Smart Growth and Road Pricing 101

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Outline

1. Smart growth
   Definition(s)
   Connection with accessibility, sustainability
   Opinions about its effectiveness

2. Road pricing
   Theory
   Practice
   Public attitudes (summary)

3. Questions for today and the future
Smart growth

(Victoria Transport Policy Institute)

Goals

- Adequate automobile mobility
- Good alternative transport options
- Accessible, mixed-use, resource-efficient land use patterns
- Preserving green space and community livability
- Sustainability

Planning occurs at local level, but requires multi-jurisdictional coordination.

Sometimes viewed as opposite of urban sprawl.
Urban sprawl [1]

wirednewyork.com
Urban sprawl [2]

twistsifter.com
Urban sprawl [3]

lighttrailnow.org
Accessibility

(Victoria Transport Policy Institute)

Refers to ease of reaching desired destinations.

Determining factors:

1. Mobility (speed of movement)
2. Transportation system connectivity
3. Land use
4. Substitutability of alternative destinations
5. Travel substitutes (delivery services, telecommunications)

Road pricing improves mobility (and delivery services), but not the other factors - at least directly.
## Definitions of sustainability

<table>
<thead>
<tr>
<th></th>
<th>Accessibility</th>
<th>Congestion</th>
<th>Mode choice</th>
<th>Health</th>
<th>Safety</th>
<th>Environment/ ecosystems/ noise</th>
<th>Resources &amp; energy</th>
<th>Economic goals</th>
<th>Social goals</th>
<th>Future generations</th>
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<td>Brundtland Commission 1987</td>
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<td>Richardson 1999</td>
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<td>OECD</td>
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<td>Litman 2008</td>
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<td>European Union Council of Ministers of Transport</td>
<td>x</td>
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<td>x</td>
<td>x</td>
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<td>Transportation Association of Canada</td>
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<td>x</td>
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<tr>
<td>Center for Sustainability</td>
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Compiled from Victoria Transport Policy Institute (http://www.vtpi.org/tdm/tdm67.htm)
Smart growth

Potential benefits

• More choice of transport mode
• Improved access to workplaces, shopping, recreation and other types of destinations
• Increased worker productivity from easier interaction (at local and city-wide scale). The New Economic Geography and economies of agglomeration.
• Environmentally friendly
Smart growth

Recent examples of initiatives

In-fill development (F. Bula, The Globe and Mail, October 30)

In 2009, Vancouver introduced a policy to allow “small houses to be built behind any single-family house … that has a lot wider than 33 feet as well as access to a lane or road.”

Sidewalks (S. Agrell, The Globe and Mail, November 18)

• “Shoppers lane” segregates tourists from locals (London, UK)
• Curbless streets. Reduce traffic speeds and pedestrian injuries (Portland)
• Bloor Street Transformation Project (Toronto)
Smart growth

Potential drawbacks and limitations

Land uses change very slowly.

Mixed evidence on how jobs–housing balance affects commuting times. (Literature on excess commuting, Hamilton 1982.)

Diminishing returns to building height (structure, energy consumption, access time). (Kim, Nov. 13)

Adverse local effects:
  • Increases housing costs
  • Reduces green space
  • Increases congestion, noise & air pollution
Smart growth


"Ceteris paribus, urban intensification which increases population density will reduce per capita car use, with benefits to the global environment, but will also increase concentrations of motor traffic, worsening the local environment in those locations where it occurs."

- Distance driven per capita varies less than proportionally with population density
- A given increase in housing density may translate into a smaller increase in population density
- Also: Migration patterns change dramatically with age (Plane)

"policymakers face two choices: accept the local consequences as the price of wider progress, or take more radical measures to constrain traffic growth in intensified areas"

"The range and level of measures needed to counteract the effects of intensification in different circumstances is an area where current knowledge is surprisingly limited...."
Outline

1. Smart growth
   Definition(s)
   Connection with accessibility, sustainability
   Controversy

2. Road pricing
   Theory
   Practice
   Public attitudes (summary)

3. Questions for today and the future
Road pricing theory [1]

1. Engineering literature:
   - Real-world networks
   - Traffic assignment (route choice, mode choice)

2. Economics literature:
   - Internalizing costs of congestion and other externalities
   - Effects of road pricing on travel choices
   - Effects of road pricing on land use
Effect of road pricing on land use [1]

Monocentric city model
- All jobs located at CBD
- All trips are commuting
- Traffic congestion increases with proximity to CBD

Rent curve with no tolls
- Housing density declines with distance
Effect of road pricing on land use [2]

- Congestion toll increases cost of travel
- Rent curve with no tolls
- Rent curve with tolls
- Housing density declines more quickly
- Residential city boundary shrinks.
Effect of road pricing on land use [3]

Beyond the monocentric city model

• Polycentric urban structures began to emerge in the early twentieth century
• Firms and households can locate in multiple centres
• Households can adapt to congestion by changing place of work
• Firms can adapt to congestion by moving closer to workers
Effect of road pricing on land use [2]

Rent curve with no tolls
Rent curve with tolls
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Road pricing in Canada

Only 19 tolled facilities (incl. Golden Ears Bridges)
Highway 407 accounts for over half total traffic volume
Tolls imposed mainly for revenue generation
# Forms of road pricing

<table>
<thead>
<tr>
<th>Type of scheme</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facility-based</td>
<td></td>
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<tr>
<td>High occupancy toll (HOT) lanes</td>
<td>San Diego I-15, Minneapolis I-394</td>
</tr>
<tr>
<td>Express toll lanes</td>
<td>Orange County State Route 91</td>
</tr>
<tr>
<td>Highways</td>
<td>Highway 407</td>
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<tr>
<td>Area-based</td>
<td></td>
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<tr>
<td>Cordons</td>
<td>Norwegian cities; Stockholm; Gothenburg (2013)</td>
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<tr>
<td>Zones</td>
<td>London; Milan</td>
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<tr>
<td>Road networks</td>
<td>Singapore: some expressways, arterials</td>
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<tr>
<td></td>
<td>Heavy Goods Vehicles: Switzerland, Austria, Germany, Czech Republic, Slovakia</td>
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<tr>
<td>Regional</td>
<td></td>
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<td></td>
<td>US pilot tests</td>
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<tr>
<td>National</td>
<td></td>
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<td></td>
<td>Britain (2004-2007)</td>
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<td></td>
<td>The Netherlands: Dutch Mobility Plan (…2010…)</td>
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</tbody>
</table>
## Goals of existing schemes

<table>
<thead>
<tr>
<th>Scheme</th>
<th>Goals</th>
<th>Revenue generation</th>
<th>Congestion relief</th>
<th>Pollution reduction</th>
<th>Transit promotion</th>
</tr>
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<tbody>
<tr>
<td>Conventional toll roads</td>
<td></td>
<td>1</td>
<td></td>
<td></td>
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<tr>
<td>Norwegian toll rings</td>
<td></td>
<td>1</td>
<td></td>
<td>2 (recently)</td>
<td></td>
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<tr>
<td>HOT lanes</td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
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<tr>
<td>Singapore</td>
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<td></td>
<td>1</td>
<td></td>
<td>2</td>
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<tr>
<td>London</td>
<td></td>
<td></td>
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<td>2</td>
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<td>Stockholm</td>
<td></td>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Milan Ecopass</td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>US Vehicle Miles Traveled fee</td>
<td></td>
<td>1</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>
Relative importance of goals

Environmental
Benefits from congestion relief dominate pollution reduction & climate change (Anas and Lindsey, 2010)

Revenue generation
Benefits can dominate direct benefits from congestion relief (de Palma, Lindsey & Proost, 2007).
- Revenues can be used for public transit. Contributes to the smart growth goal of alternative transport options
- Need for new revenue sources. Metrolinx's “Big Move” requires $50 billion over 25 years. Transit City vs. subways ....
Evidence on land-use effects of road pricing [1]

Indirect evidence

Various studies identify who gains from tolling, and who loses, as a function of where they are located. Agents and activities that gain are encouraged, and those that lose are discouraged.

Example: Boundary effects for cordons

- **British towns**: Santos, Newbery and Rojey (2001)
- **Madrid**: Condeco-Melhorado et al. (2010)
- **Chicago**: Anas (2010)
Evidence on land-use effects of road pricing [2]

Empirical evidence

- Except for Singapore, no congestion pricing scheme has been in place long enough to have had appreciable effects on land use.

Loss of retail business

- Studies (few) indicate effects are modest.
- Any lost business from drivers could be offset by gains from shoppers using other modes.

Effects on smart growth

- Very little evidence.
Challenges for assessing the effects of road pricing

Traffic congestion
• A "wicked problem" (Bern Grush, March 2010)

Multiple transport modes
• Automobile usage has scale diseconomies
• Public transport and “slow” modes have scale economies

Multiple policy tools, and multiple levels of government

Land use decisions
• Slow and costly adjustment
• History-dependence

Unexpected outcomes
• London: Size of initial traffic reduction
• Stockholm: Erosion of benefits due to rapid growth in share of exempt “green” cars
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Summary: Public attitudes in Canada

Tolls more acceptable:

• Simple schemes
• Schemes with clear goals
• On new capacity (especially if not otherwise built)
• If a reasonable toll-free alternative exists.
• If revenues earmarked to the tolled facility
• More support (or less antipathy) to facility-based than area-based schemes
• Mixed attitudes towards peak-period tolls

Implications for affecting land use?
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Questions

Smart growth and urban sprawl
1. Does traffic congestion induce urban sprawl?
2. Does urban sprawl increase traffic congestion?
3. Is smart growth worth pursuing?
4. Who gains from smart growth, and who loses?

Road pricing
1. Which dimensions of smart growth can road pricing support?
2. Which road pricing measures are best? Which are feasible?
3. How should road-pricing revenues be used?
4. Who gains from road pricing, and who loses?
Mackenzie chosen as first mayor of Toronto on March 15, 1834.

City finances were in perilous condition. A property tax was levied of three pence currency on the pound.

“There was”, Mackenzie said, “a wonderful outcry raised in Toronto that the inequality of the taxes, and the burthensome extent to which they had been laid upon the citizens, were the acts of the corporation, and still more especially the doings of the mayor.” (p.256)

Mackenzie designed the arms of the city of Toronto with the motto:

“Industry, Intelligence, Integrity”
Supplementary slides
Traditional objections to road pricing [1]

1. Paying for something that was free

Canadian roads traditionally provided publicly without direct user charges.

2. Double taxation

Most road-pricing schemes not revenue neutral.

The Netherlands plans (planned) to eliminate fixed vehicle charges.

UK has considered lowering fuel taxes if a national scheme is introduced.
Traditional objections to road pricing [2]

3. Inequitable

*With respect to income*

Higher-income groups more likely to gain because willing to pay more for travel time savings.

Counterarguments: Depends on travel volume, mode choice, use of toll revenues.

*With respect to location*

Location relative to tolled facilities

Boundaries of area-based schemes

Toll differentiation on road networks

Tolling of residential streets, private roads
Traditional objections to road pricing [3]

Other objections

System complexity
Invasion of privacy
Loss of retail business
Other revenue sources cheaper to collect
Public attitudinal surveys (US)

<table>
<thead>
<tr>
<th>Survey Results</th>
<th>HOT Lanes</th>
<th>Traditional Tolling</th>
<th>Express Toll Lanes</th>
<th>Cordon/ Area Pricing</th>
<th>Private Ownership</th>
<th>Overall</th>
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</thead>
<tbody>
<tr>
<td>Majority Support</td>
<td>73%</td>
<td>71%</td>
<td>62%</td>
<td>32%</td>
<td>0%</td>
<td>56%</td>
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<tr>
<td>Majority Opposition</td>
<td>15%</td>
<td>26%</td>
<td>23%</td>
<td>53%</td>
<td>60%</td>
<td>31%</td>
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<tr>
<td>Neither Majority</td>
<td>12%</td>
<td>3%</td>
<td>15%</td>
<td>16%</td>
<td>40%</td>
<td>13%</td>
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<tr>
<td>Total Percent</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
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<tr>
<td>Total Cases</td>
<td>26</td>
<td>35</td>
<td>13</td>
<td>19</td>
<td>10</td>
<td>103</td>
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</table>

Source: Zmud (2008, NuStats)
Public attitudinal surveys (US)

Zmud (2008, NuStats)

Public support generally higher for:

- Specific projects with tangible benefits
- Revenues earmarked for highways or public transit
- Simple projects
  Prefer toll roads to mileage fees

Tolls preferred to taxes or reduced service
Public attitudes in Québec

Preferred type of user charge

<table>
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<tr>
<th></th>
<th>TOTAL (n=1002)</th>
<th>Has a car (n=793)</th>
<th>Does not have a car (n=209)</th>
<th>Island of Montreal &quot;514&quot; (n=175)</th>
<th>Greater Montreal &quot;450&quot; (n=225)</th>
<th>Rest of Quebec (n=602)</th>
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<tbody>
<tr>
<td>Tolls on Quebec's main highways</td>
<td>52%</td>
<td>53%</td>
<td>47%</td>
<td>50%</td>
<td>51%</td>
<td>53%</td>
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<tr>
<td>Taxing gas</td>
<td>18%</td>
<td>17%</td>
<td>20%</td>
<td>19%</td>
<td>16%</td>
<td>18%</td>
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<tr>
<td>Registration and licence fees</td>
<td>12%</td>
<td>12%</td>
<td>12%</td>
<td>8%</td>
<td>14%</td>
<td>13%</td>
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<tr>
<td>Recurrent fee based on mileage</td>
<td>11%</td>
<td>11%</td>
<td>12%</td>
<td>14%</td>
<td>11%</td>
<td>10%</td>
</tr>
<tr>
<td>Don't know / Refusal</td>
<td>7%</td>
<td>6%</td>
<td>9%</td>
<td>9%</td>
<td>8%</td>
<td>6%</td>
</tr>
</tbody>
</table>

Source: Léger Marketing (2007)
Comments at Transport Futures 2010  [1]

(Road Pricing and Leadership Summit, June 18)

Bruce Starr (Oregon senator)
   Road pricing schemes must be carefully explained to the public

Peter Milczyn (Toronto City Councillor)
   Any road pricing scheme must have a clear purpose

Frank Klees (Ontario Conservative party)
   No tolls on new roads without untolled alternative route
Comments at Transport Futures 2010 [2]

(Road Pricing and Leadership Summit, June 18)

Survey results

Richard Bergeron (Quebec Opposition party leader)

When should tolls operate?
- **Only at rush hours:** 31%
- At all times: 26%
- Only on weekdays: 21%

Peter Fassbender (Mayor of Langley, Chair of Mayors’ Council, Vancouver)

Attitudes toward road pricing options
- *Mixed support:* HOT tolls, tolls on new roads & bridges, distance-based tolls
- *Overall opposition:* Area congestion pricing, Tolls on existing roads and bridges, Road pricing by time of day