Streetcars: The Missing Link?
Benefits of Transit and How it Can Shape Our Cities

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Transportation $$$, travel choices and outcomes

- transportation investment
- land use decisions

- travel choices
- time use

- air quality
- physical activity
- climate change

- public health
- economy
Motivation for The Event

- To help clarify and gain more of a common definition of the different available modes of transit
  - Lots of confusion between streetcars and light rail
- Need to distinguish between how the different modes of transit perform in terms of capacity, right-of-way requirements, flexibility, and cost
- Increase the understanding of how different transit investments relate and lead different types of local land use and regional development patterns
  - Developers, and subsequent residents and employers react differently to each mode of transit
It’s All About Energy

On 350 calories — one apple tart or a “special” slice of Ray's Pizza — a cyclist can travel 10 miles, a pedestrian 3.5 miles, and an automobile 100 feet.

Transportation Alternatives, Bicycle Blueprint, 1998

THE CLIMATE CHANGE AND PUBLIC HEALTH NEXUS
BUILT ENVIRONMENT

ECONOMY & QUALITY OF LIFE
A System of Modes

- Vancouver has significant investment in both surface bus and in rapid transit (LRRT or Skytrain & Heavy Rail)
- Streetcars serve a connective function and can help to knit together destinations and efficiently chain trips between existing modes
- For Example, a downtown streetcar system could connect several major destinations
  - Canada Place, Convention Centre, Waterfront Station, Sea Bus (north shore), Science World, Granville Island
“Transportation Drives Land Development”

- What sort of communities are we trying to achieve and how can we reduce energy use?
- Encouraging shorter distances between destinations ultimately
  - More compact mixed use environments
- Requires focusing transportation investments within existing centers and in certain modes
  - The “20 minute neighborhood”
- Ideally match supply of place types with public preferences or demand
  - Unmet Demand for Walkable Places Increasing Prices
  - Survey Forthcoming
Walkable Places …………

Disconnected

Crow-Fly Buffer
Network Buffer
Sample Household

Connected

Require a Range of Transit Investments

2 KM

1 KM
Transit use and walking are highly synergistic

- Transit use is the highest where walking was the most prevalent.
- Adults in the highest levels of net residential and commercial densities, street connectivity, and land use mix were two times as likely to use transit for work and other purposes.
- Adults in the most walkable neighbourhoods drove approximately 58% less with the average reported daily travel distance for home-based trips around 7 km per day.

Vancouver Study by Devlin and Frank, 2009

IN YOUR HANDOUTS
Transit Use and Physical Activity

- Transit use was significantly associated with greater odds of meeting physical activity recommendations (OR=3.42; CI=2.40-4.87)
  - by walking for transportation
- The odds of meeting 30 minute Physical Activity Recommendation is negative for additional trips as a car driver (OR = .87; CI=0.76-0.99)

Source: LaChapelle and Frank, 2009
Research Results: 
*Land Use Matters*

Low density, separated land uses, and poor street connectivity is associated with:

- increased auto use, air pollution, greenhouse gas emissions, and energy consumption
- reduced transit ridership, walking and physical activity;
- Increased obesity
  - Which increases the likelihood of:
    - cardiovascular disease
      » (http://circ.ahajournals.org/cgi/content/full/96/9/3248)
    - type II diabetes
      » (http://www.hms.harvard.edu/sitn/presentations2003/week9/2week9.pdf)
    - colorectal cancer
A 5 % Increase in Walkability is associated with a:

- 32 % increase in minutes of walking and biking
- A ¼ pt reduction in BMI
  - About ½ kilogram
- A 6.5 % reduction in per capita vehicle kilometers traveled
- A 5.5 percent reduction in ozone precursors
  - Oxides of Nitrogen and Volatile Organic Compounds

Many Pathways from Land Use to Health, Frank et al.
Journal of the American Planning Association 2006
Lower Mainland Walkability Map
## Adult Findings - Transit Use

Built environment characteristics explaining transit use in adults

<table>
<thead>
<tr>
<th></th>
<th>Any transit trip</th>
<th>Work/school transit trip</th>
<th>Non-work/school transit trip</th>
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</thead>
<tbody>
<tr>
<td>Higher residential density</td>
<td>++</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Higher street connectivity</td>
<td>++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Higher commercial density</td>
<td>+++</td>
<td>NS</td>
<td>+</td>
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<tr>
<td>Higher mix of land uses</td>
<td>++</td>
<td>++</td>
<td>NS</td>
</tr>
<tr>
<td>More nearby parks and open spaces</td>
<td>NS</td>
<td>NS</td>
<td>NS</td>
</tr>
<tr>
<td>Higher overall neighbourhood walkability</td>
<td>++</td>
<td>++</td>
<td>++</td>
</tr>
</tbody>
</table>

NS = not significant, '+' = 95% significant; '++' = 99% significant, '+++’ = 99.9% significant

Devlin and Frank, 2009
Walkability and Elderly
Air pollution Exposure and Walkability

Marshall, Brauer, and Frank 2009 – *Environmental Health Perspectives*
CO2 & Neighbourhood Design

Source: LUTAQH final report, King County ORTP, 2005
The Global Warming Gamble

Policy Levers to Reduce Transportation - Related CO2 emissions
Driving 1/3 As Much in 2050

<table>
<thead>
<tr>
<th>2050 Payoff Scenarios</th>
<th>VEHICLE EFFICIENCY</th>
<th>FUEL MIX</th>
<th>DEMAND</th>
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</thead>
<tbody>
<tr>
<td>Major Progress</td>
<td>47</td>
<td>-35%</td>
<td>8.4</td>
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<tr>
<td>Technology Breakthrough</td>
<td>61</td>
<td>-65%</td>
<td>20.9</td>
</tr>
</tbody>
</table>

Brookings Draft Report – King County
Results – Urban Form + Major Progress – Seattle Study

• All else equal, households living in the most walkable King County neighborhoods were 54 percent more likely to meet the 8.4 daily mile threshold.

• Each ten-minute decrease in regional transit travel time increased the odds of meeting the vehicle miles traveled target by 11 percent.
Final Map of CO2 emissions from transportation

WE NEED THIS HERE!!

Includes:
Local urban form (land use mix, intersection density, retail FAR)
Regional location (auto travel time)
Transit accessibility & travel time
Demographics
Urban Form and Transit Demand (Non-Work Travel Example)

- Transit demand increased by 3.4 percent with a 10 percent increase retail floor space ratio (site design) and by 3.0 percent with a 10 percent increase in mix of uses at the destination.

- Increasing home and destination intersection density by 10 percent was associated with a 2.4 percent and 2.3 percent increase in transit demand for non-work travel respectively.

  - (Frank et al 2006 – Transportation). King County Seattle Study Funded by the Washington State Dept of Transportation.
The Seattle City Council recently voted to support connecting four streetcar lines to the existing line in the South Lake Union neighborhood.
A fundraiser has been announced for Sept. 30, 2010 to benefit the Downtown L.A. Streetcar effort. The co-hosts joined forces to highlight their belief in the economic, cultural, transportation and livability benefits a modern streetcar system would bring to Downtown.
Streetscape and Right of Way Considerations

- The characteristics of each transit mode result in different urban design (smaller scale) decisions
  - Station design is impacted by access characteristics
    - Placement within right-of-way – pedestrian and bike access
    - Loading Characteristics - platform height
    - Width, setbacks, buffers, interactions with other vehicles if at street level
  - Resulting accessibility
    - Capacity, speed, and distances people will travel
Dresden Streetcar
Figure 2-1  Vehicle Ownership Impact on Rail Commuting

Note: Reside Near = 1/2 mile or less; Work Near = 1/2 mile or less.
Source: Cervero & Duncan, 2002
Thank You!

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