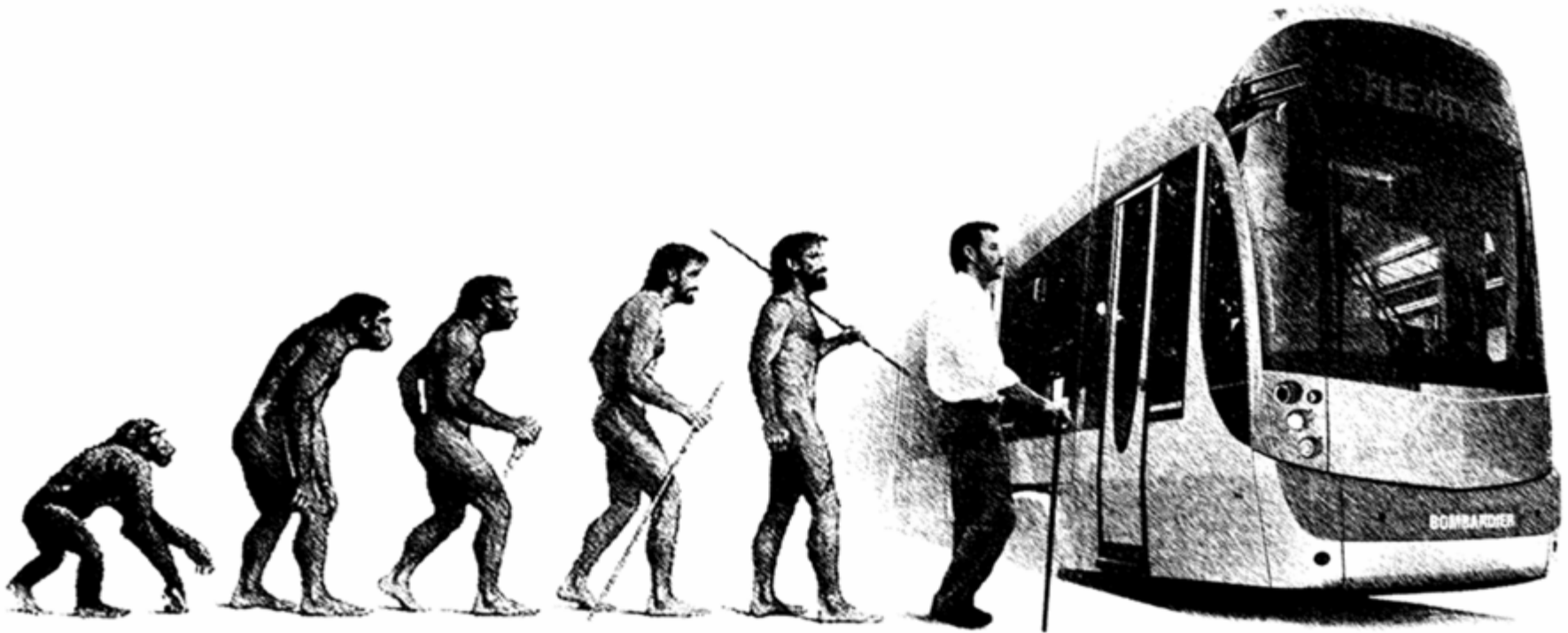


Streetcars: The Missing Link?

Benefits of Transit and How it Can Shape Our Cities



**Dr. Lawrence Frank, Bombardier Chair in Sustainable Transportation
University of British Columbia**

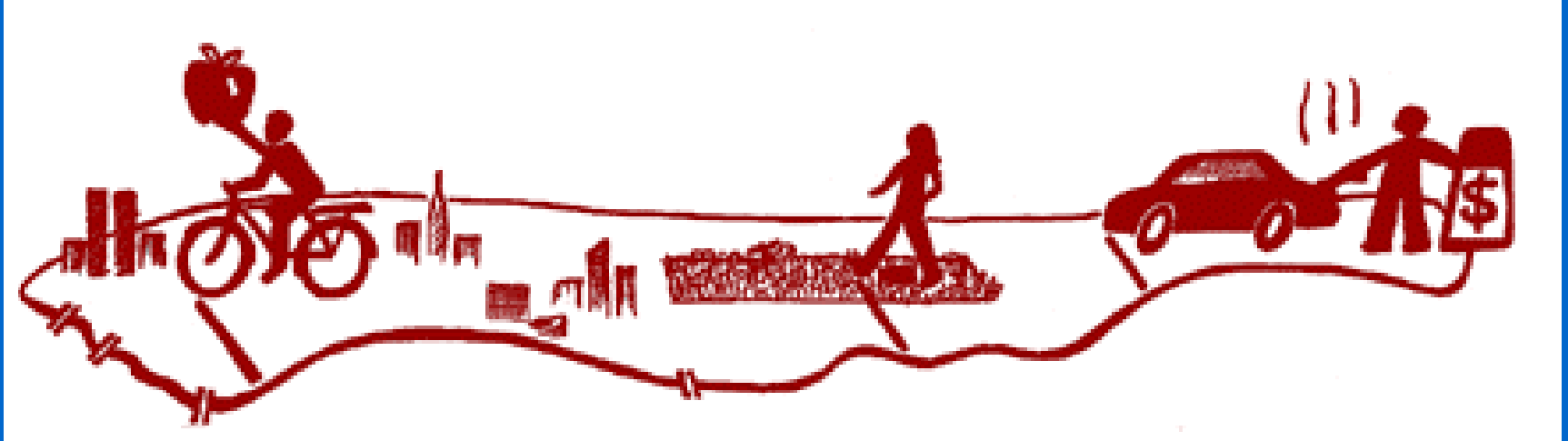
Transportation \$\$\$, travel choices and outcomes



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

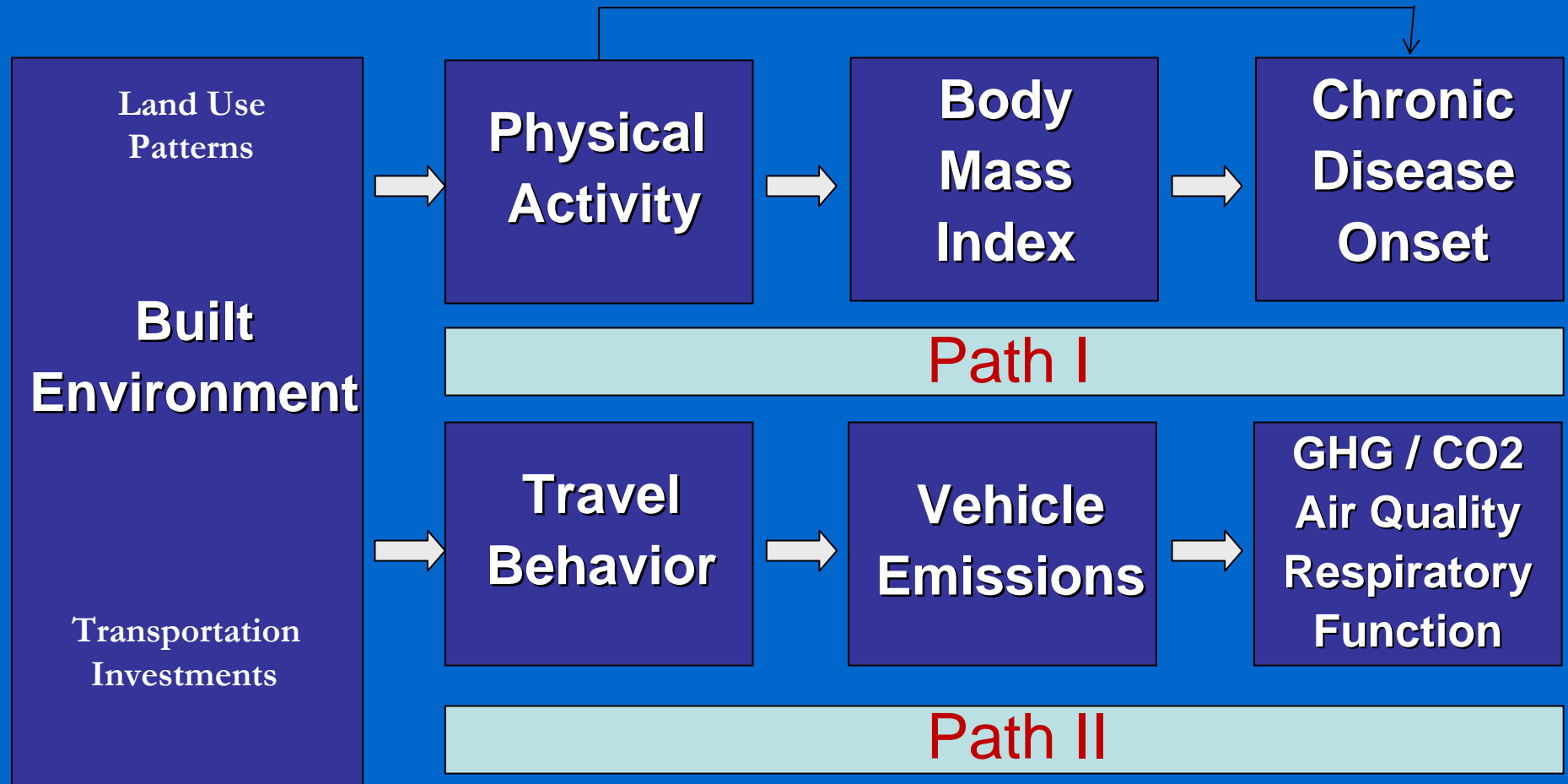
A System of Modes

- 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”

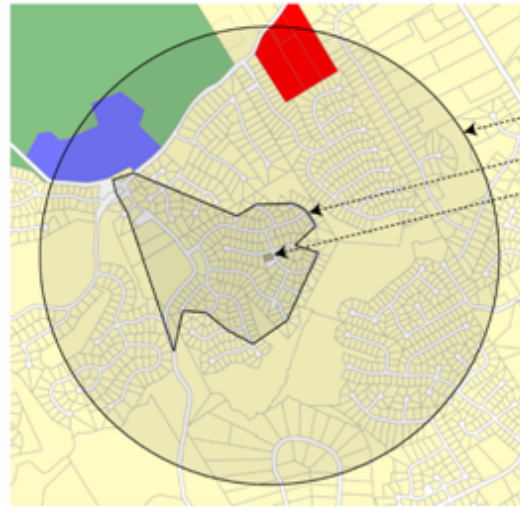
- What sort of communities are we trying to achieve and how can we reduce energy use?
- Encouraging shorter distances between destinations ultimately
 - More compact mixed use environments
- Requires focusing transportation investments within existing centers and in certain modes
 - The “20 minute neighborhood”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

CONCEPTUAL MODEL

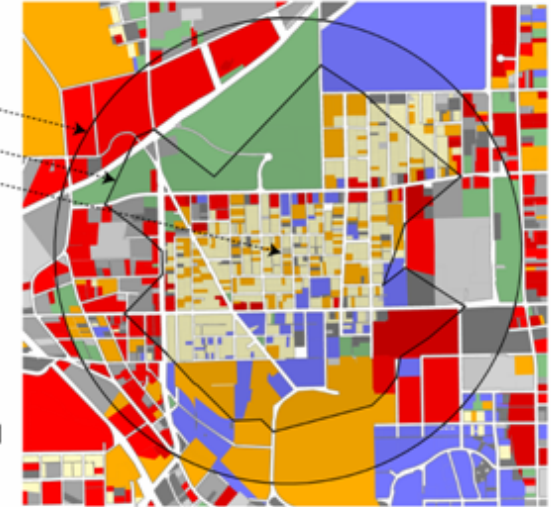


Walkable Places

Disconnected



Connected



**Require a
Range of
Transit
Investments**

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

IN YOUR HANDOUTS

Research Results: *Land Use Matters*

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

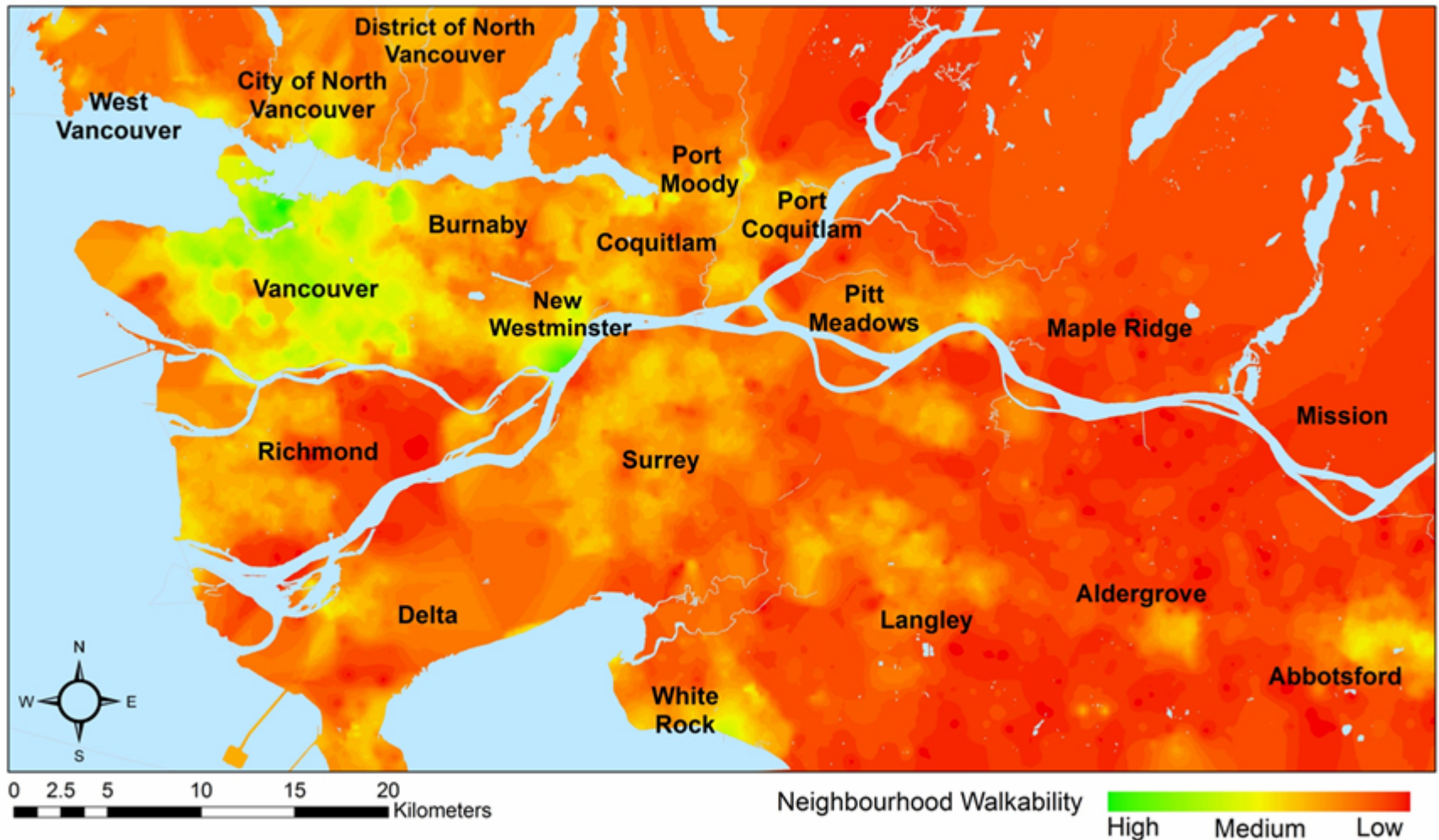
- increased auto use, air pollution, greenhouse gas emissions, and energy consumption
- reduced transit ridership, walking and physical activity;
- Increased obesity
 - Which increases the likelihood of:
 - cardiovascular disease
 - » (<http://circ.ahajournals.org/cgi/content/full/96/9/3248>)
 - type 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 $\frac{1}{4}$ pt reduction in BMI
 - About $\frac{1}{2}$ 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



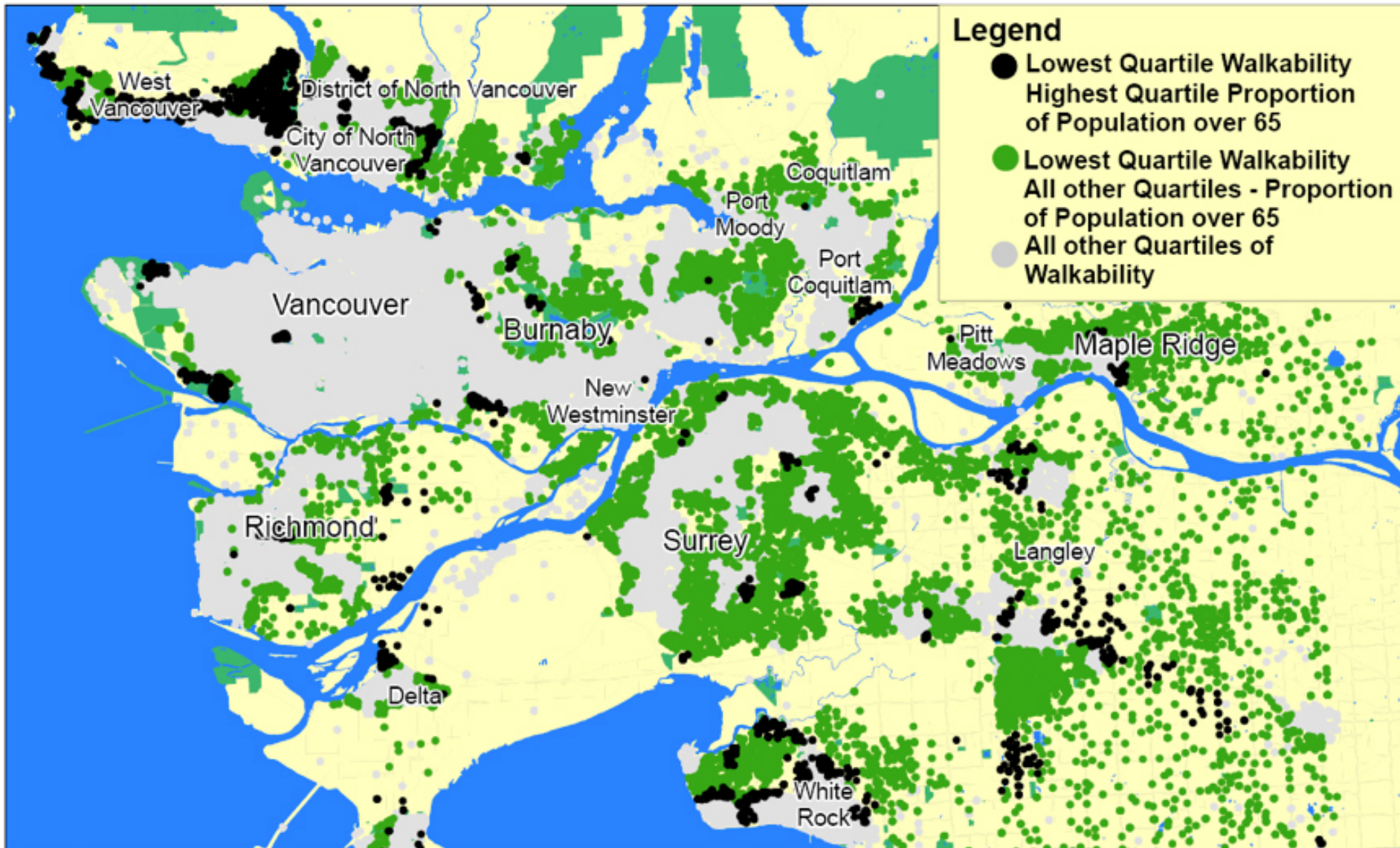
Adult Findings - Transit Use

Built environment characteristics explaining transit use in adults

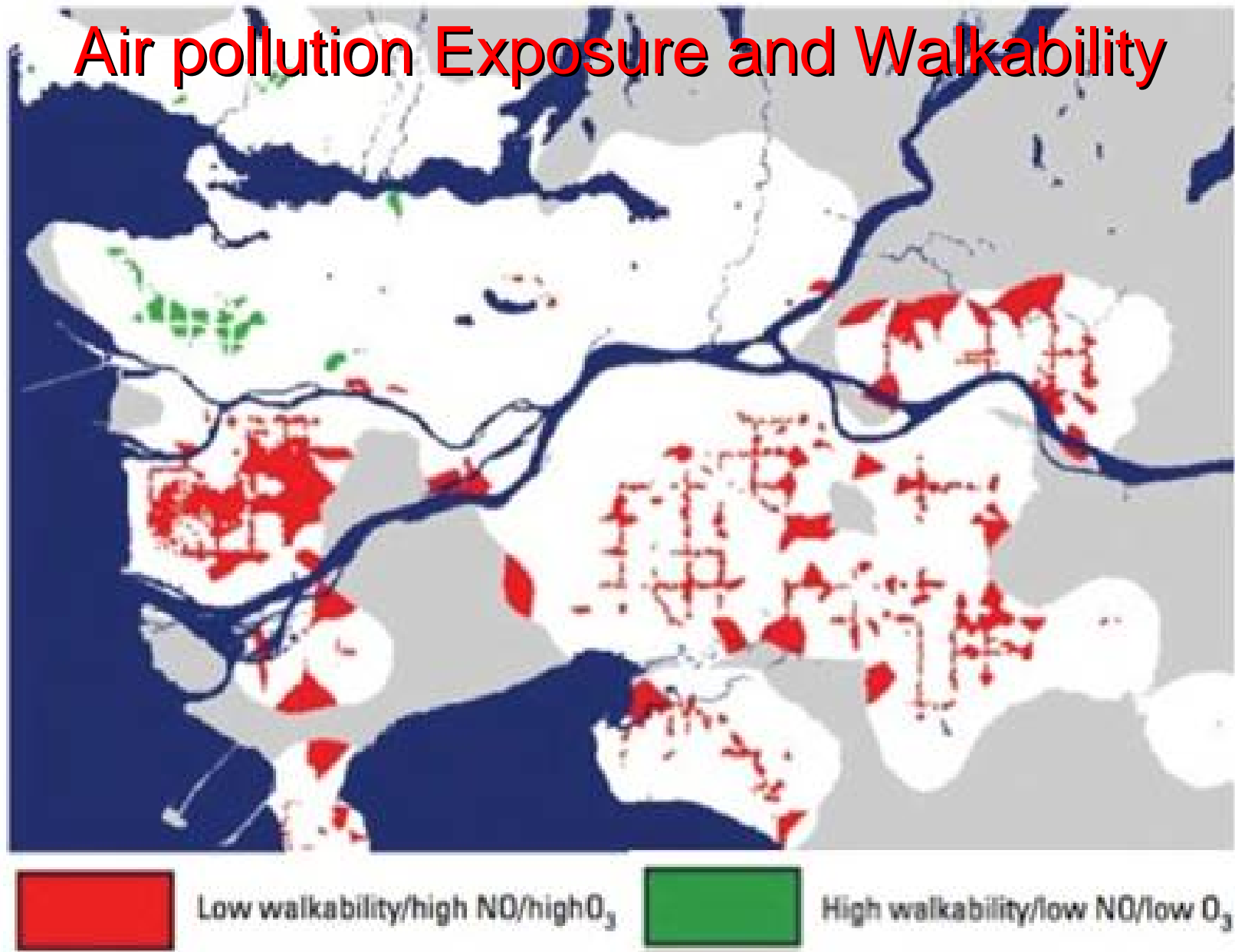
	Any transit trip	Work/school transit trip	Non-work/school transit trip
Higher residential density	++	+	+
Higher street connectivity	++	+	++
Higher commercial density	+++	NS	+
Higher mix of land uses	++	++	NS
More nearby parks and open spaces	NS	NS	NS
Higher overall neighbourhood walkability	++	++	++

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

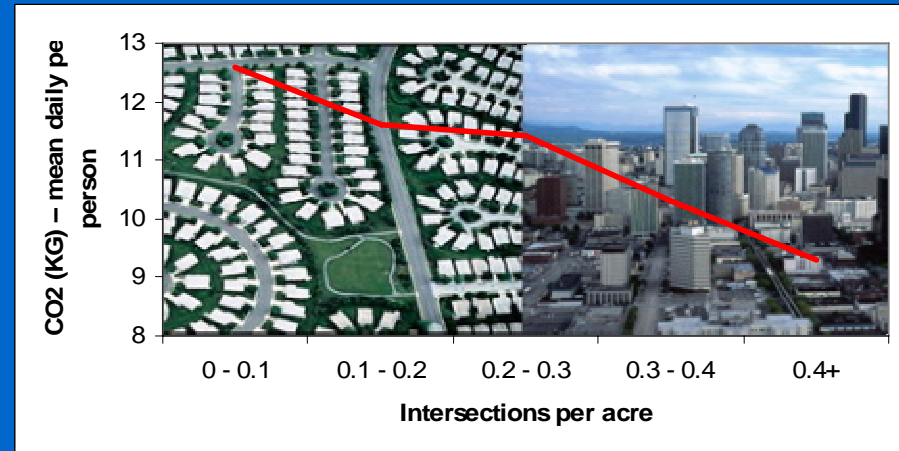
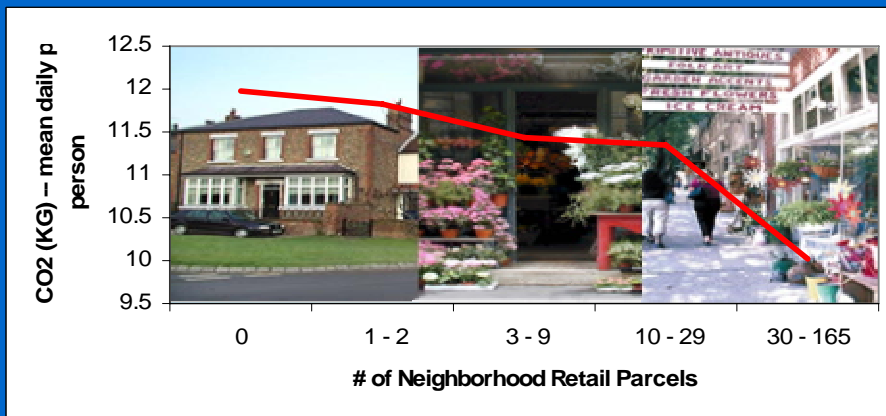
Walkability and Elderly



Air pollution Exposure and Walkability



CO2 & Neighbourhood Design



Source: LUTAQH final report, King County ORTP, 2005

THE GLOBAL WARMING GAMBLE



FUEL MIX



VEHICLE
EFFICIENCY







DEMAND

Policy Levers to Reduce
Transportation - Related CO₂ emissions



Driving 1/3 As Much in 2050

 <p>2050 Payoff Scenarios</p>	<p>VEHICLE EFFICIENCY</p>  <p>MPG</p>	<p>FUEL MIX</p>  <p>GHGs/gal</p>	<p>DEMAND</p>  <p>daily VMT per capita</p>
<p>MAJOR PROGRESS</p>	<p>47</p>	<p>-35%</p>	<p>8.4</p>
<p>TECHNOLOGY BREAKTHROUGH</p>	<p>61</p>	<p>-65%</p>	<p>20.9</p>

Brookings Draft Report – King County

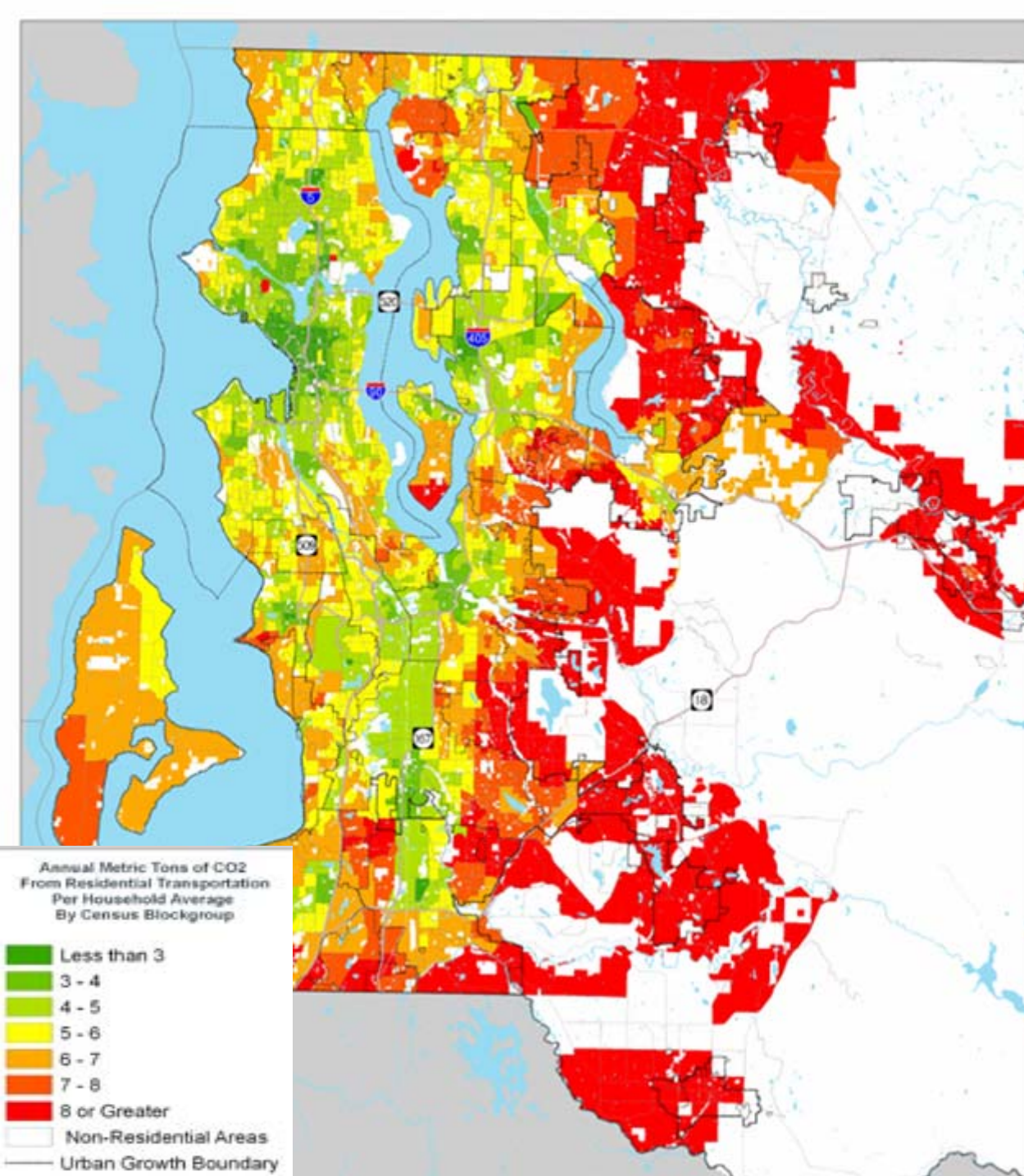
Results – Urban Form + Major Progress – Seattle Study

- 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

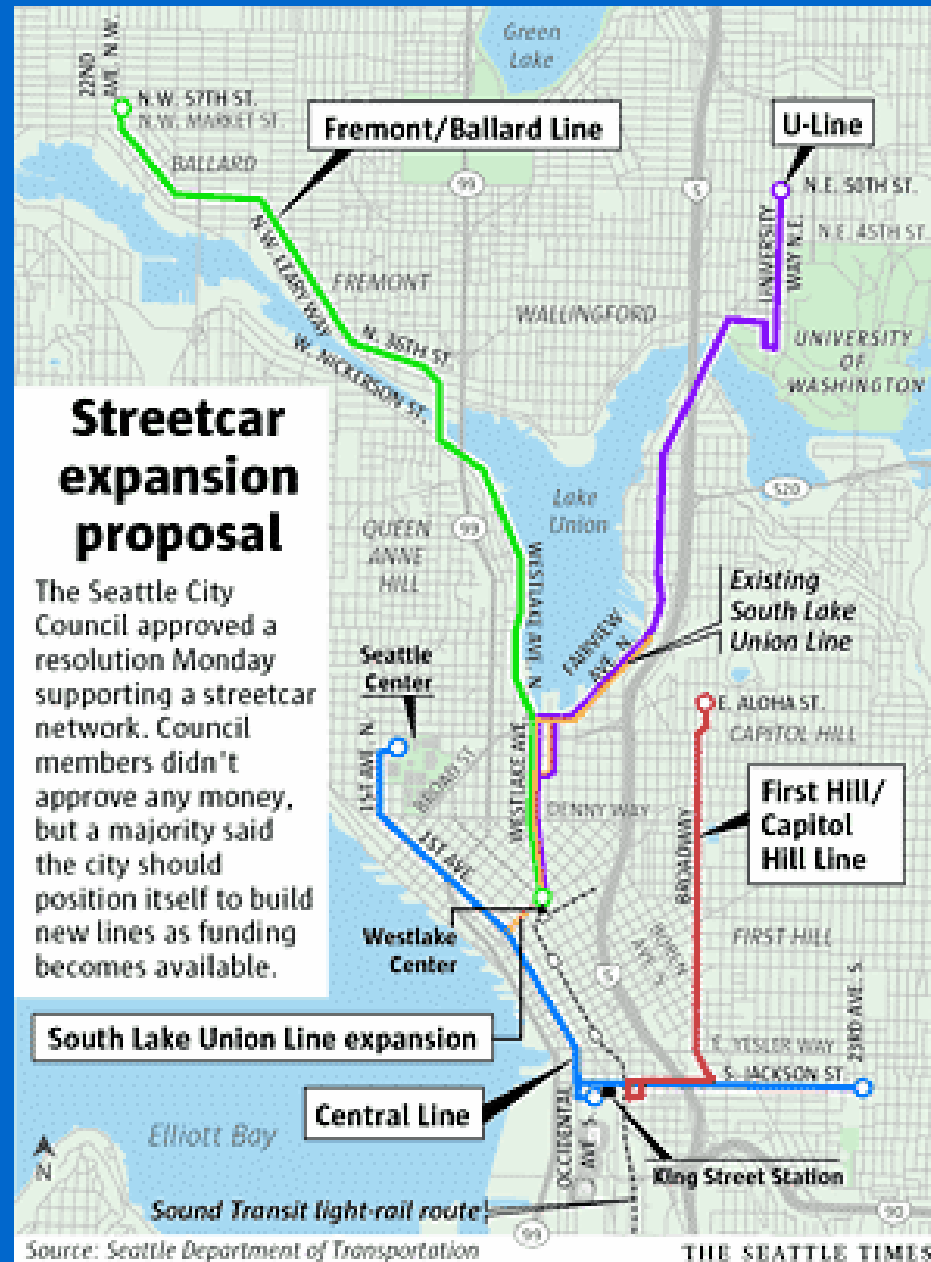


Urban Form and Transit Demand (Non-Work Travel Example)

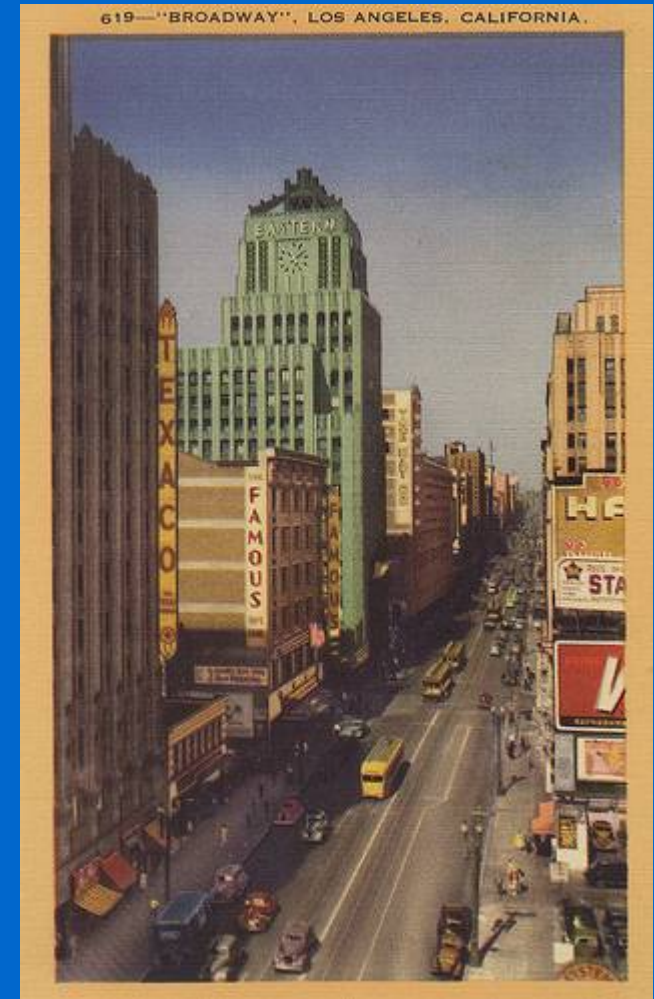
- Transit demand increased by 3.4 percent with a 10 percent increase retail floor space ratio (site design) and by 3.0 percent with a 10 percent increase in mix of uses at the destination.
- Increasing home and destination intersection density by 10 percent was associated with a 2.4 percent and 2.3 percent 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

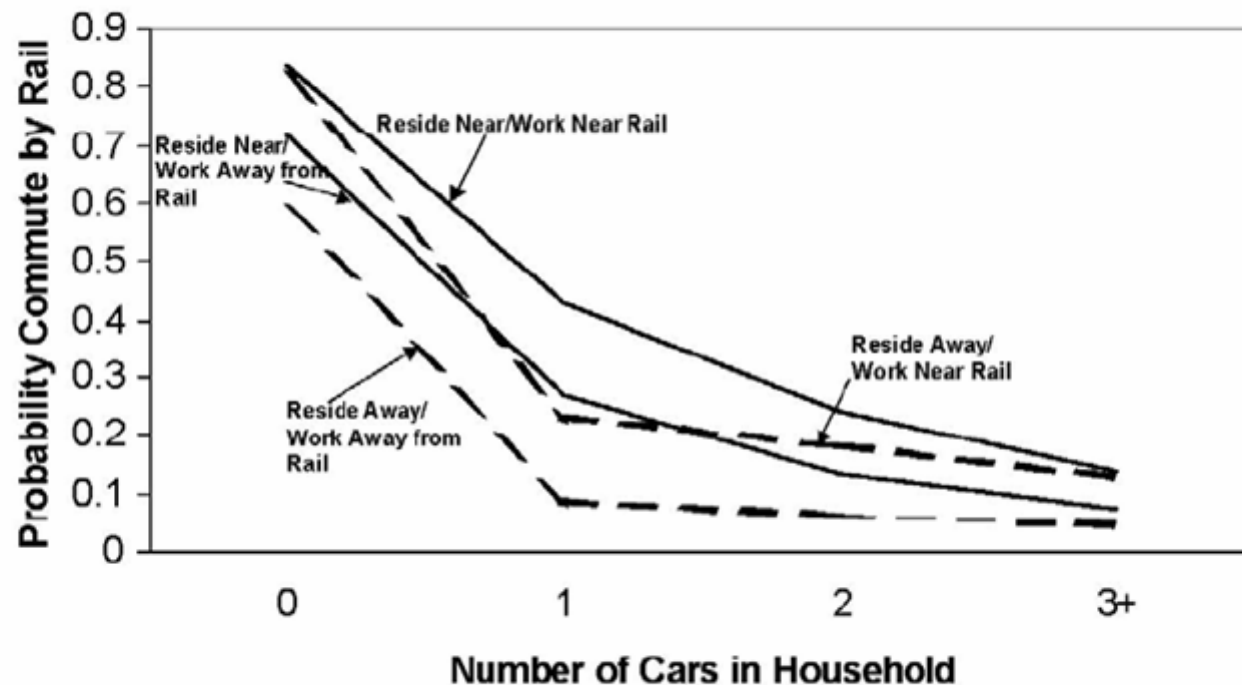
- The characteristics of each transit mode results in different urban design (smaller scale) decisions
 - Station design is impacted by access characteristics
 - Placement within right-of way – pedestrian and bike access
 - Loading Characteristics - platform height
 - Width, setbacks, buffers, interactions with other vehicles if at street level
 - Resulting accessibility
 - capacity, speed, and distances people will travel

Dresden Streetcar



Overriding Effects

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

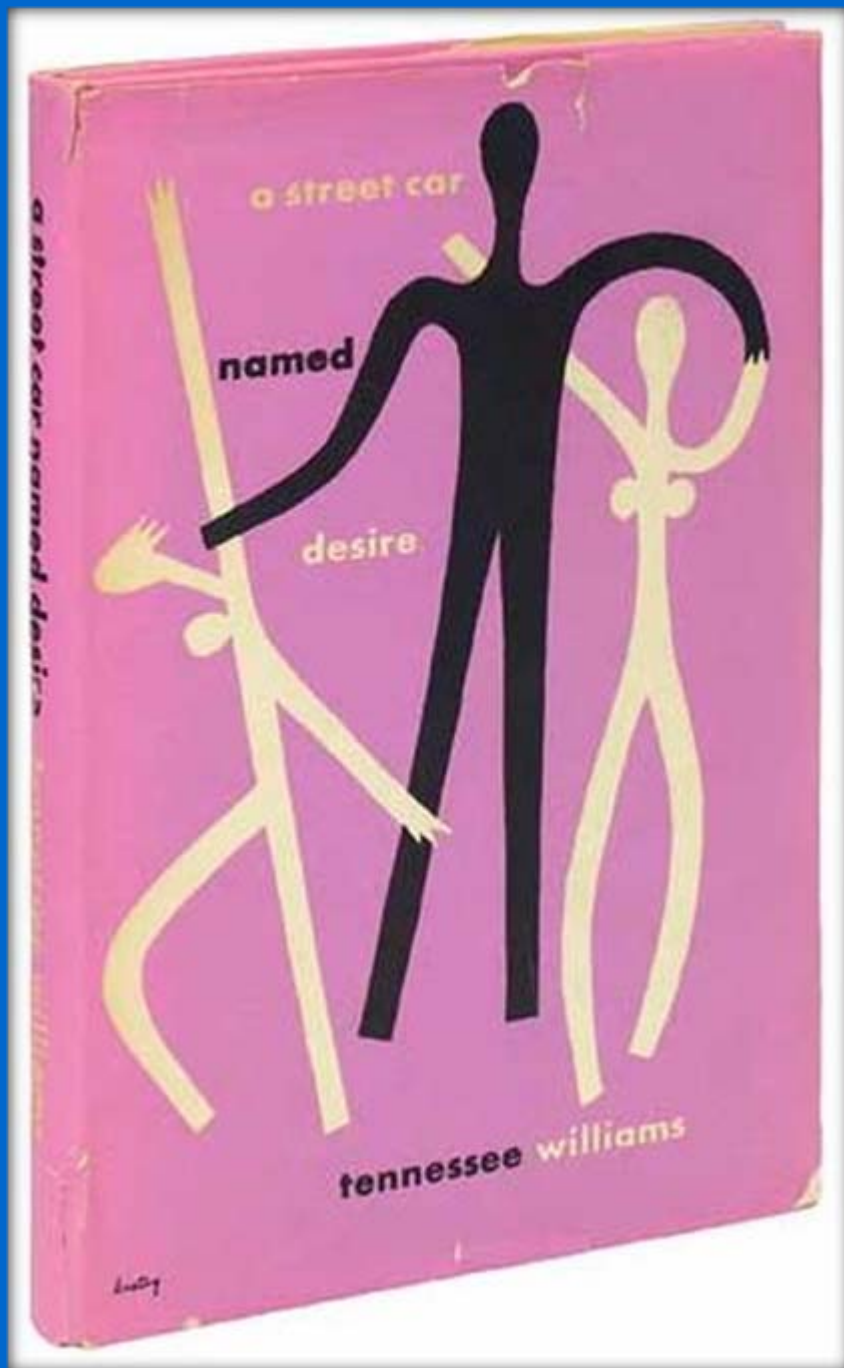


Quality of Life

Environmental Quality
Air Quality and Greenspace

Human Behavior
Travel Patterns and Physical Activity

Built Environment
Transportation Investments and Land Use



Thank
You!

www.act-trans.ubc.ca/