

# Towards an Effective but Socially-Conscious Congestion Pricing Strategy in the GTHA

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# Motivation

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Users/consumers should pay the **full cost** of whatever they consume

Otherwise, they are **subsidized**

Therefore, they **unnecessarily** consume more to the detriment of all

i.e. **“Tragedy of the Commons”**

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Garrett Hardin, journal *Science* in 1968

# Tragedy of the Commons

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A dilemma arising when multiple individuals, acting independently and rationally consulting their own self-interest, will ultimately **deplete** a **shared** limited resource even when it is clear that it is not in anyone's long-term interest for this to happen.

Examples:

- Overgrazing
- Congestion

Criticized for promoting privatization

Used here to encourage **“control”**



# Established Facts

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People should pay the **full-cost** of what they consume; otherwise, they are **subsidized** and they unnecessarily consume more to the detriment of all.

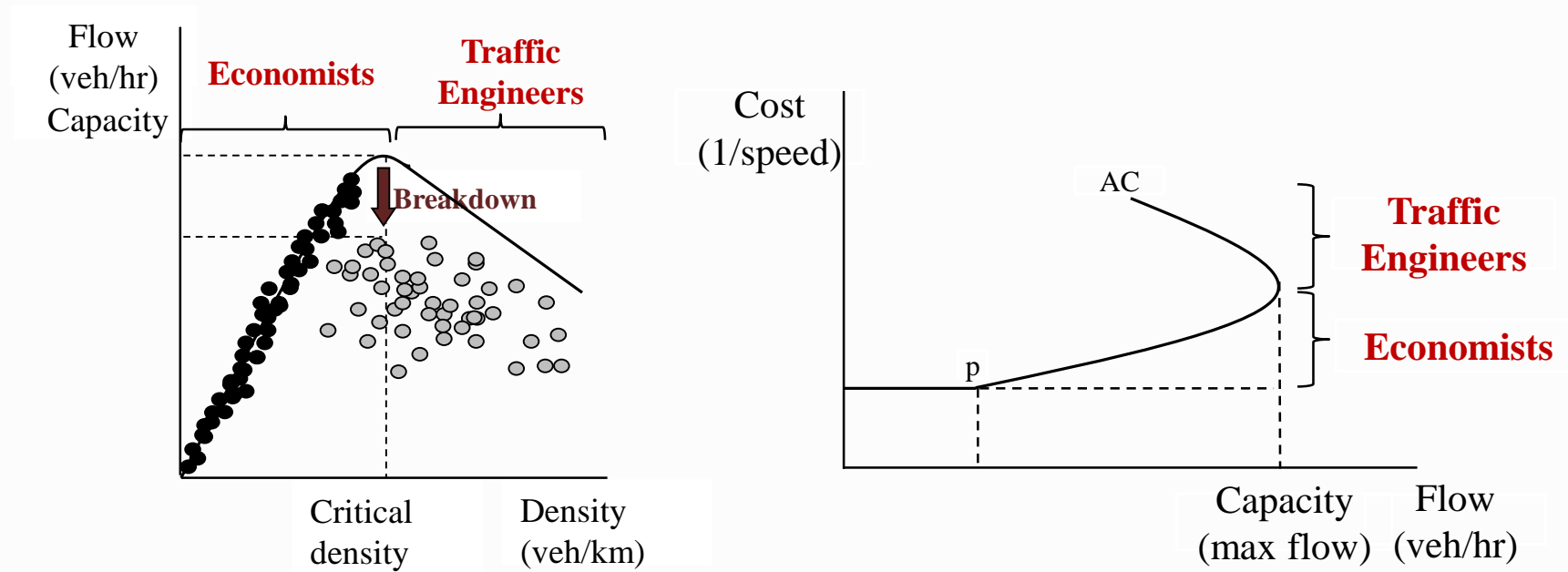
VKT is quite responsive to **price** (as opposed to transit or capacity expansions), (Duranton and Turner, 2009).

Increasing ***drive alone costs*** brings greater reductions in SOV demand than increasing *SOV travel time* or *improving* times and costs of alternatives (Washbrook et al., 2006).

Therefore, policy makers should place as much emphasis on ***financial disincentives*** for auto use as they do on improving the supply of alternative modes.

# Congestion? Microeconomic and Traffic Engineering Perspectives

- Economists: performance of the system (e.g. travel time) **rises** with the intensity of use (e.g. flow levels)
- Traffic engineers: traffic density exceeds the **critical density**, resulting in traffic **breakdown**

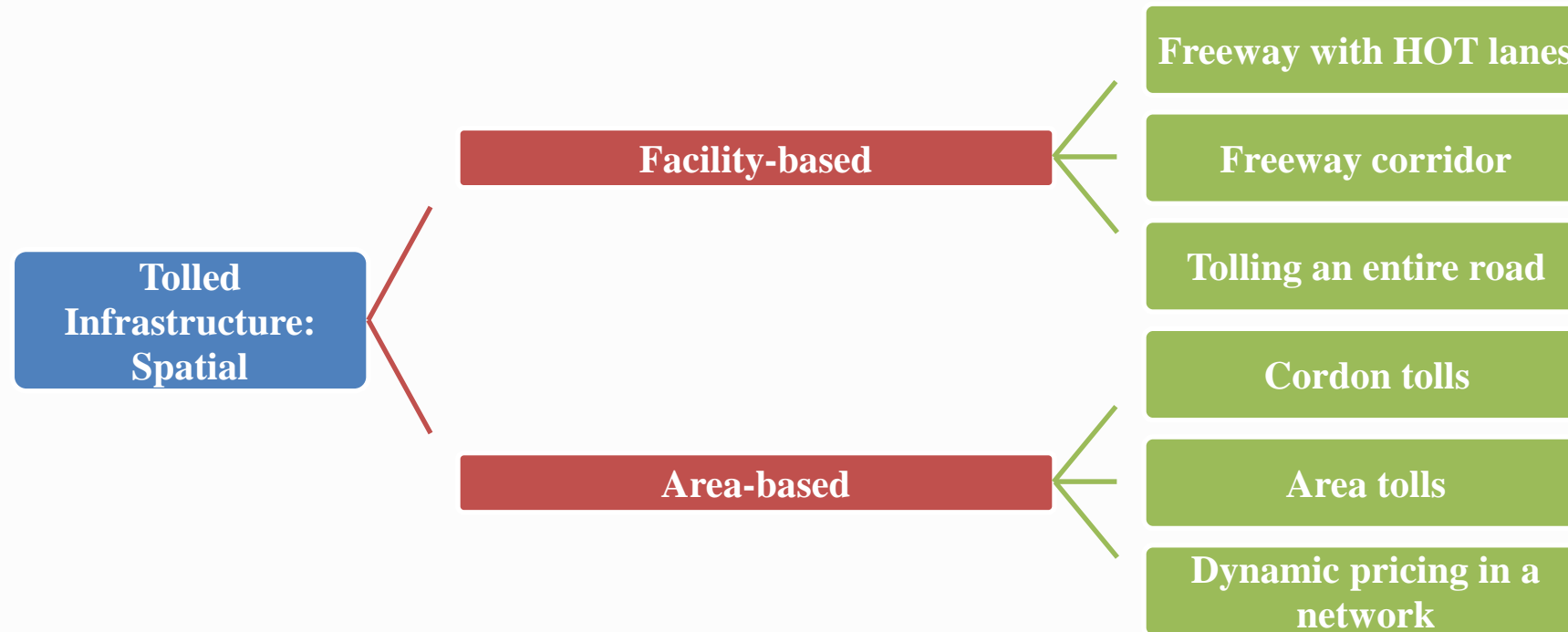


# Congestion Pricing: Objectives and Recommended Policies

Pricing Policy	Objectives/Impacts	Example(s)
Cordon tolls	Reduce downtown traffic	<ul style="list-style-type: none"> <li>– London Congestion Pricing</li> <li>– Stockholm Congestion Pricing</li> </ul>
HOT lanes	Encourage carpooling	<ul style="list-style-type: none"> <li>– I-15 HOT Lanes, San-Diego, CA</li> <li>– I-394 in Minnesota</li> <li>– SR-167 in Seattle</li> </ul>
Monopoly pricing	Maximize profits	<ul style="list-style-type: none"> <li>– ETR 407 (Express Toll Route)</li> </ul>
Variable tolls	Control congestion (temporal and/or spatial distribution)	<ul style="list-style-type: none"> <li>– Singapore Electronic Road Pricing</li> </ul>
<ul style="list-style-type: none"> <li>– Distance-based fees</li> <li>– Pay as you drive (PAYD) insurance</li> </ul>	<ul style="list-style-type: none"> <li>– Reduce automobile use</li> <li>– Reduce emissions</li> </ul>	<ul style="list-style-type: none"> <li>– "MileMeter", Texas, US</li> <li>– "Real Insurance PAYD", Australia</li> </ul>
First-best (marginal-cost) pricing	Maximize social welfare (social optimum traffic conditions)	----
Bottleneck pricing	Reschedule departure-time (without altering route-choice, mode-choice, or miles driven)	----

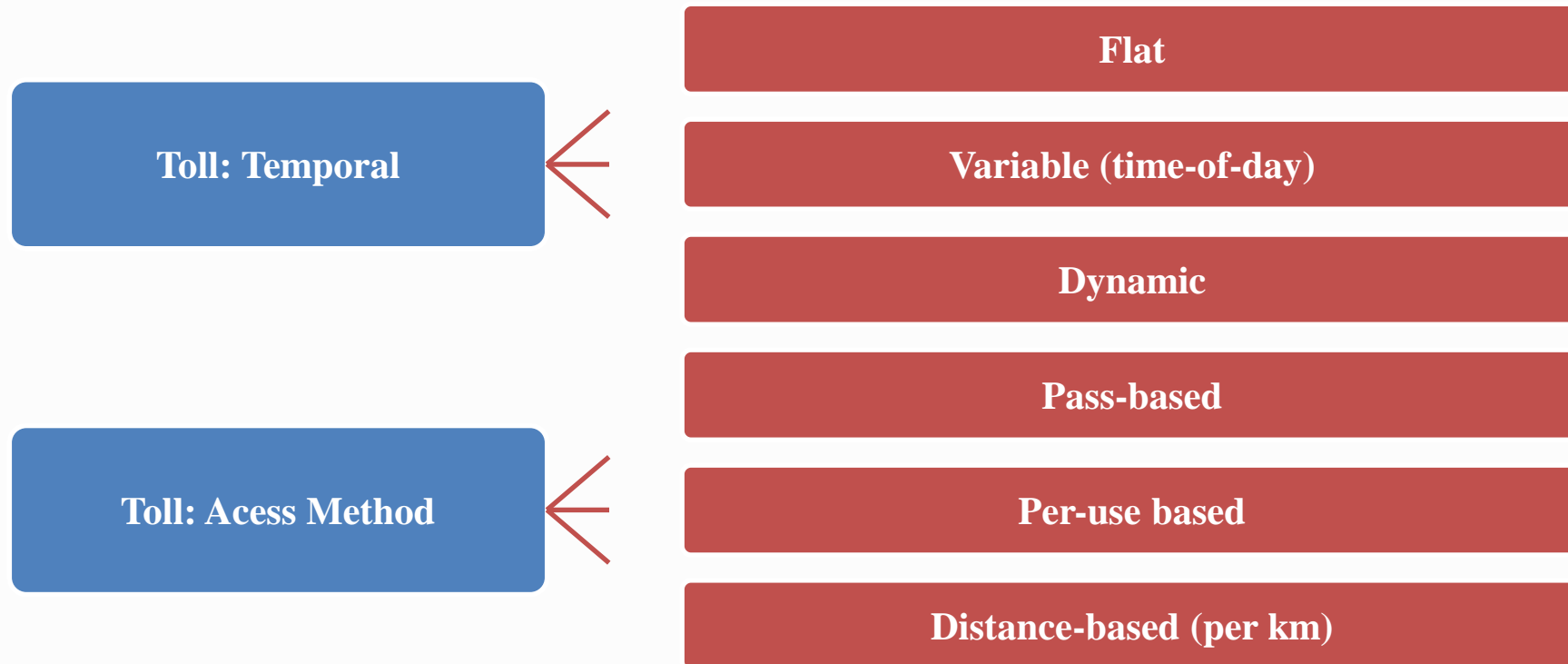
# Congestion-Pricing Decision Making Process – *Operations Side*

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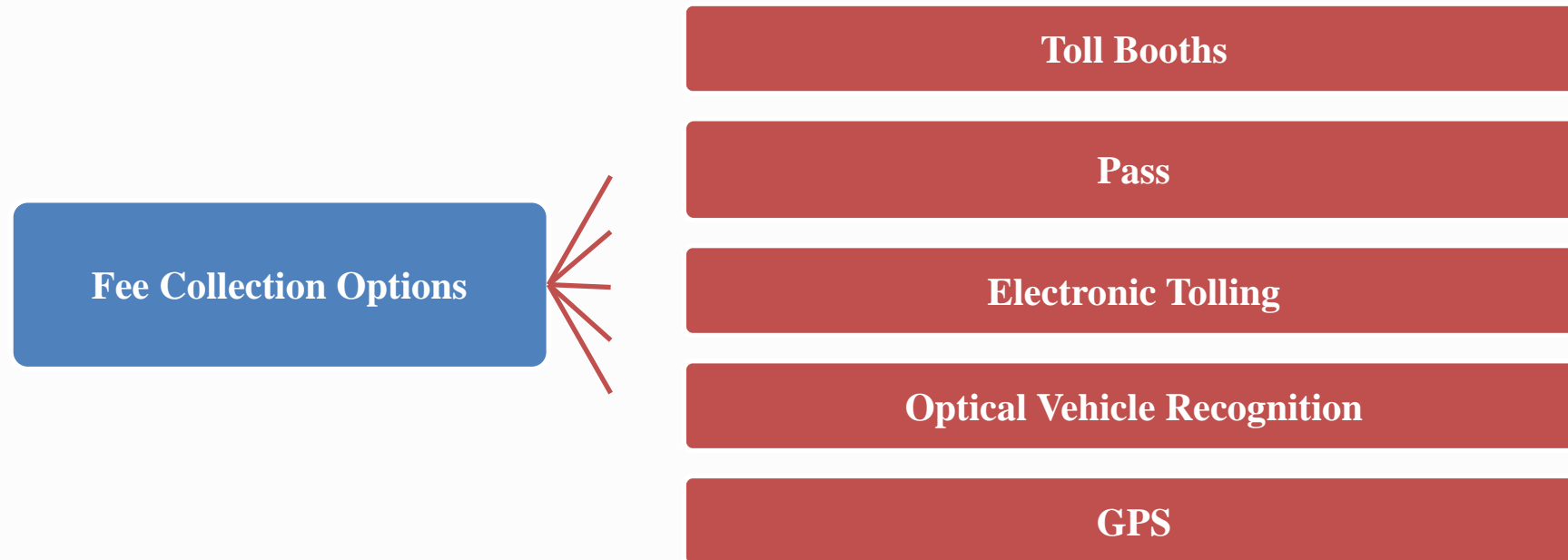
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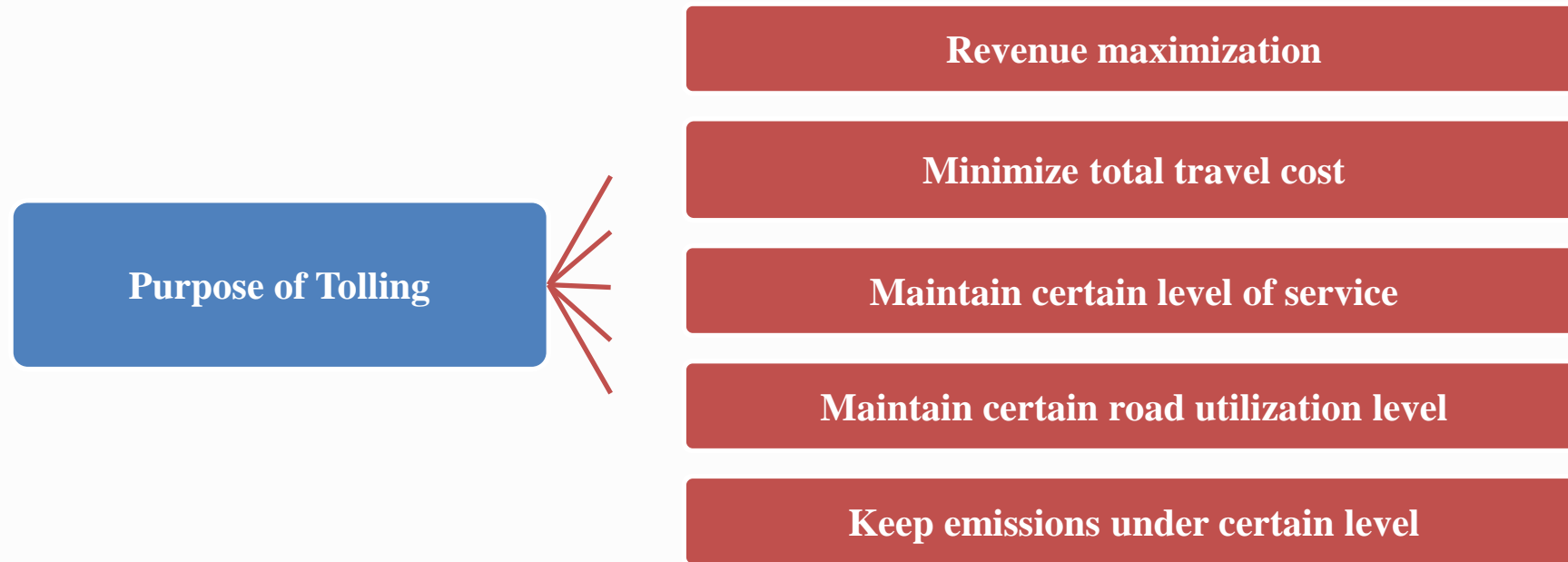
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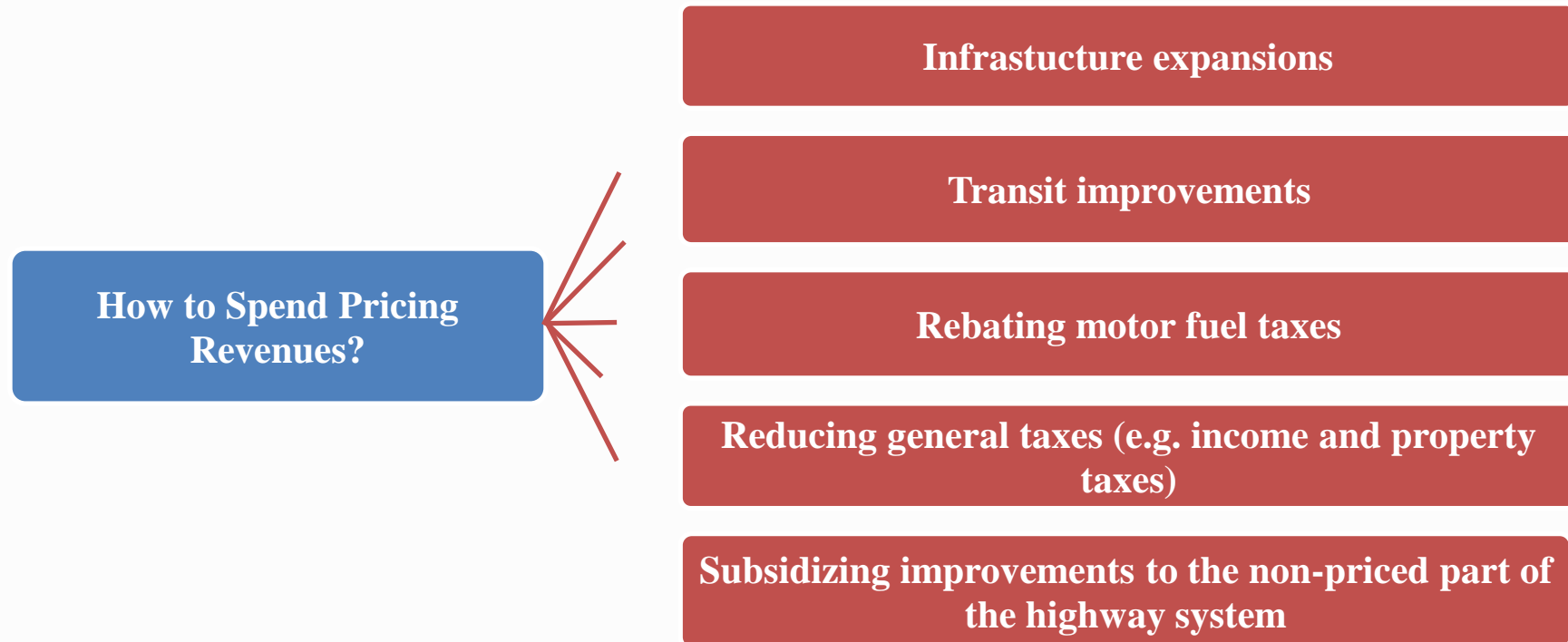
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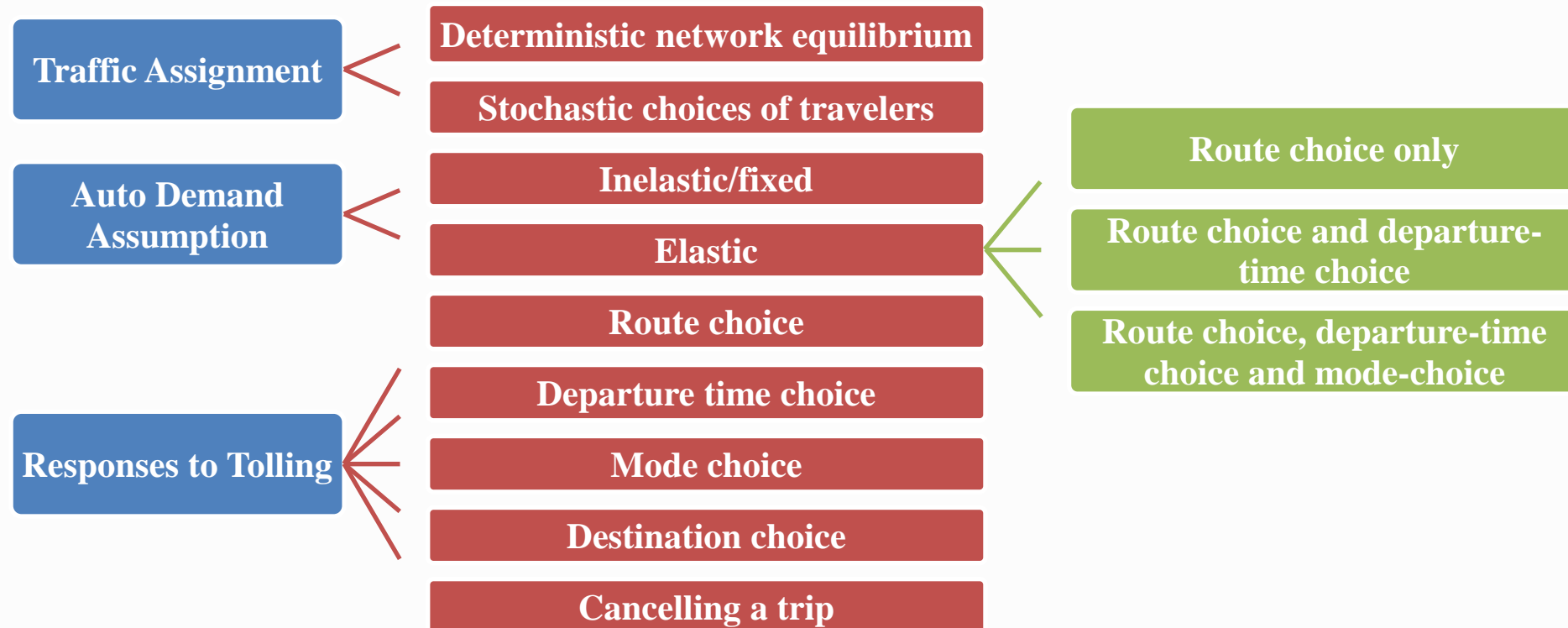


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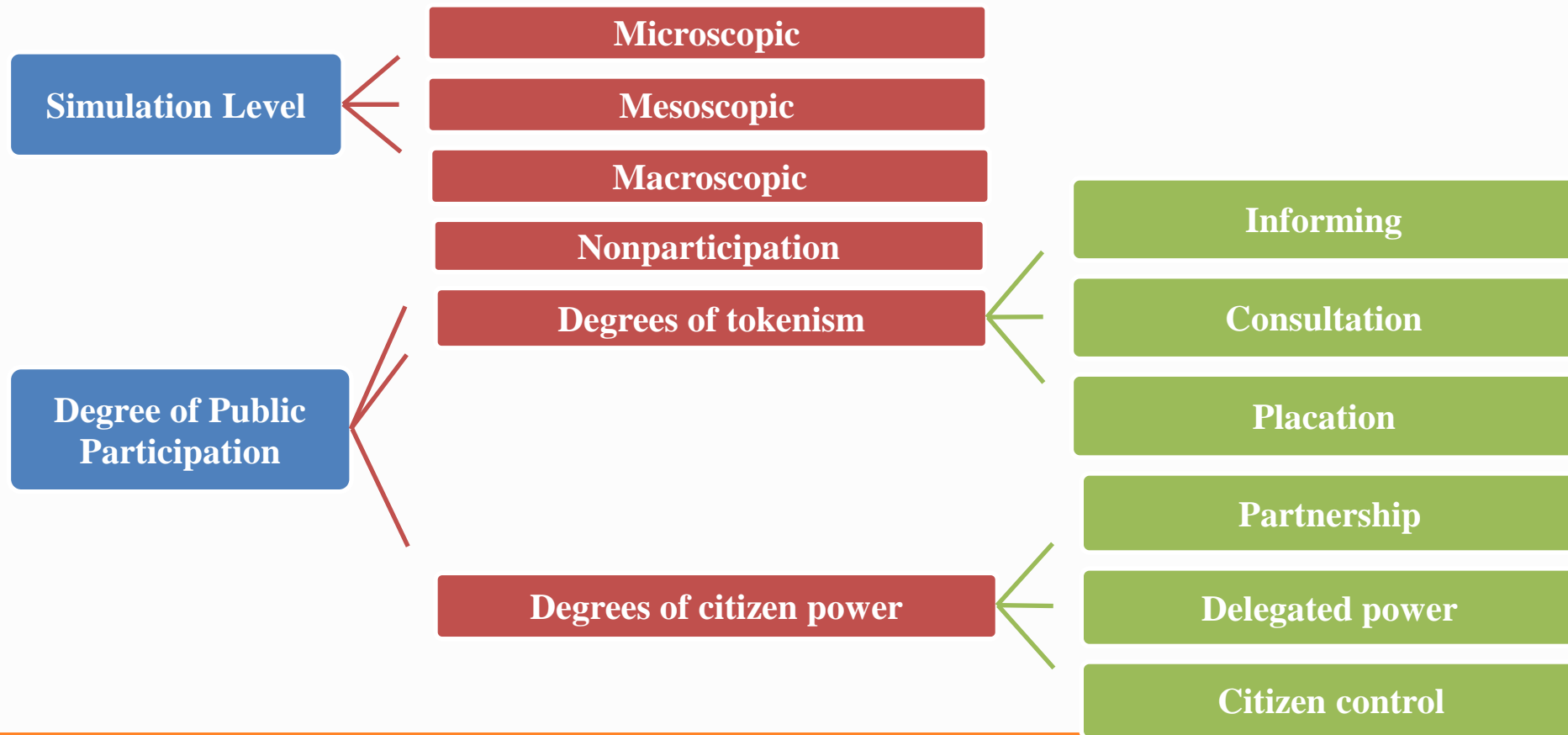
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# Congestion-Pricing Decision Making Process – *Analysis Side*



# Congestion-Pricing Decision Making Process – *Analysis Side*



# International Experience

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USA, UK, France, Norway, Sweden, Germany,  
Switzerland, Singapore, and Australia have  
**implemented major road pricing projects.**

# London Congestion Pricing

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In service since 2003.

The **first** congestion pricing program in a major European city.

£10 daily **cordon fee (flat price)** for driving in “Central London Congestion Pricing Zone” during weekdays (from 7am to 6pm) (**one** time per chargeable day).

Bus and taxi service improved.

Accidents and air pollution declined in city center.

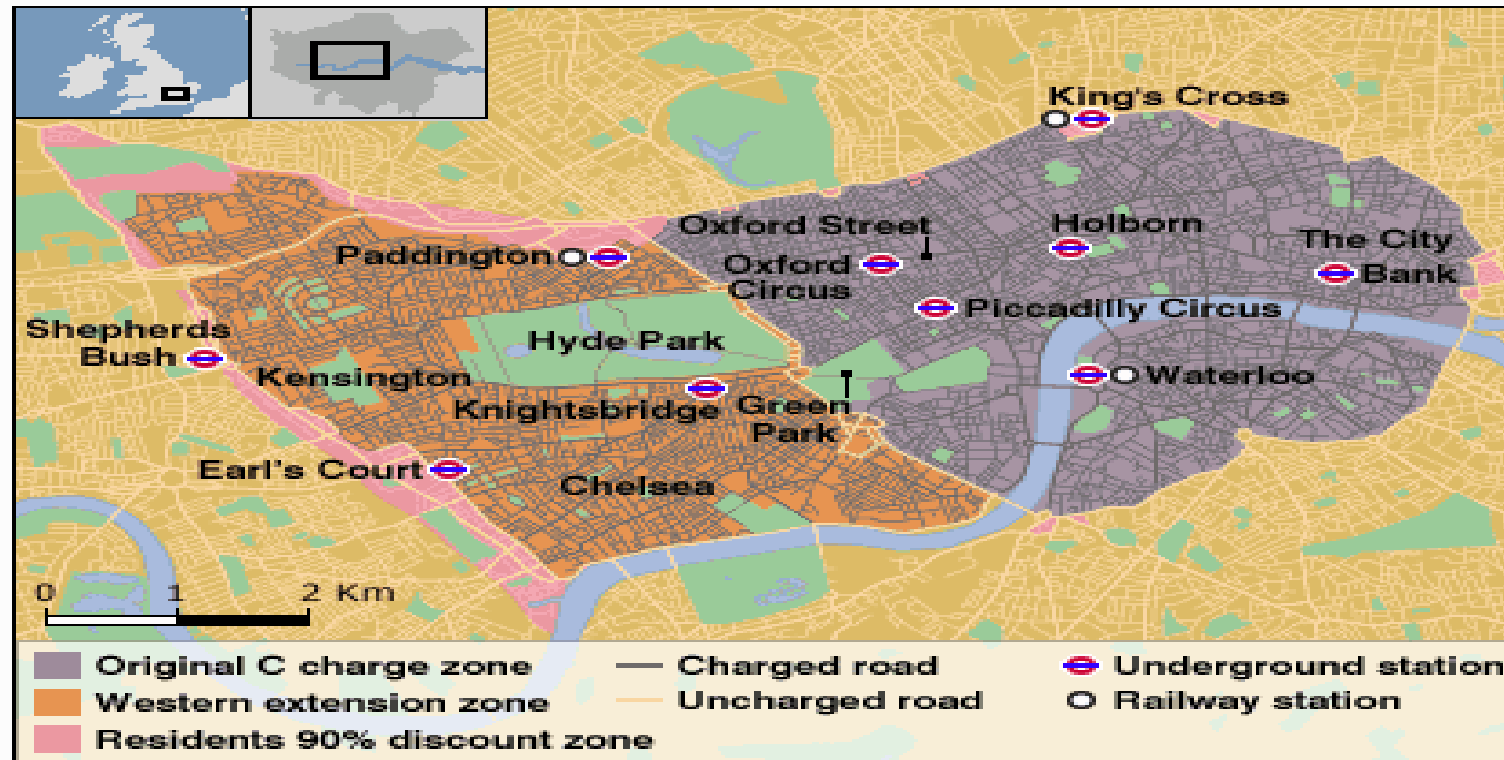
After 1 year of cordon tolls and during charging:

- Traffic **circulating** within the zone decreased by 15%.
- Traffic **entering** the zone decreased by 18%.
- Congestion (measured as the actual minus the free-flow travel time per km) **decreased** by 30% within the zone.



# London Congestion Pricing

## The Central London Congestion Pricing Zone



# Stockholm Congestion Charge

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Public **support increased** after a 7-months **trial** in 2006.

Charge based on **time of day**, and up to a **max charge** per day.

Vehicles entering “**Stockholm City Center**” on **weekdays** (from 6:30am to 6:30pm) charged \$1.27 to \$2.54 **per trip**, with a max daily charge of \$8.

Traffic **volumes reduced** by ~25%.

Public transit **ridership increased** by 40,000 users per day.

# Stockholm Congestion Charge

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Uses **electronic transponders** to bill cars.

Non-equipped cars are **photographed**, matched to a motor vehicle database and then billed.

Time of day	Tax
00:00 – 06:29	0 SEK
06:30 – 06:59	10 SEK
07:00 – 07:29	15 SEK
07:30 – 08:29	20 SEK
08:30 – 08:59	15 SEK
09:00 – 15:29	10 SEK
15:30 – 15:59	15 SEK
16:00 – 17:29	20 SEK
17:30 – 17:59	15 SEK
18:00 – 18:29	10 SEK
18:30 – 23:59	0 SEK



# I-15 HOT Lanes, San Diego, CA

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First significant **value pricing** project.

Implemented in 1996 along the 13-km HOV section of I-15 in San Diego.

Convert HOV to HOT; solo drivers pay a monthly pass (\$50 to \$70) to use HOV during peak periods.

In 1998, automated and dynamic pricing scheme.

# I-15 HOT Lanes, San Diego, CA

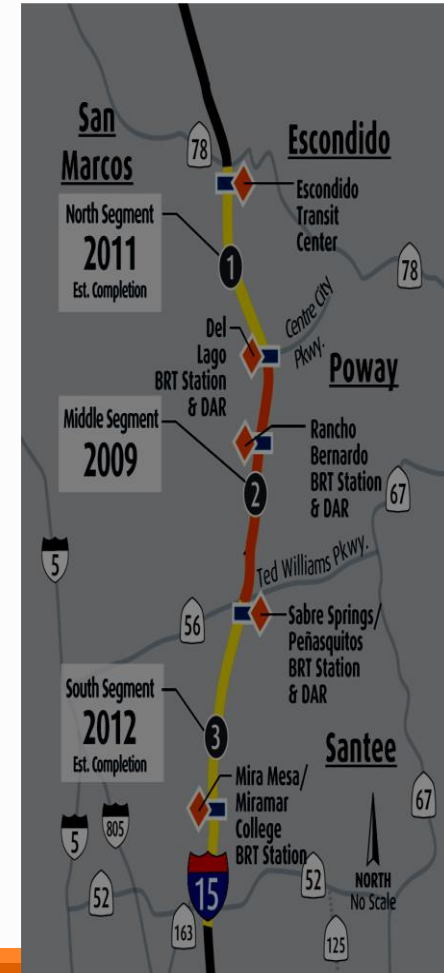
Toll levels determined from congestion level to maintain “free-flow” conditions in the HOV lane.

Tolls updated every 6 minutes (\$0.5 to \$4) (closed-loop regulator).

Toll level displayed on real-time sign.

48% increase in HOV volumes.

Success in congestion minimization.



# 407 ETR (Express Toll Route)

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Multi-lane, electronic HYWY running 69 km across the top of the GTA from HYWY 403 (in Oakville) to HYWY 48 (in Markham).

Constructed in a partnership between “Canadian Highways International Corporation” and the Province of Ontario.

Currently owned by 407-ETR International Inc.



# 407 ETR (Express Toll Route)

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Fees at the regular zone (**open-loop regulator**):

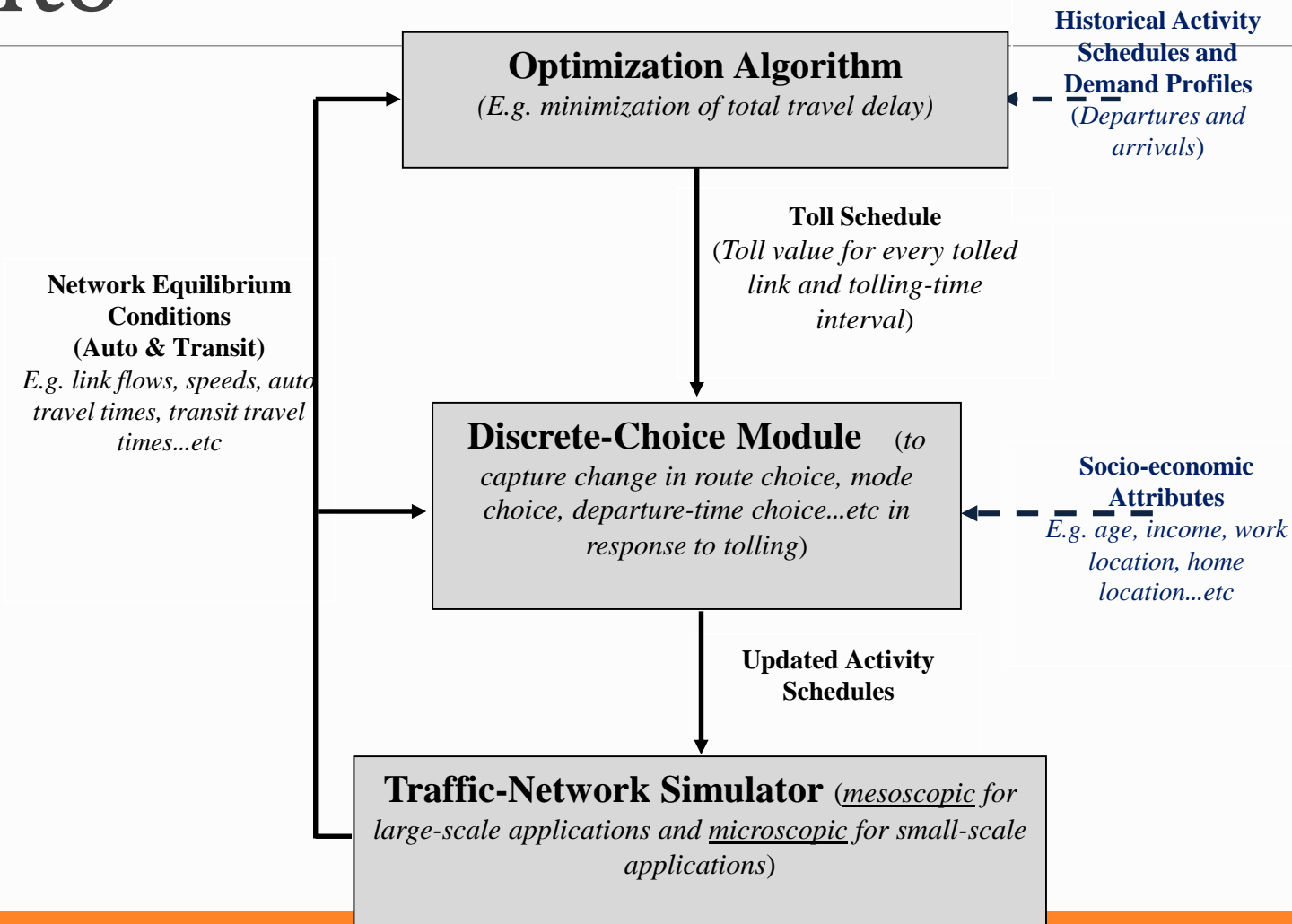
- Monday-Friday:
  - Peak period (6-7:30am, 8:30-10am, 3-4pm, 6-7pm): 22.75¢/km
  - Peak hours (7:30-8:30am, 4-6pm ): 22.95¢/km
  - Off-peak rates: 22.95¢/km
- Weekends and holidays: 19.35¢/km

Speeds on HYWY 407 ~ **double** free HYWYs.

High level of user satisfaction.

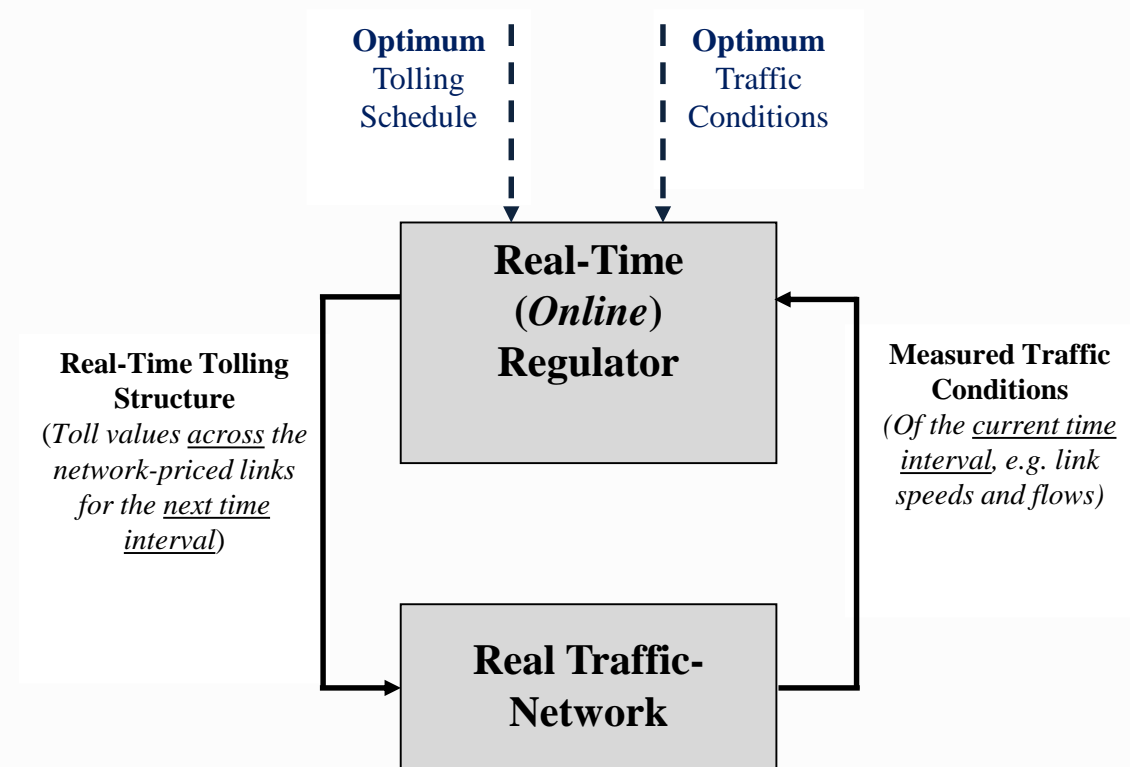
**Monopoly** price!

# Ongoing Research at University of Toronto



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Thank You!

