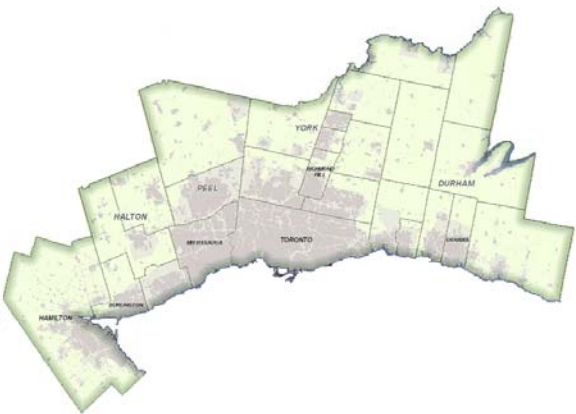




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ECONOMIC CASE FOR THE DRAFT REGIONAL TRANSPORTATION PLAN

***Metrolinx Board Meeting
November 28, 2008***



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Examining the Economic Case for the Draft Regional Transportation Plan (DRTP)

Three Perspectives are Needed:

- Economic Burden of Inadequate Supply and Congestion
- Economic Efficiency of Better Supply Management
- Economic Efficiency and Welfare Effects of New and Better Transit Supply

Economic Burden of Inadequate Supply and Congestion

GTHA (2006)

Delay cost	\$2.6B
+ Wasted fuel & other vehicle operating costs	\$500M
+ Excess emissions	\$30M
+ Increased accidents	\$256M
= cost borne by commuters	\$3.3B

- **Lost Gross Regional Product** **\$2.7B**
→ *Can be added to the \$3.3B*

- Fewer jobs 25,962
- Increased operating costs for industry \$260M
- Lost industry revenue \$4.7B
→ *Cannot be added to the \$3.3B*

Economic Burden of Inadequate Supply and Congestion

New York

\$5B + \$2B + \$4B = \$11B

Chicago

\$7.3B

GTHA

\$3.3B + \$2.7B = \$6B

	NEW YORK	CHICAGO	GTHA
YEAR OF ANALYSIS (DATA)	2005	2005	2006
Population	12 million	8 million	6 million
Costs included in the analysis	Time, productivity, vehicle operating costs	Time, fuel, productivity, environmental	Time (including reliability), productivity, vehicle operating costs, accidents, environmental
Total cost of congestion	\$11 billion	\$7.3 billion	\$6 billion
Annual cost to commuters	\$7 billion	\$6.2 billion	\$3.3 billion
Annual cost to the economy (productivity)	\$4 billion		\$2.7 billion
Annual cost to the freight industry	Not included	\$1 billion	Not included
Annual cost of total excess congestion, per capita	\$917	\$912	\$1,000
Increase in peak travel time as a result of congested traffic conditions	13%	22%	32%
Lost time per week for average driver	52.5 minutes/week	66 minutes/week	57.5 minutes/week
Monetary value of excess travel delay per commuter^[1]	\$1229 per year per commuter	\$1544 per year per commuter	\$1346 per year per commuter
Number of jobs region loses due to congestion	51,515	87,000	42,000

^[1] Assuming equal value of time across regions, where the value is that of the GTHA study

Economic Efficiency and Welfare Effects of DRTP

Draft Regional Transportation Plan: Net Present Value (NPV) & Rate of Return

INDICATOR - VALUE FOR MONEY	MEAN	10 th PERCENTILE	90 th PERCENTILE
Total Costs (Present Value)	\$31,156	N/A	N/A
Total Benefits (Present Value)	\$46,674	\$43,811	\$52,408
Net Present Value (at 5% discount rate)	\$15,519	\$12,620	\$21,249
Internal Rate of Return	19.0%	18.1%	24.2%

- Analysis period: 2006 – 2031
- Millions of 2006 dollars
- Costs and benefits discounted at real rate of 5%

Economic Efficiency and Welfare Effects of DRTP

Draft Regional Transportation Plan: Present Value (PV) of benefits and costs

CATEGORY	GTHA	% BENEFITS	
BENEFITS			
CONGESTION MANAGEMENT			
Time Savings - Auto Users	\$21,656	77%	
Savings in Vehicle Operating Costs	\$4,812	17%	
Emission Savings	\$823	3%	
Accident Cost Savings	\$669	2%	
<i>Total Congestion Management</i>	\$27,959	100%	60%
MOBILITY			
Time Savings - Transit Users	\$3,249	90%	
Value to Low-Income Travelers	\$307	9%	
Cross Sector Benefits	\$49	1%	
<i>Total Mobility Benefits</i>	\$3,604	100%	8%
COMMUNITY DEVELOPMENT			
Commercial Development	\$1,887	37%	
Residential Development	\$3,173	63%	
<i>Total Community Development</i>	\$5,060	100%	11%
ECONOMIC OUTPUT			
<i>Economic Output</i>	\$10,051		22%
ALL BENEFITS	\$46,674		100%
COSTS			
Capital Expenditures	\$25,886		
Operating and Maintenance Costs	\$5,270		
ALL COSTS	\$31,156		
NPV: BENEFITS - COSTS	\$15,519		

Analysis period: 2006-2031; Values: 2006 \$M; Discount rate: real rate of 5%

Distribution of DRTP Benefits

Draft Regional Transportation Plan: PV of benefits, by region

CATEGORY	GTHA	CITY OF HAMILTON	HALTON REGION	PEEL REGION	CITY OF TORONTO	YORK REGION	DURHAM REGION
BENEFITS							
CONGESTION MANAGEMENT							
Time Savings - Auto Users	\$21,656	\$1,245	\$2,360	\$4,589	\$4,315	\$5,619	\$3,527
Savings in Vehicle Operating Costs	\$4,812	\$288	\$323	\$988	\$1,543	\$1,115	\$554
Emission Savings	\$823	\$96	\$112	\$196	\$2	\$256	\$161
Accident Cost Savings	\$669	\$58	\$56	\$132	\$164	\$148	\$111
<i>Total Congestion Management</i>	<i>\$27,959</i>	<i>\$1,688</i>	<i>\$2,850</i>	<i>\$5,905</i>	<i>\$6,024</i>	<i>\$7,138</i>	<i>\$4,354</i>
MOBILITY							
Time Savings - Transit Users	\$3,249	\$3	\$59	\$599	\$2,109	\$551	-\$74
Value to Low-Income Travelers	\$307	\$27	\$40	\$55	\$73	\$69	\$43
Cross Sector Benefits	\$49	\$2	\$4	\$8	\$22	\$5	\$6
<i>Total Mobility Benefits</i>	<i>\$3,604</i>	<i>\$33</i>	<i>\$103</i>	<i>\$663</i>	<i>\$2,205</i>	<i>\$626</i>	<i>-\$25</i>
COMMUNITY DEVELOPMENT							
Commercial Development	\$1,887	\$52	\$31	\$224	\$1,483	\$66	\$30
Residential Development	\$3,173	\$67	\$53	\$216	\$2,612	\$184	\$41
<i>Total Community Development</i>	<i>\$5,060</i>	<i>\$119</i>	<i>\$84</i>	<i>\$440</i>	<i>\$4,095</i>	<i>\$251</i>	<i>\$71</i>
ECONOMIC OUTPUT							
<i>Economic Output</i>	<i>\$10,051</i>	<i>\$607</i>	<i>\$1,025</i>	<i>\$2,123</i>	<i>\$2,166</i>	<i>\$2,566</i>	<i>\$1,565</i>
ALL BENEFITS	\$46,674	\$2,446	\$4,062	\$9,131	\$14,489	\$10,581	\$5,966

Analysis period: 2006-2031; Values: 2006 \$M; Discount rate: real rate of 5%

Regional Equity of DRTP Benefits

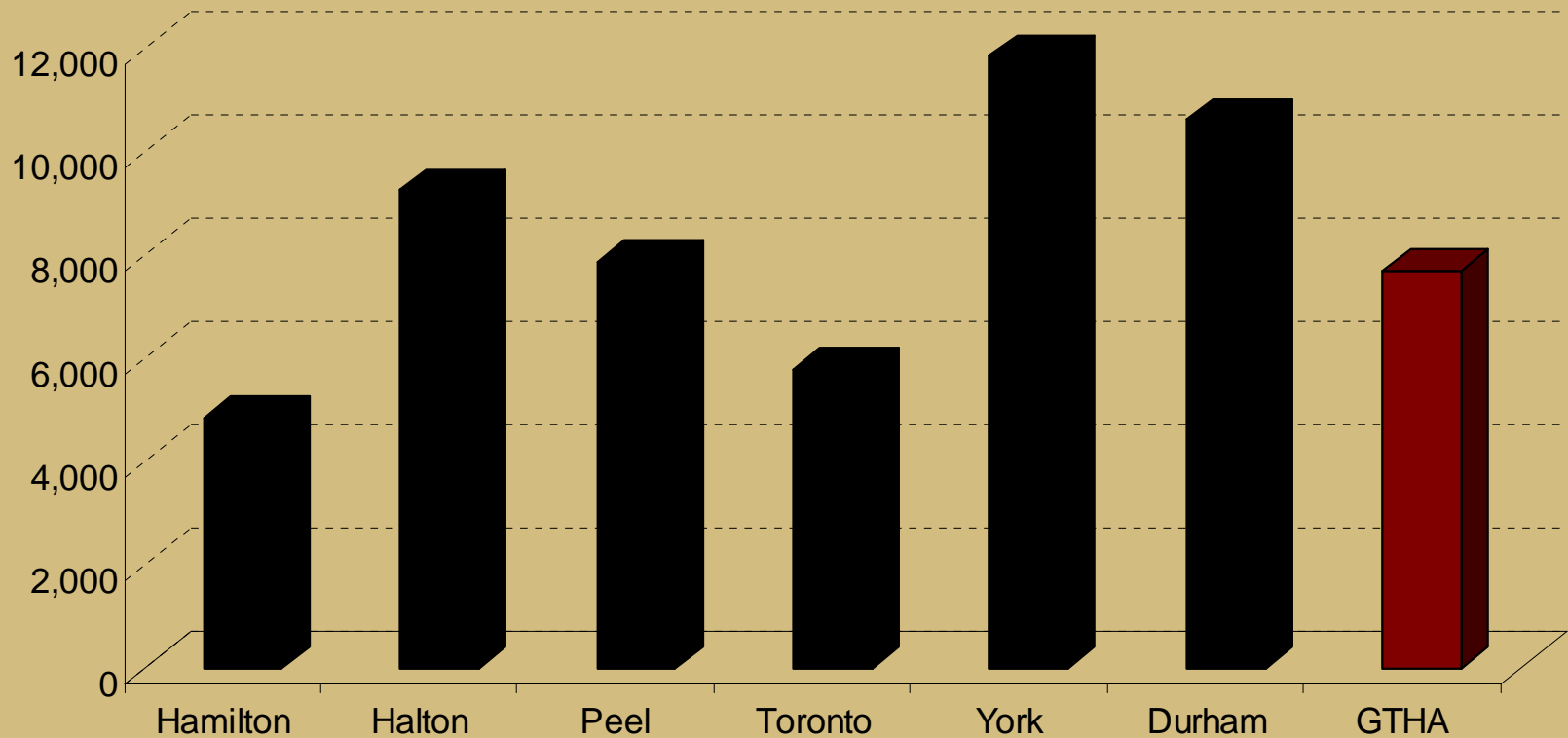
Draft Regional Transportation Plan: Present Value (PV) of benefits per capita, by region

CATEGORY	GTHA	CITY OF HAMILTON	HALTON REGION	PEEL REGION	CITY OF TORONTO	YORK REGION	DURHAM REGION
BENEFITS							
CONGESTION MANAGEMENT							
Time Savings - Auto Users	\$2,950	\$2,139	\$3,870	\$3,279	\$1,546	\$4,697	\$4,637
Savings in Vehicle Operating Costs	\$656	\$495	\$529	\$706	\$553	\$932	\$729
Emission Savings	\$112	\$165	\$184	\$140	\$1	\$214	\$212
Accident Cost Savings	\$91	\$100	\$92	\$94	\$59	\$124	\$146
<i>Total Congestion Management</i>	\$3,809	\$2,898	\$4,674	\$4,219	\$2,158	\$5,967	\$5,725
MOBILITY							
Time Savings - Transit Users	\$443	\$5	\$97	\$428	\$756	\$461	-\$97
Value to Low-Income Travelers	\$42	\$47	\$65	\$39	\$26	\$58	\$56
Cross Sector Benefits	\$7	\$4	\$7	\$6	\$8	\$5	\$8
<i>Total Mobility Benefits</i>	\$491	\$56	\$169	\$473	\$790	\$523	-\$33
COMMUNITY DEVELOPMENT							
Commercial Development	\$257	\$90	\$52	\$160	\$531	\$56	\$39
Residential Development	\$432	\$115	\$87	\$154	\$936	\$154	\$54
<i>Total Community Development</i>	\$689	\$205	\$138	\$314	\$1,467	\$210	\$94
ECONOMIC OUTPUT							
<i>Economic Output</i>	\$1,369	\$458	\$1,948	\$1,354	\$4,702	\$1,204	\$5,152
ALL BENEFITS	\$6,359	\$4,201	\$6,662	\$6,523	\$5,190	\$8,844	\$7,843

Analysis period: 2006-2031; Values: 2006 \$M; Discount rate: real rate of 5%

Regional Equity of DRTP Benefits

Comparison of Estimated Benefits per Capita of the 25-Year DRTP, by Region
\$/capita (present value, 2006 dollars)



Macroeconomic Impact of the 25-Year DRTP

- Tax revenue impact \$14.7 billion
 - *\$1.9 billion local and municipal*
 - *\$6.8 billion provincial*
 - *\$6.0 billion federal*

ECONOMIC IMPACT	PRESENT VALUE
Output	\$39,266
Employment Income	\$11,825
GDP	\$17,630

Note: values are in millions of dollars (\$2006), in present value terms

- The total output impact of the DRTP investment projects amount to over \$69.6 billion, including \$33.9 billion of the original expenditures that would take place in Ontario.
- The plan will create an estimated 429,528 jobs, including 153,795 direct jobs, 116,126 indirect jobs, and 159,607 induced jobs.

CONCLUSION

1. Economic Burden of Inadequate Supply and Congestion

- \$3.3 billion cost to commuters; plus
- \$2.7 billion cost to economy
- \$6.0 billion per year in total

2. Economic Efficiency of New and Better Capacity and Capacity Management

- \$15.5 billion Net Benefit
- 19.0% Rate of Return
- 429,000 Jobs

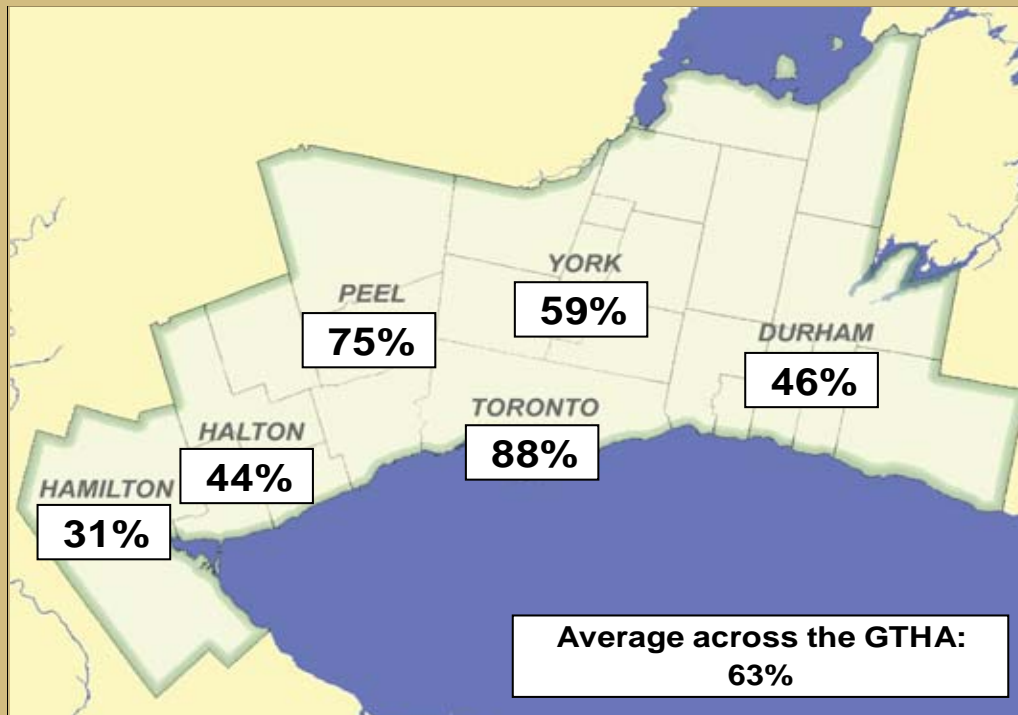
Supplementary Information

Perspective 1

Economic Burden of Inadequate Supply and Congestion

Regional Increases in Travel Times:

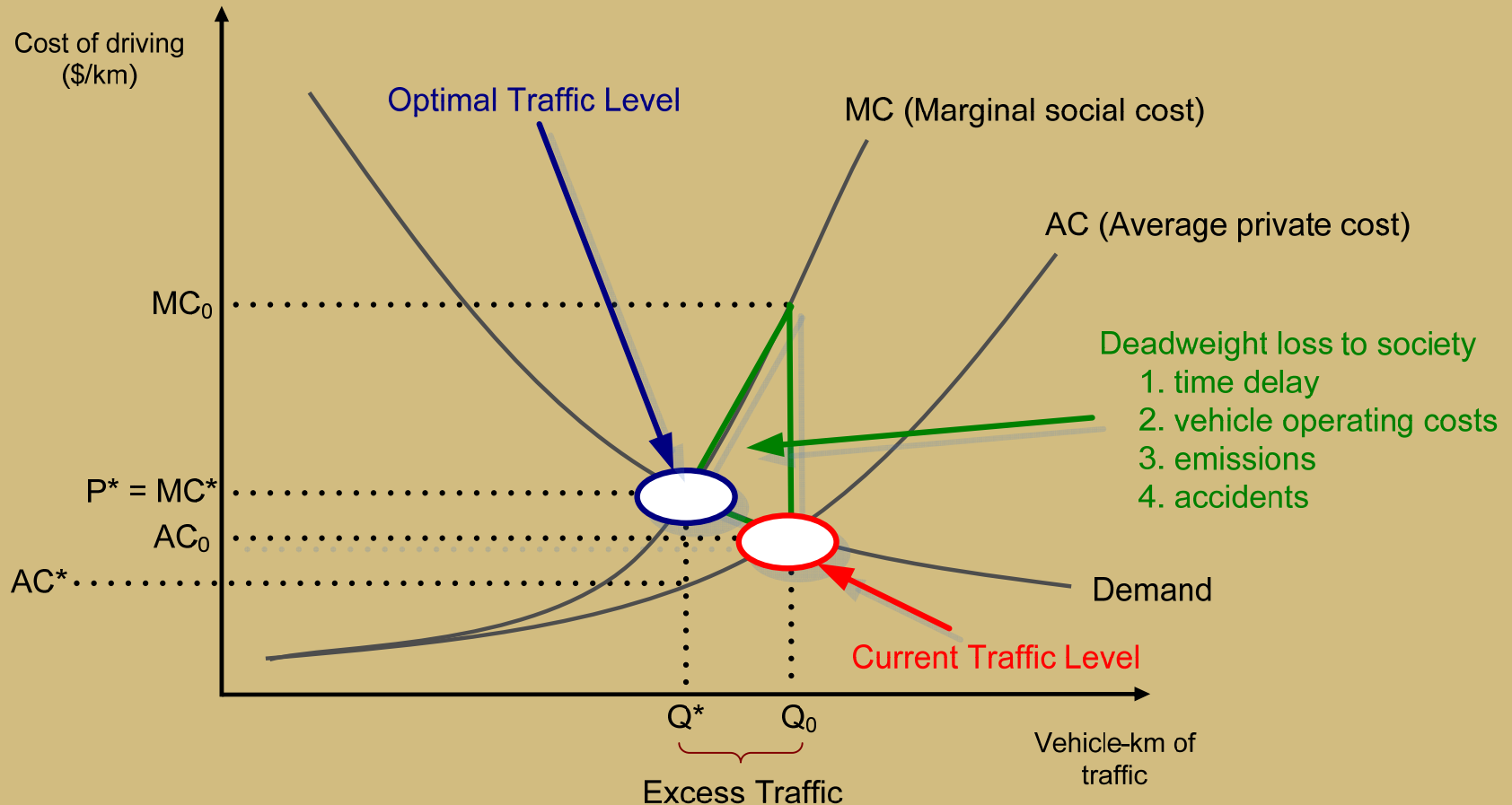
- In Toronto the Travel Time Index (TTI) is 1.88
- A trip that would take 20 minutes in free-flow conditions will take 38 minutes during the peak travel time periods → an 18-minute (or 88%) travel time penalty



REGION NAME	TRAVEL TIME INDEX (TTI)
City of Hamilton	1.31
Halton Region	1.44
Peel Region	1.75
City of Toronto	1.88
Region of York	1.59
Durham Region	1.46
GTHA AVERAGE	1.63

Perspective 1

Economic Burden of Inadequate Supply and Congestion



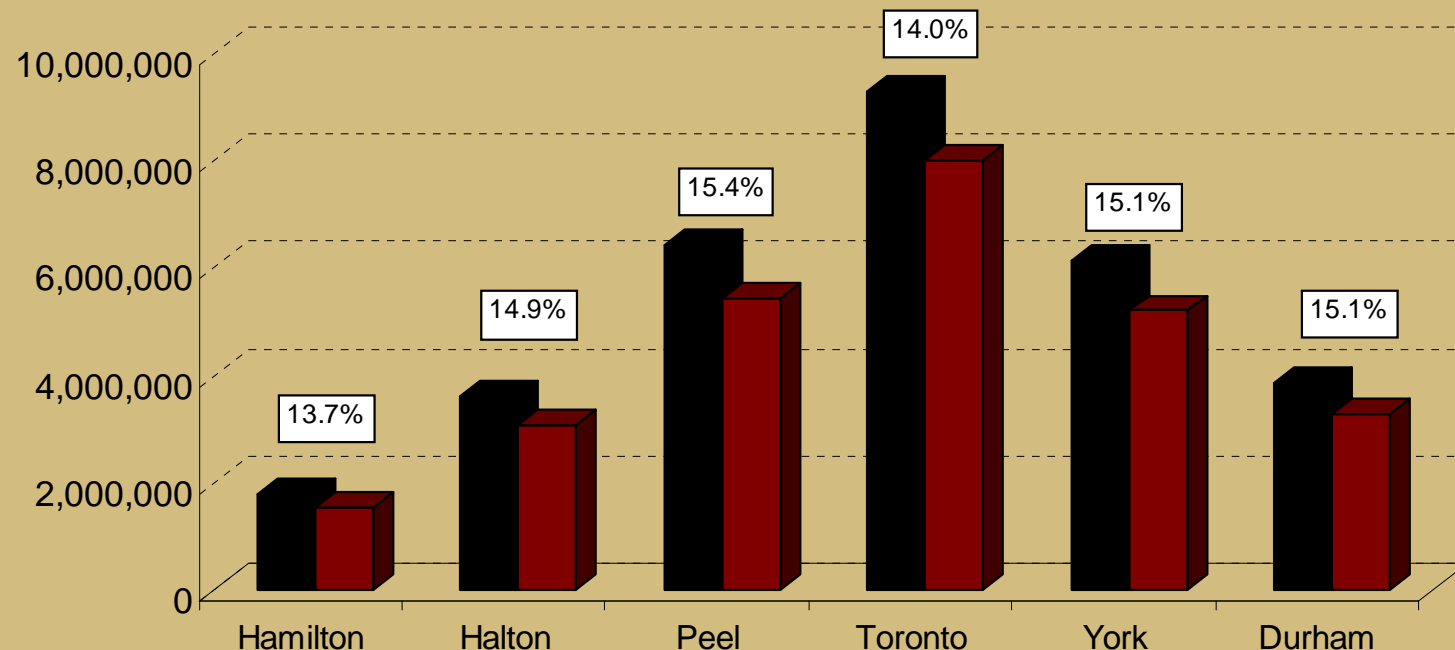
- Average private cost = vehicle operating costs + personal value of time
- Marginal social cost = vehicle operating costs + personal value of time + external value of time + emissions + accidents

Perspective 1

Economic Burden of Inadequate Supply and Congestion

At the socially optimal level, daily auto traffic would be 15-17% less per region:

Actual vs. Optimal Auto Traffic
Daily auto VKT, AM peak period



Excess Auto Traffic as % of Current Level

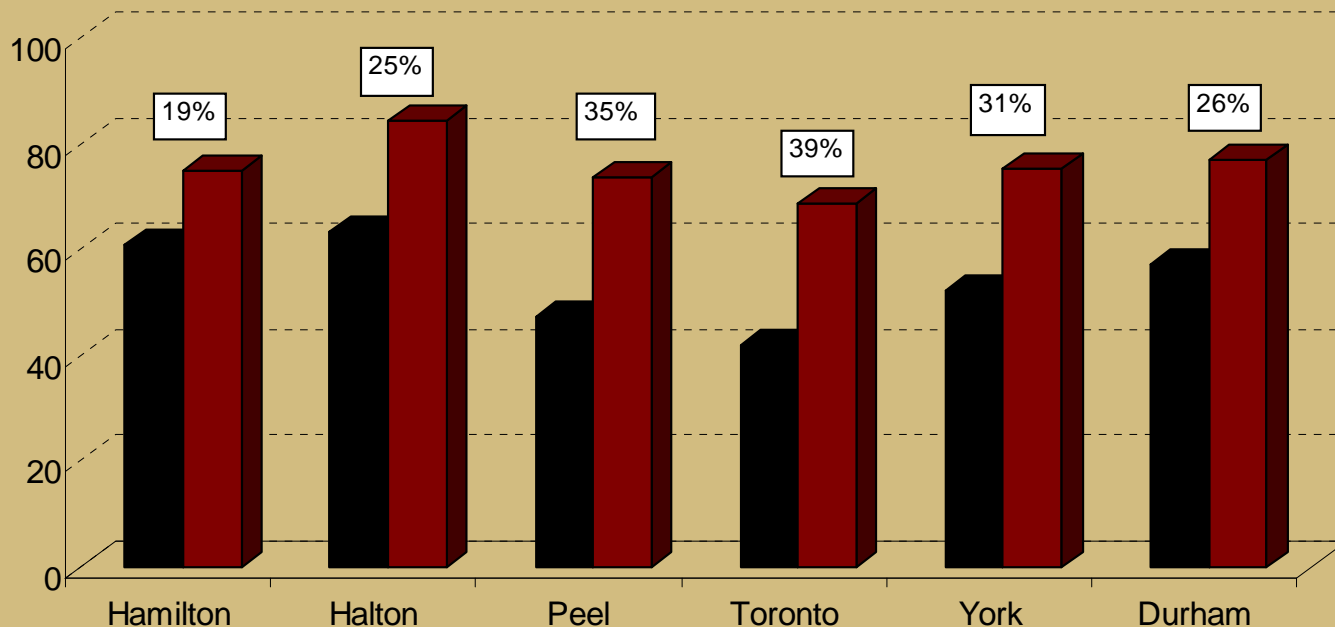
■ Actual Auto VKT ■ Optimal Auto VKT

Perspective 1

Economic Burden of Inadequate Supply and Congestion

The current (inefficiently high) level of auto traffic decreases peak travel speeds by 19-39%:

Actual vs. Optimal Travel Speed
km/hr, AM peak period

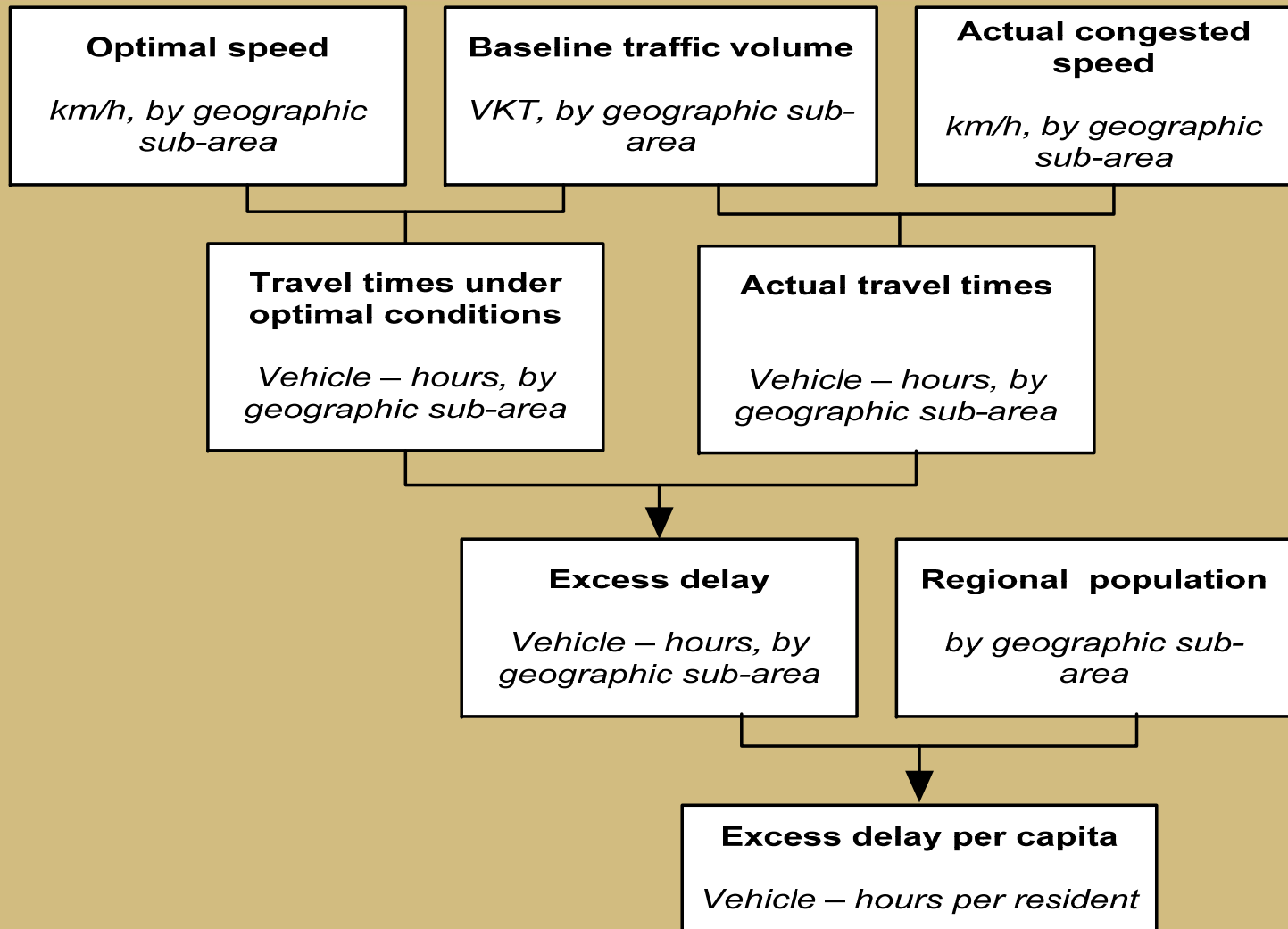


Reduction in actual speeds compared to optimal (as % of optimal)

■ Current Speed ■ Optimal Speed

Perspective 1

Economic Burden of Inadequate Supply and Congestion



Perspective 1

Economic Burden of Inadequate Supply and Congestion

- **Burden is material:** *Signals market failure*

Annual Cost of Congestion	New York City	Chicago	GTHA
Delay	\$5b	\$7.3b	\$2.6b
Wasted fuel and other vehicle operating costs	\$2b		\$0.5b
Excess emissions and accident costs	-	-	\$0.3b
Total congestion cost to commuters	\$7b	\$8.3b	\$3.3b
Lost Gross Regional Product	\$4b	-	\$2.7b
Total cost of congestion	\$11b	\$7.3b	\$6b
Increased industry operating costs	\$1.9b	-	\$0.2b
Lost industry revenue	\$4.5b	-	\$4.1b
Fewer jobs due to existing congestion	51,500	-	27,500

- Burden of congestion alone not a sufficient basis for “messaging” prospective benefits of supply management and pricing

Perspective 1

Economic Burden of Inadequate Supply and Congestion

- **HDR (2008): GTHA, 2006 data**
 - Cost of congestion: \$6.0B/yr (commuters: \$3.3B; economy: \$2.7B)
 - Annual delay per peak traveler: 50 hrs/year

- **Ontario MOT (2007): GTHA, 2006 data**
 - Cost of congestion wrt **free-flow** = \$6B/yr; wrt LOS D/E = \$5.5B/yr
 - Annual delay per peak traveler: 46 hrs/year

- **Transport Canada (2006): Toronto, 2001 data**
 - Cost of congestion for Toronto: \$1.6B (\$2002)

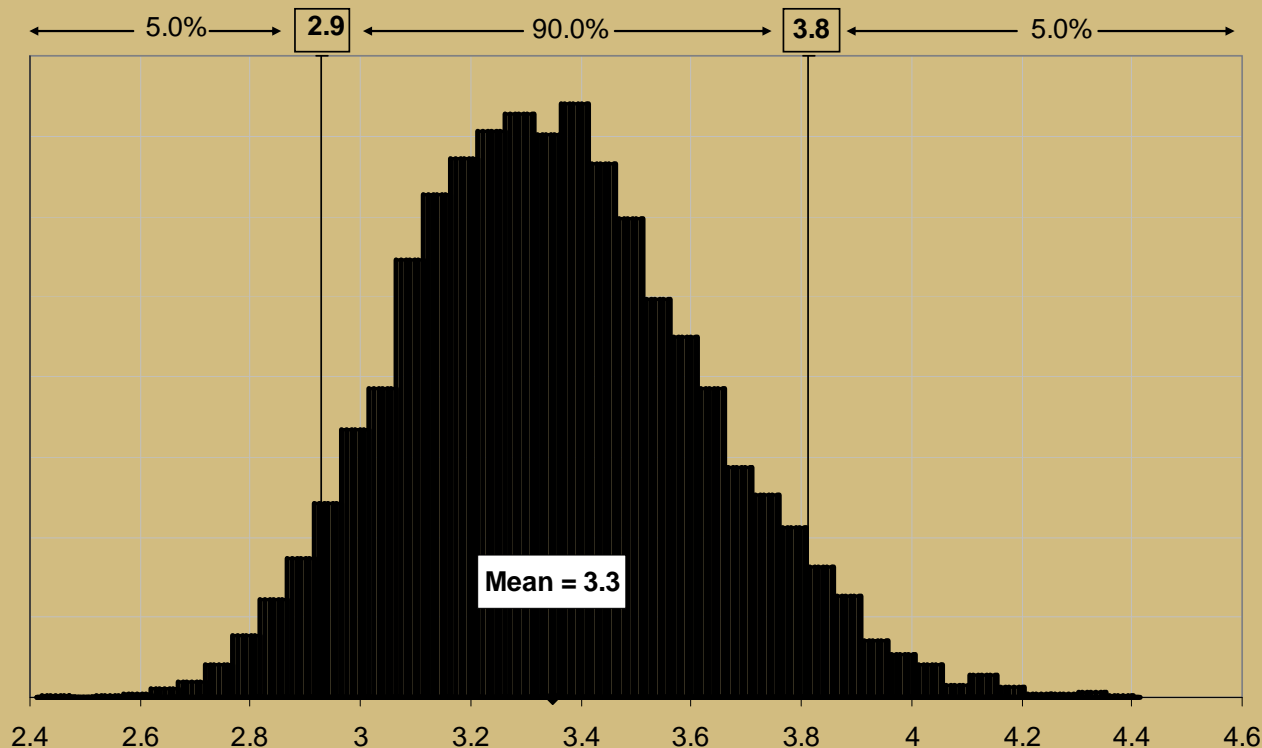
Perspective 1

Economic Burden of Inadequate Supply and Congestion - Uncertainty

- **Cost of congestion to commuters:** \$3.3 billion/year
- **90% confidence interval:** (\$2.9B, \$3.8B)

Annual Cost of Congestion for Commuters in the GTHA

\$ billion, AM + PM peak periods



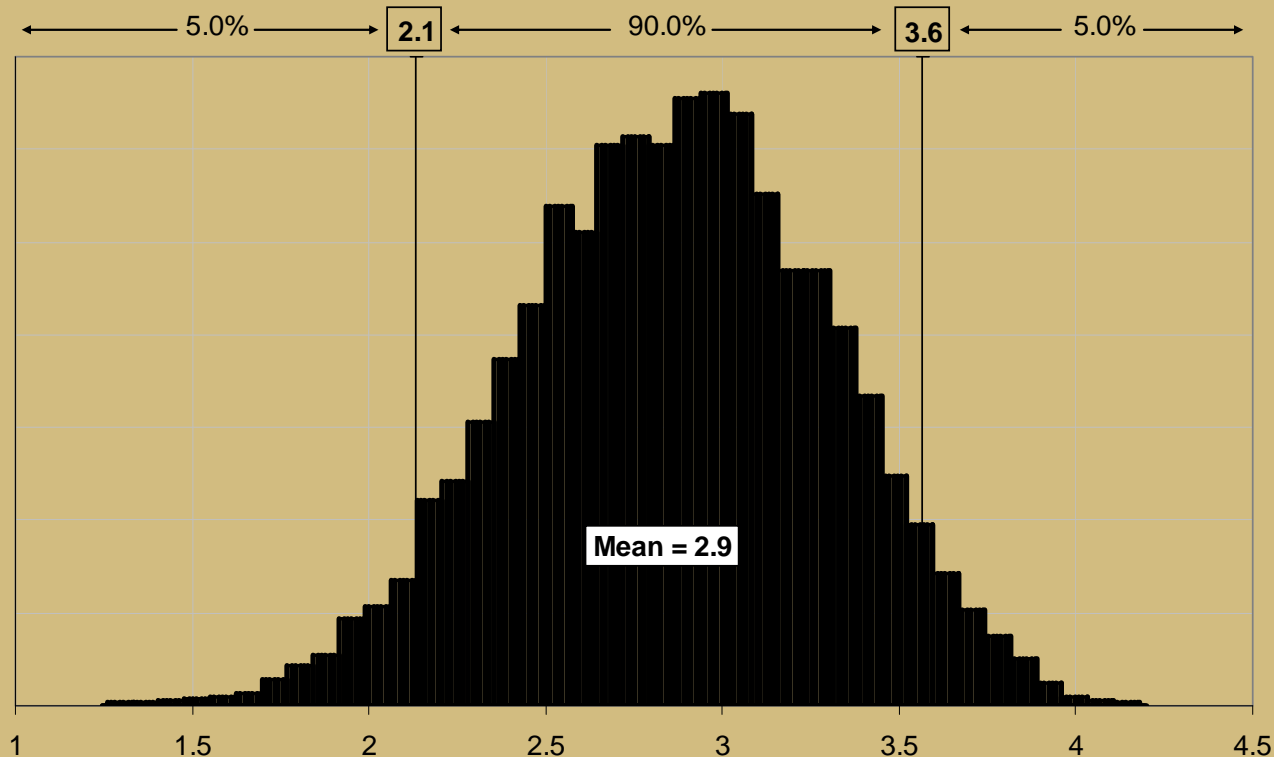
Perspective 1

Economic Burden of Inadequate Supply and Congestion - Uncertainty

- **Cost of congestion to the economy:** \$2.9 billion/year
- **90% confidence interval:** (\$2.1B, \$3.6B)

Annual Reduction in GDP in the GTHA Region due to Congestion

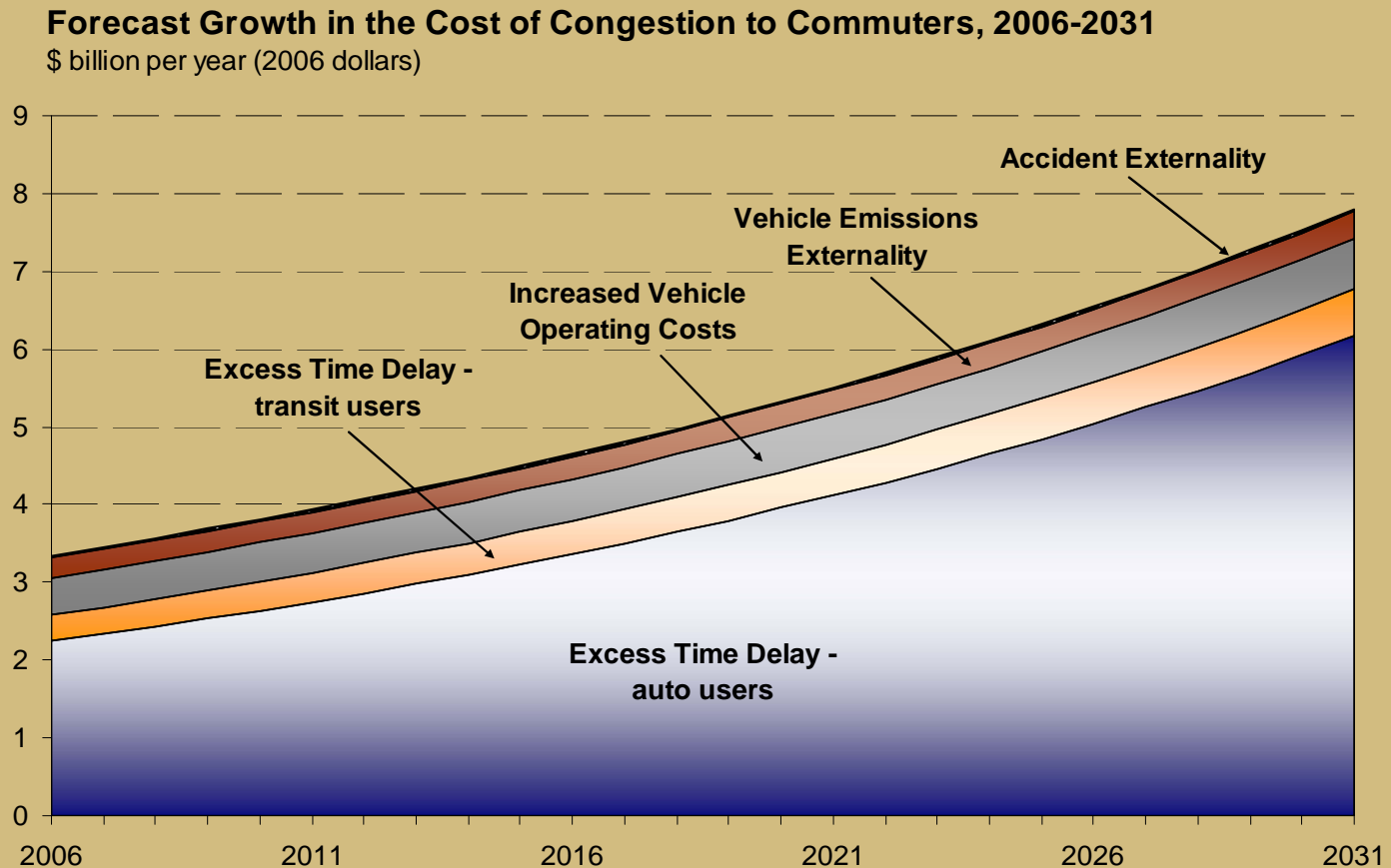
\$ billion, AM + PM peak periods



Perspective 1

Economic Burden of Inadequate Supply and Congestion - Over Time

- **With no action:** excess delay forecast to increase considerably, from \$3.3 billion to \$7.8 billion per year → an increase of **136%** by 2031.

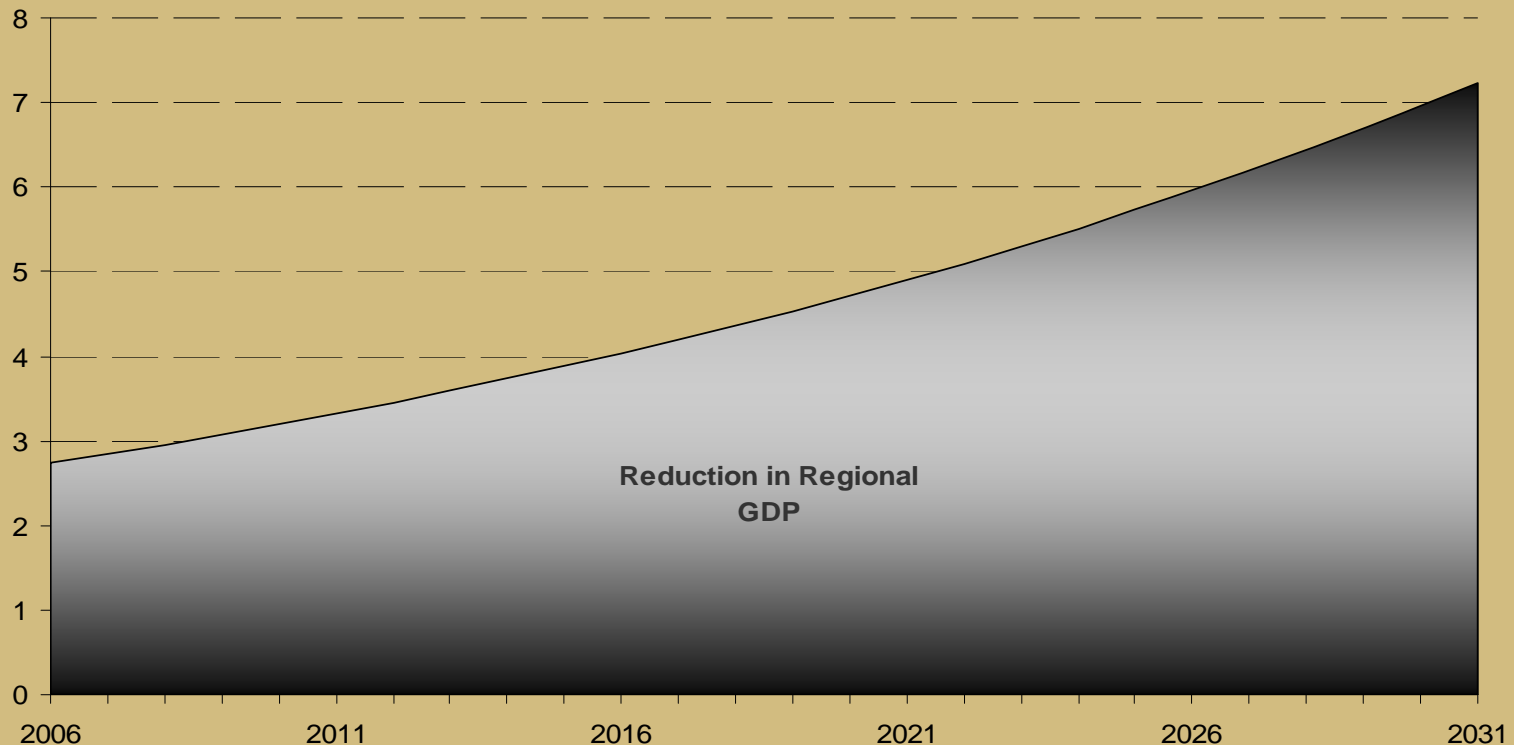


Perspective 1

Economic Burden of Inadequate Supply and Congestion - Over Time

- **With no action:** reduction in GDP due to excess congestion would increase from \$2.7 billion to \$7.2 billion per year – an increase of **167%** by 2031.

Forecast Growth in the Cost of Congestion to the GTHA Economy, 2006 to 2031
\$ billion per year (2006 dollars)



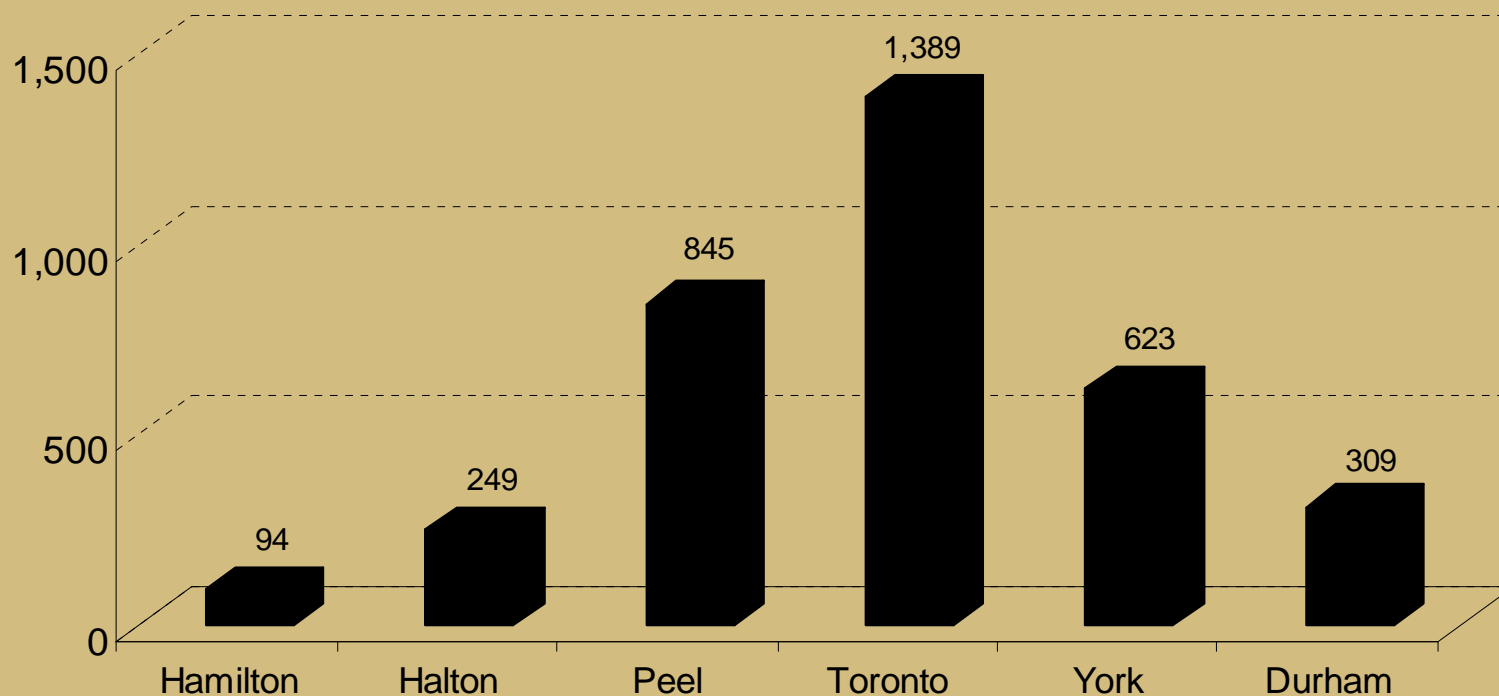
Perspective 1

Economic Burden of Inadequate Supply and Congestion

Annual cost of congestion to commuters across each region in the GTHA:

Annual Cost of Congestion to Commuters in 2006, by region

\$ million, 2006

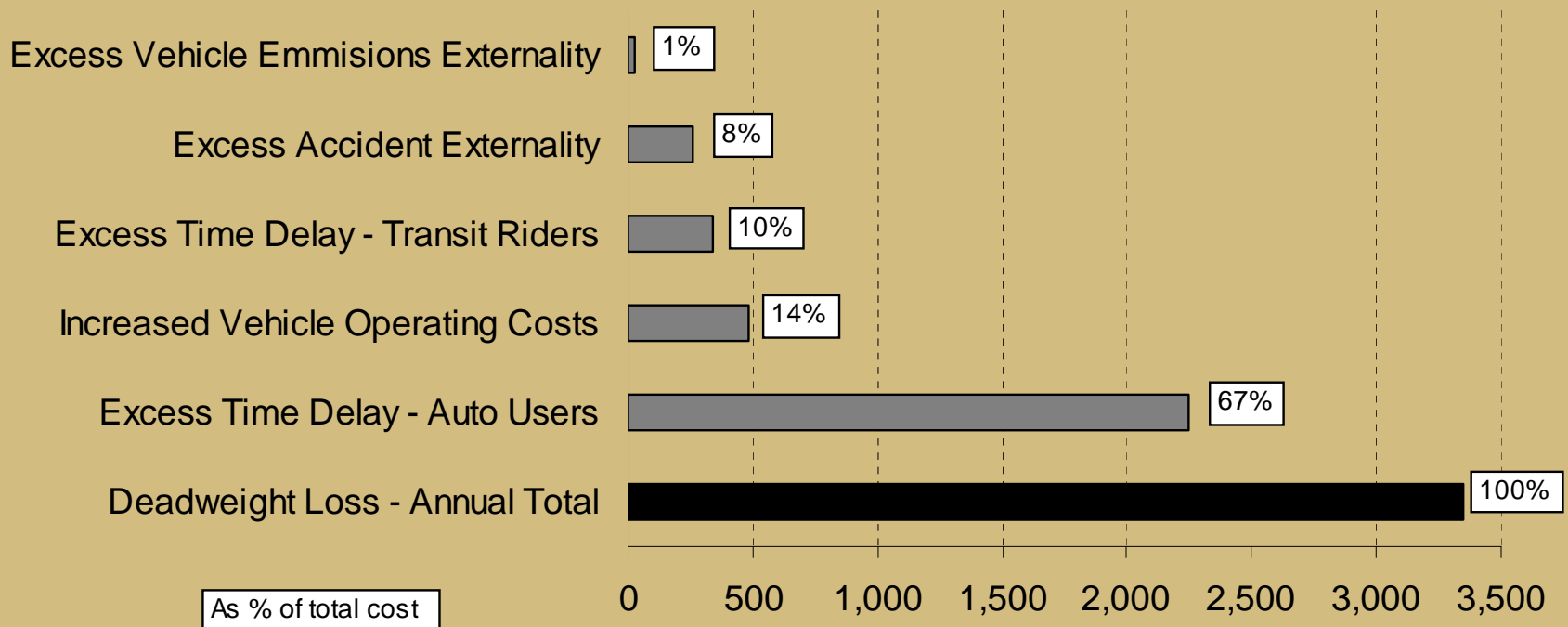


Perspective 1

Economic Burden of Inadequate Supply and Congestion

The greatest cost is that of ***excess travel time and associated uncertainty***
→ 77% of total congestion cost

Annual Commuting Cost of Congestion in the GTHA, by component
\$ million, 2006



Perspective 1

Economic Burden of Inadequate Supply and Congestion

The average commuter in the GTHA incurs an excess delay of 11.5 minutes per day, and **50 hours per year**:

REGION NAME	HOURS PER DAY	HOURS PER YEAR	MINUTES PER DAY, PER COMMUTER	HOURS PER YEAR, PER COMMUTER
City of Hamilton	9,002	2,340,523	4.8	21
Halton Region	24,314	6,321,584	7.8	34
Peel Region	88,844	23,099,566	11.1	48
City of Toronto	163,319	42,463,052	15.6	67
Region of York	64,596	16,794,912	12.9	56
Durham Region	30,419	7,909,060	8.8	38
TOTAL GREATER TORONTO AND HAMILTON AREA (GTHA)	357,759	93,017,265	11.5	50

Perspective 1

Economic Burden of Inadequate Supply and Congestion

Greater Toronto and Hamilton Area (GTHA) - 2006

Cost component	Daily Excess Cost of Congestion (\$)	Annual Excess Cost of Congestion (\$)	Annual Excess Cost of Congestion per capita (\$/person)
Time cost - auto users	8,635,110	2,245,128,711	370
Time cost - transit riders	1,296,555	337,104,226	56
Vehicle operating costs	1,843,273	479,251,048	79
Accidents	985,643	256,267,185	42
Vehicle emissions	113,999	29,639,838	5
Total	12,874,581	3,347,391,008	552

- The above costs have been calculated for each of the 6 regions

Perspective 1

Economic Burden of Inadequate Supply and Congestion

Impact on regional economic activity due to *labour market effects*:

Reduction in employment due to excess commuting costs (number of jobs)	25,962
Reduction in the value of regional economic activity (business revenues), \$ millions	\$4,744
Reduction in the value of regional value added (regional GDP), \$ millions	\$2,733

Impact of congestion on *industry logistic costs*:

Industry	Increase in industry costs (\$ millions)	Reduction in industry revenues (\$ millions)	Reduction in industry employment (FTE jobs)
Retail Trade	22.1	27.5	467
Construction	63.1	-	-
Manufacturing	97.6	804.0	1,959
Wholesale Trade	56.3	-	-
Agriculture	4.1	52.5	429
Accommodation and Food services	-	40.4	849
Arts and Entertainment	-	6.2	94
Transportation	16.7	6.0	43
Subtotal	259.9	936.6	3,841

Perspective 1

Economic Burden of Inadequate Supply and Congestion

Economic Impact Analysis Evaluation Metrics of the 25-Year DRTP:

ECONOMIC IMPACT	PRESENT VALUE (\$M, 2006)
Output	\$39,266
Employment Income	\$11,825
GDP	\$17,630
Jobs	429,528

Tax Revenue Impact in Ontario of the DRTP Investment:

LEVEL OF GOVERNMENT	TAX REVENUE (\$M)
Local/ Municipal	\$1,942.7
Provincial	\$6,846.3
Federal	\$6,028.1
TOTAL TAX REVENUE	\$14,817

Perspective 2

Economic Efficiency Effects of Supply Management

■ Sources of economic benefits:

- Time savings
- Improved reliability (valued 2.5 times greater)
- Less VKT, higher transit share
- Environment
- Safety
- Land use

■ Evidence:

- Nationwide congestion pricing – At least \$27B/year (time and accident savings minus lost value to those priced out of the peak)
- Chicago: \$3.5 billion in time savings alone; +32% more transit trips; CBD employment +14%

Perspective 2

Environmental Benefits of Supply Management

■ Air Quality

- Simulations indicate air quality emissions reduced 5%-15% depending on complete versus partial pricing and demand elasticity
- Dollar value of reduced emissions 5.7% and 29.1% of social gains from reduced congestion for area-wide pricing
- Dollar value of reduced emissions 4.9% and 8.5% of social gains from reduced congestion for partial pricing

■ Greenhouse Gases

- Predicted reductions in CO₂ emissions range from 2.9% in the Washington, D.C. area to 7.4% in the Los Angeles area with moderate congestion pricing
- Germany's emission-based truck tolls cut greenhouse emissions by 7% (with higher load factors)

■ Efficiency alone not sufficient for understanding of prospective benefits

Perspective 3

Economic Efficiency and Welfare Effects of New Investment and Policy

- Costs of new investment:

CATEGORY	CAPITAL SPENDING BY PLAN			
	10 YEAR	15 YEAR	25 YEAR	ALL YEARS
UNDISCOUNTED COSTS				
Capital Expenditures	\$17,510	\$11,150	\$19,190	\$47,850
Operating and Maintenance Costs	\$1,497	\$2,621	\$7,824	\$11,943
ALL COSTS	\$19,007	\$13,771	\$27,014	\$59,793
DISCOUNTED COSTS				
Capital Expenditures	\$12,831	\$5,927	\$7,128	\$25,886
Operating and Maintenance Costs	\$1,017	\$1,381	\$2,871	\$5,270
ALL COSTS	\$13,848	\$7,308	\$9,999	\$31,156

Values: 2006 \$m; **Discount rate:** real rate of 5%

Perspective 3

Economic Efficiency and Welfare Effects of New Investment and Policy

New Investment Can Generate Significant Economic Benefits

CATEGORY OF BENEFITS	DESCRIPTION
TIME SAVINGS	Better and more reliable travel times; gains in productivity
AFFORDABLE MOBILITY	Cash savings to low income households for reallocation to housing, nutrition, childcare ...
CROSS-SECTOR BENEFITS	Savings in social service agency budgets
SAVINGS IN VEHICLE AND SYSTEM OPERATING COSTS	Reduced outlays on fuel, oil, maintenance, insurance
SAFETY	Reduced fatalities, injuries, property damage
ENVIRONMENT	Reduced air pollution and greenhouse gas emissions
ECONOMIC DEVELOPMENT	Higher land values

Perspective 3

Economic Efficiency and Welfare Effects of DRTP

Regional Transportation Plan: Net Present Value (NPV) & Rate of Return

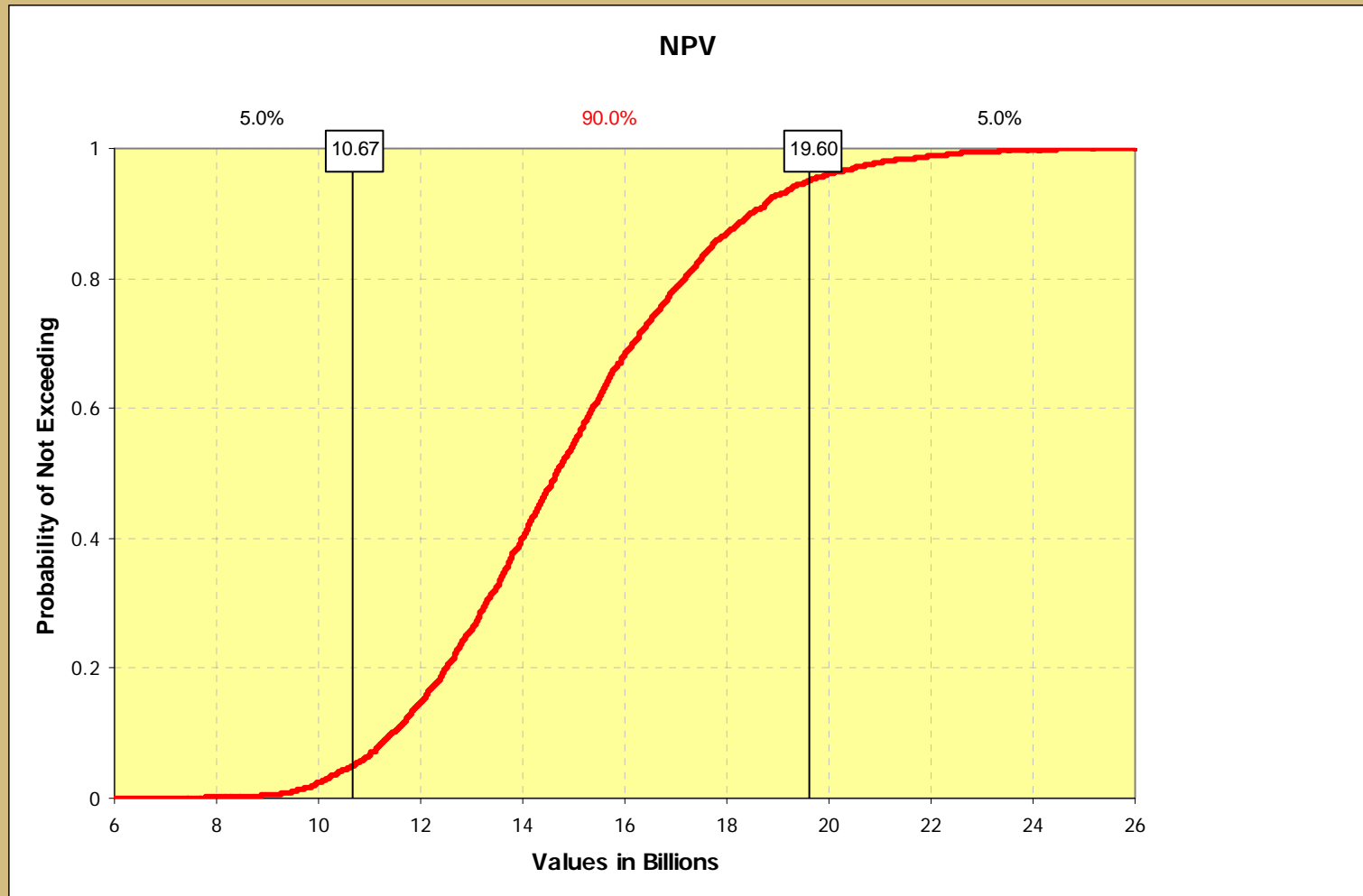
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Perspective 3

Economic Efficiency and Welfare Effects of DRTP

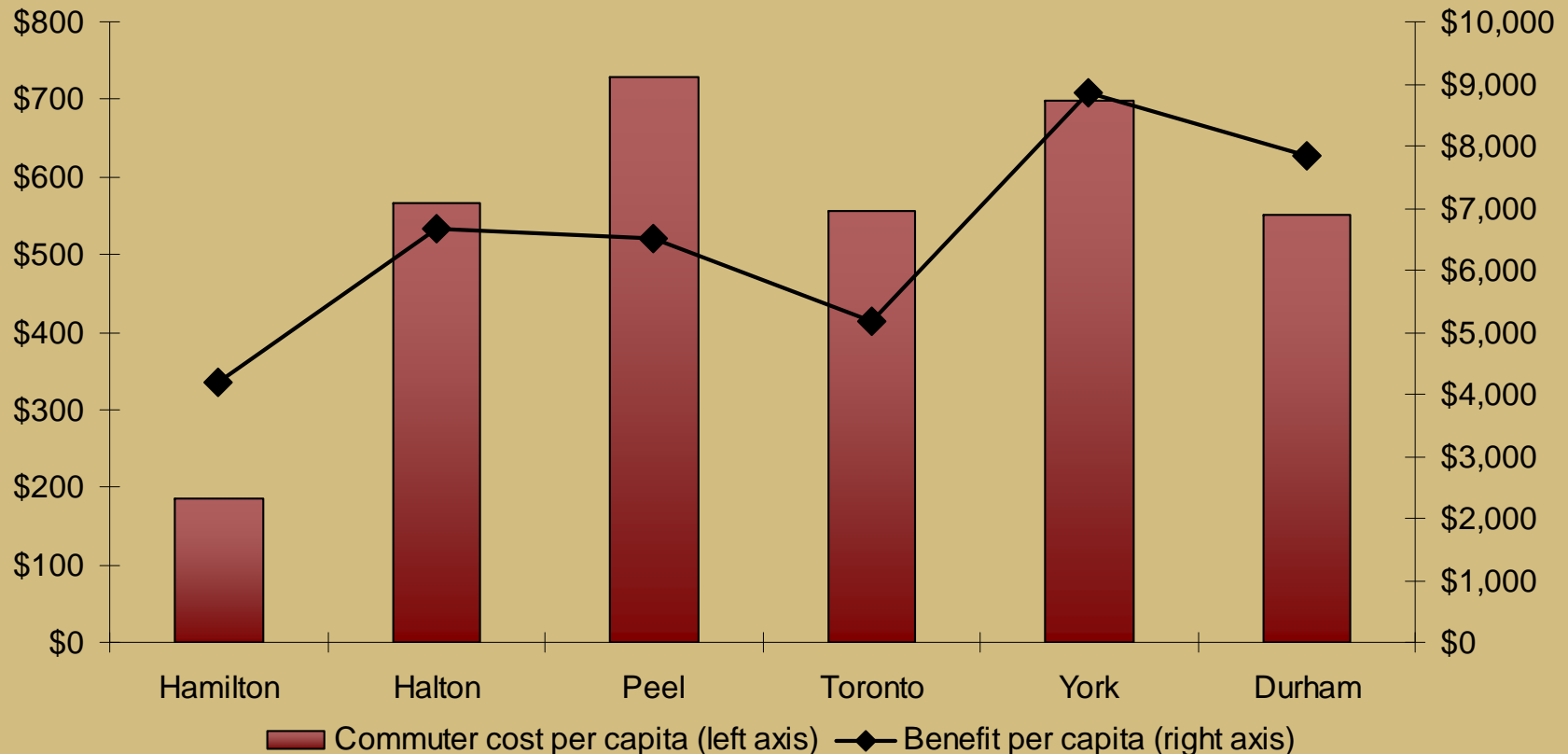
Regional Transportation Plan: NPV



Perspective 3

Regional Distribution of RTP Benefits and Cost of Congestion per Commuter

Regional Distribution of Benefits Relative to Current Congestion Cost
Over the 25-Year DRTP



Commuter cost per capita: 2006 cost of congestion to commuters, divided by regional population
Benefit per capita: present value of benefits due to RTP implementation, 2006-2031

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