(Preliminary Results)*

<table>
<thead>
<tr>
<th>Place of Residence Model</th>
<th>Place of Work Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variable</strong></td>
<td><strong>Dependent Variable</strong></td>
</tr>
<tr>
<td>Sustainable <em>Work</em> Mode Share for Station Area Residents %</td>
<td>Sustainable <em>Work</em> Mode Share for Station Area Workers %</td>
</tr>
</tbody>
</table>

**Independent Variables**

- Dwelling unit density
- Walk Score
- Transit accessible jobs (within 30-min commute)

**Independent Variables**

- Employment density
- Commute distance
- Walk Score
- Parking (off-street)
Place of Residence Model Findings
(Preliminary Results)

For residents living within 800m of a rapid transit station, a 10% increase in:

- **Dwelling unit density** translates into a **1.7% increase** in sustainable mode share

- **Walk Score** translates into a **2.7% increase** in sustainable mode share

- **Accessibility to jobs by transit** (within a 30 min travel time) translates into a **0.7% increase** in sustainable mode share
For workers working within 800m of a rapid transit station, a 10% increase in:

- **Employment density** translates into a **1.6% increase** in sustainable mode share.
- **Median commute distance** for workers translates into a **3.3% decrease** in sustainable mode share.
- **Walk Score** translates into a **5.6% increase** in sustainable mode share.
- **Off-street parking** spaces would translate into a **0.1% decrease** in sustainable mode share.
Applying the Models

- Regional Transportation Strategy
  - Alternatives analysis
  - Inform subregional and municipal targets
  - Estimate of performance in smaller areas of interest

- Predicting Performance of Neighbourhoods with Changing Transit Service Levels and Land Use

- What if Scenario evaluation (neighbourhood level)

- Development of future land use guideline elements for Transit Service Guidelines update
Case Study

- Consider a Neighbourhood Being Served by a New Rapid Transit Station

- Use tools to forecast sustainable mode
Mode Share: Pre- and Post Changes

Radar Charts for Suburban Rapid Transit Station, 2006 and 2031

- Neighbourhood Pre-Rapid Transit, 2006
- Neighbourhood Post-Rapid Transit, 2031

Indicators:
- Intersection Density
- Walk Score
- Jobs accessible by 30min transit
- Employment Density
- Dwelling Density
High Sustainable Mode Share Expected
(Preliminary Results)

Neighbourhood with New Rapid Transit Station: Actual and Modeled Sustainable Mode Share for Journey to Work Trips

- **2006 actual**: 29.9%
- **2006 modeled**: 31.1%
- **2031 modeled**: 41.2%
What is the change in mode share attributed to?

(Preliminary Results)

Sustainable Mode Share for Journey-to-Work Trips (%)

<table>
<thead>
<tr>
<th>Neighbourhood Study Area, 2031</th>
<th>Neighbourhood Study Area with Walk Score of 100, 2031</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change due to Built Environment Changes (to 2031)</td>
<td>Change due to New Rapid Transit Access</td>
</tr>
<tr>
<td>2006 Baseline</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>0%</th>
<th>5%</th>
<th>10%</th>
<th>15%</th>
<th>20%</th>
<th>25%</th>
<th>30%</th>
<th>35%</th>
<th>40%</th>
<th>45%</th>
<th>50%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Neighbourhood Study Area, 2031
Neighbourhood Study Area with Walk Score of 100, 2031
Classification of Station Area

- High-Density Centres/Central Broadway
  - Olympic Village
  - Broadway-City Hall
- Medium Density Centres
  - Arbutus-Broadway
  - Metrotown
  - Granville-Broadway
  - Main-Broadway
- Low-Density Neighbourhoods
  - Holdom
  - Sperling
  - King Edward
  - 22nd St
  - Langara-49th Avenue
- Mixed Use: Low-Med Density
  - Production Way
  - Braid
  - Rupert
  - Lake City
  - Scott Road
  - Sapperton
  - Oakridge-41st Avenue
  - Surrey Central
  - King George
  - Brentwood
  - Main
  - Marine Drive
  - Richmond-Brighouse
  - Landsdowne
  - VCC-Clark
  - Main
  - Commercial
  - Grosvenor
  - Broadway
  - Joyce
  - Macdonald
  - MacMillan
  - Burnaby
- Neighbourhood: Med-High Density
  - Edmonds
  - Marine
  - Nanaimo
  - 29th Ave
  - New West
Mode Share varies by trip purpose

Sustainable Mode Share Summary for Study Area
Estimated for 2031:
• ~41% for work trips
• ~30%-35% for non-work trips
How are other transportation outcomes expected to vary?

Also available:
- Per household
- Transit PKT
- GHG emissions
- Altering scenarios

[Bar charts showing comparisons between different transportation outcomes and years.]
Rapid Transit Station Areas – Summary Observations

• Combination of land use change and transportation investment is moving us towards achieving our transportation outcomes.

• Can have high sustainable mode share even without rapid transit in the right locations and with walking and transit-supportive characteristics.

• Highlights the magnitude to which specific land use characteristics influence travel behaviour.

• Urban Centres and FTDAs will likely be the most important places for contributing towards the most change.
Next Steps

- Final minor changes
- Fuller validation of models
- Review by stakeholders
- Possible incorporation of demand management and other factors
- Future development of land use guidelines that support different types of transit service (as part of Transit Service Guidelines update)
Corridor Evaluation

74 Frequent Transit Network Corridors
## Corridor Summaries

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type A: Local</strong></td>
<td>38.7</td>
<td>12.3</td>
<td>51.0</td>
<td>350</td>
<td>23.4%</td>
<td>22.8%</td>
</tr>
<tr>
<td><strong>Type B: Frequent</strong></td>
<td>40.8</td>
<td>26.1</td>
<td>66.8</td>
<td>705</td>
<td>29.3%</td>
<td>28.3%</td>
</tr>
<tr>
<td><strong>Type C: Very Frequent</strong></td>
<td>63.0</td>
<td>24.2</td>
<td>87.2</td>
<td>1,922</td>
<td>38.9%</td>
<td>38.3%</td>
</tr>
<tr>
<td><strong>Type D: Fast and Very Frequent</strong></td>
<td>48.1</td>
<td>51.0</td>
<td>99.1</td>
<td>2,851</td>
<td>42.0%</td>
<td>40.0%</td>
</tr>
<tr>
<td><strong>Corridor Average</strong></td>
<td>41.8</td>
<td>20.4</td>
<td>62.2</td>
<td>706</td>
<td>27.7%</td>
<td>26.9%</td>
</tr>
<tr>
<td><strong>Regional Average</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>24.5%</strong></td>
<td><strong>25.7%</strong></td>
</tr>
</tbody>
</table>
Corridor “Fact Sheet”
Population Density

Population Density (pers / ha)
Job Density

Employment Density
(jobs / ha)