The Stockholm Trial:
Congestion charging and improved public transport aimed at reducing traffic jams and creating a better environment

Gunnar Söderholm, City of Stockholm deputy CEO
• **Improved public transport** 22 Aug 2005

• **New park-and-ride sites** Autumn 2005

• **Congestion charging** 3 Jan-31 July 2006

• **Referendum** 17 Sept 2006
Primary objectives of congestion charging

• Reduced congestion

• Increased accessibility

• Better environment
Secondary objectives of congestion charging

• To reduce traffic volume by 10-15% on the most-heavily-used routes during morning and afternoon/evening peak periods.

• To improve accessibility for buses and cars in the inner city.

• Revenue back to Stockholm
Evaluation programme

- **Before and during the trial**
  - Monitoring period
  - Before autumn 2004 (spring 2005)
  - During spring 2006
  - More complete analysis: 21 June 2006

- **Monthly indicators**
  - Monitoring period
  - Selected indicators
  - 10th of each month

- **Go live**
  - Monitoring period
  - Public transport reinforcement, 22 August 2005 - daily during the first 2 weeks
  - Congestion charging, 3 January 2006 - daily during the first 2 weeks
  - Selected indicators
North Link
New western bridge
Årstabron – railway bridge
Western detour

E18 motorway
Railway tunnel

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Extensive media coverage
System launching day
Focused on the expected chaos
Extensive media coverage

One day after

Immediate positive press focused on the huge impact
Passages in/out of congestion-charging zone 06:00 – 19:00
Effects stabilised quickly

Passager över avgiftssnittet kl 6-19

-28% -24% -23%
-22% -22%
-21% (-28 000)
-9% (-3000)
-26% (-6000)
-22% (-19 000)

-19% (-12 000)
-26% (-6000)

Trafik på Essingeleden berör inte av träningsskuff.
30 % exempted passages

Lidingöpassagerer i februari och mars är uppskattade utifrån andel lidingöpassagerer i januari.
Who pays the tax?

- 20 % inner city
- 30 % rest of Stockholm City
- 40 % Rest of Stockholm County
- 10 % Rest of Sweden
Fordonspassager över avgiftssnittet

Flöde (fordon/h)

April 2005
April 2006

Tidpunkt

Fordonspassager över avgiftssnittet
Traffic in and out from the inner city
Goals essentially reached

• 10 - 15 % less traffic to/from inner city
  – Was 20-25%

• Increased accessibility
  – Queue times down 30-50% in/near the inner city
  – Essingeleden about the same

• Decreased emissions
  – 10-14% less in inner city; 2-3% in total county

• Inhabitants should perceive an improved urban environment
  – Unclear – difficult to define and measure
10% of estimated "trouble"

- Call center 1 800
- Appeals to tax auth 115
- Appeals to court 5
- Enforcement < 1 %
- 10 – 15 persons has problem with stolen plates
- Less than 1 % who try to cheat the system
- 99,9 % Operational time
Effects on car traffic - prel. overview
Essingeleden about the same – but Södra länken is worse

Travel time increase on Södra länken due to it being a new road
Unexpectedly small traffic increase on E4-Essingeleden
De olika Mätpunkterna

Innerstadsgata
Inre infart
Yttre infart
Essingeleden
Södra länken
Tvärled
Less traffic also further out and inside the cordon.

- Streets inside
- Streets inside, large
- Main roads inside
- Cordon
- Inner main roads
- Outer main roads
- Streets, outside
- "Ring roads"
Inner main rods

-40% -35% -30% -25% -20% -15% -10% -5% 0%
Större innerstadsgator

Förändringar med 99% konfidensgrad

- Signifikant minskning
- Signifikant ökning
- Ej signifikant minskning
North-South- traffic

Nordydaxeln
Förändringar med 99% konfidensgrad
- Signifikant minskning
- Ej signifikant minskning

Anmärkningsvärt minskning
Ej signifikant minskning
Outer main roads

Yttre infarter, riktning in och ut

Förändringar med 99% konfidensgrad

- Signifikant minskning
- Signifikant ökning
- Ej signifikant minskning
- Ej signifikant ökning

-20% -15% -10% -5% 0% 5% 10%

Ulvsundavägen m Alvik
E18 Enköpingsvägen m Enköp
Tyresövägen
Enköpingsvägen
Väg 222 Värmdöleden m Sthlm
Väg 222 Värmdöleden m Gusta
Bergslagsvägen
V 226 Huddingev Tullinge
Sörentorp
Huddingevägen
Nynäsvägen
Nockebybron
Stocksundsbron
Solnavägen
Streets in Stockholm City suburbs

- Uppfart mot Åbyvägen
- Gamla Tyresövägen
- Västberga Allé
- Stortorpsvägen
- Skärholmsvägen
- Lugnets Allé
- Ågestabron
- Alviksvägen
- Skälbyvägen
- Bolidenvägen
- Perstorpsvägen
- Ekholmsvägen
- G:a Södertäljevägen
- Korkskruven
- Svanholmsvägen
- Ånestadsgator
- Norra Kolonnvägen
- Smistavägen
- Ägestabron
- Lagnarves Allé
- Skärholmsvägen
- Stortorpsvägen
- Västberga Allé
- Gamla Tyresövägen
- Uppfart mot Åbyvägen

Förändringar med 99% konfidensgrad
- Signifikant minskning
- Signifikant ökning
- Ej signifikant minskning
- Ej signifikant ökning

-25% -20% -15% -10% -5% 0% 5% 10% 15% 20% 25%
30-50% less time in queues

Delay time, AM peak

- Inner main roads, inbound
- Inner main roads, outbound
- Inner streets
- Inner main roads, northbound
- Inner main roads, southbound

fm 2005  fm 2006
Even larger effect on PM peak

![Delay time, PM peak](chart.png)
Effects on travel times – prel. overview

(AM peak)
Morning traffic

Förändring av trängsel, morgonrusning

The graph shows the traffic congestion changes during morning rush hours in the inner city streets, from the beginning of the year to the end of the year. The data includes the congestion levels for the inner city streets, both for morning and evening rush hours, for the entire year. The graph is divided into 24 weeks, with each week representing a period of approximately one week. The x-axis represents the weeks, and the y-axis represents the percentage increase in traffic congestion compared to the baseline. The graph includes multiple lines, each representing different streets and time periods. The data suggests a significant increase in traffic congestion during the autumn and spring months, particularly in the evening rush hours.
Morning traffic

Förändring av trängsel, morgonrusning

0% 25% 50% 75% 100% 125% 150% 175%

vecka 2 vecka 3 vecka 4 vecka 5 vecka 6 vecka 7 vecka 8 vecka 9 vecka 10 vecka 11 vecka 12 vecka 13 vecka 14 vecka 15 vecka 16 vecka 17 vecka 18 vecka 19 vecka 20 vecka 21 vecka 22 vecka 23
Förändring av trängsel, eftermiddagsrusning

innerstadsgator, höst och vår -05

inre infart - in

innerstadsgator

inre infart - ut, höst och vår -05

inre infart - ut

inre infart - in

0% 25% 50% 75% 100% 125% 150% 175% 200% 225% 250% 275%

vecka 2 vecka 3 vecka 4 vecka 5 vecka 6 vecka 7 vecka 8 vecka 9 vecka 10 vecka 11 vecka 12 vecka 13 vecka 14 vecka 15 vecka 16 vecka 17 vecka 18 vecka 19 vecka 20 vecka 21 vecka 22 vecka 23
Förändring av trängsel, eftermiddagssrusning

vecka 1 - vecka 23
Improved traffic safety

- Less traffic means less accidents

- Higher speeds means worse impact but small effect as a whole

- The period is too short for proper analysis of registered accidents

- Estimated reduction of wounded/killed by 5 - 10% within the charging zone
Less carbon dioxide

- Climate effects large for a single measure
- One step towards national climate target
Less emissions improve health

- Emissions are reduced in the "right" area
- According to new findings, as much as 30 premature deaths can be saved (app. 300 living years)
Noise – not much of an effect

- App 1 dBA, and at most 2 dBA
- 3 dBA the limit that can be heard
- BUT the number of disturbed by noise are reduced

<table>
<thead>
<tr>
<th></th>
<th>Innerstaden:</th>
<th>Stockholms stad:</th>
<th>Storstockholm:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ton/år</td>
<td>procent</td>
<td>ton/år</td>
</tr>
<tr>
<td>Koväveoxider, NO(_X)</td>
<td>73</td>
<td>-13 %</td>
<td>76</td>
</tr>
<tr>
<td>Kolmonoxid, CO</td>
<td>670</td>
<td>-14 %</td>
<td>710</td>
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<tr>
<td>Partiklar, PM10 totalt</td>
<td>21</td>
<td>-13 %</td>
<td>24</td>
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<tr>
<td>”slitagepartiklar”</td>
<td>19</td>
<td>-13 %</td>
<td>22</td>
</tr>
<tr>
<td>”avgaspartiklar”</td>
<td>2,0</td>
<td>-14 %</td>
<td>2,1</td>
</tr>
<tr>
<td>Flyktiga kolväten, VOC</td>
<td>110</td>
<td>-14 %</td>
<td>119</td>
</tr>
<tr>
<td>bensen, C(_6)H(_6)</td>
<td>0,9</td>
<td>-14 %</td>
<td>1,0</td>
</tr>
<tr>
<td>Koldioxid, CO(_2)</td>
<td>37 000</td>
<td>-12 %</td>
<td>39 000</td>
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</tbody>
</table>
Improved Public Transport

• 12 new express bus lines
• 18 bus lines with extended service
• Improvements of rail-bound lines
• 1800 new park-and-ride places
SL (Public Transport) in May 2006

- + 7%
- 45,000 more passengers
- 30,000 more passengers to innercity per day

- Underground: + 40,000 (+9%)
- Commuter trains: + 10,000 (+6%)
- Busses: + 13,000 (+12%)
- Local trains: + 7,000 (+12%)
Public transport

SL-resandet totalt

Påstigande per vardagsdygn, 1000-tal

jan feb mar apr maj jun jul aug sep okt nov dec

2004
2005
2006
Public transport an important part

- Improved public transport alone cannot reduce car traffic
- More passengers, but transit congestion stays about the same – increased supply of transit plays a role
- Buses have higher speeds
- Park & ride spaces have been used
- Bus riders are satisfied with the new buses

...more answers in August.
Industry & commerce

- Well-functioning road transport important
  - Time gains valuable, but administration cumbersome
- Marginal influence on land use, real estate prices and regional economy compared to other factors
- No identifiable effects on retail at aggregate level
- Influence on households purchasing power negligible
Retail in May

- No negative effects of the congestion taxes
- Retail increase + 6 % in city (+ 7 % in nation)
- Same increase inside and outside the congestion zone
Business sector more positive now

• From very negative to barely negative, on average
• Administration is a burden
• Shorter travel times valuable
Do you think there is problems in the Stockholm traffic?

- Inga problem
- Vissa problem
- Stora problem
- Vet ej
Do You think there is problem in the Stockholm traffic – car drivers

- Inga problem
- Vissa problem
- Stora problem
- Vet ej
Is the Stockholm trial a good idea
Is the Stockholm trial a good idea? Car drivers

![Graph showing the percentage of drivers who think the Stockholm trial is a good idea.](Image)
Is the Stockholm trial a good idea?
Inner city residential (102)
Is the Stockholm trial a good idea?
Suburbans (428)
How would You vote in the referendum?
## Cost-benefit analysis of the congestion charges

<table>
<thead>
<tr>
<th>Benefit Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shorter, more reliable travel times</td>
<td>590 mkr/year</td>
</tr>
<tr>
<td>Paid congestion charges</td>
<td>-760 mkr/year</td>
</tr>
<tr>
<td>Health and environment</td>
<td>90 mkr/year</td>
</tr>
<tr>
<td>Traffic safety</td>
<td>120 mkr/year</td>
</tr>
<tr>
<td>Revenues from congestion charges</td>
<td>760 mkr/year</td>
</tr>
<tr>
<td>Other revenues/costs</td>
<td>190 mkr/year</td>
</tr>
<tr>
<td>Maintenance and running costs</td>
<td>-220 mkr/year</td>
</tr>
<tr>
<td><strong>Net benefit</strong></td>
<td>760 mkr/year</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cost Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Investment and running costs 2006</td>
<td>-2000 mkr</td>
</tr>
<tr>
<td>Shadow prices etc.</td>
<td>-1100 mkr</td>
</tr>
<tr>
<td><strong>Total initial cost</strong></td>
<td>-3100 mkr</td>
</tr>
</tbody>
</table>

**Payback time: 4 years.**
The congestion charge gives a net social surplus – but not the increased bus services

- The congestion charge gives a net social surplus of around 800 mSEK per year
  - The trial is a net social deficit
  - Since the investment is a sunk cost, it’s socially profitable to carry on
  - The benefits outweigh the investment cost in 4 years
  - Short ”payback time” compared to road/rail investments (typically 15-25 years)

- The new bus services give a net social deficit
  - Cost 520 mkr/year, shorter travel times worth 180 mkr/year
Effects are large compared to other measures

- Western ring road: 15 billions
  - 14% less traffic over the inner city bridges
- Eastern ring road: 20 billions
  - 11% less traffic over the inner city bridges
- Zero public transport fare: 5 billions per år
  - 3% less car traffic in the county

- Doesn’t make sense to compare investments and congestion charges against each other
  - Congestion charge gives a financial surplus of 500 mSEK/year

- Complements, not substitute, both financially and from a traffic management perspective
What surprised the experts?

- ... that the simple charging structure worked so well
- ... that the effects happened and stabilised so quickly
- ... that the congestion reduction could be seen by virtually everybody
- ... the change in attitudes
- ... the many ways to adapt to the charges
Congestion is not a fact of life. We need a new approach and we need it now!

The demonstrated success of road pricing. Other **major** cities around the world, including London and **Stockholm** most recently have reduced congestion and improved throughput almost immediately through the implementation of congestion pricing strategies.

Norman Y. Mineta
Secretary of Transportation, US
Lessons

• Better public transport cannot reduce road congestion on its own

If congestion charge is made permanent:

• Simple zone structure seems to work OK
• Charge levels and time periods can be fine-tuned
• Continue simplification of payment and administration
• Consider seasonal traffic variation
• Charge on Essingeleden?

Well: has not become significantly worse than before – so far.
Walter Veltroni, Rom

Klaus Woeriet, Berlin

Bertrand Delanoë, Paris

Ken Livingstone, London

Annika Billström, Stockholm
Information on the web:

www.stockholm.se/miljoavgifter
www. Stockholmsforsoket.se