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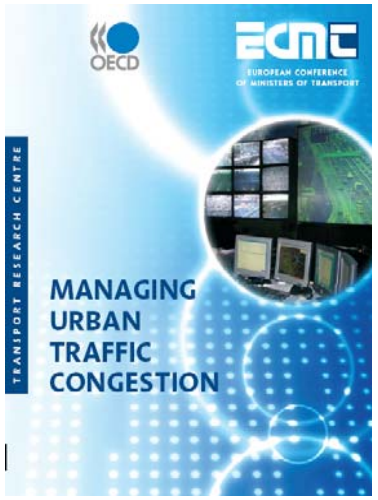
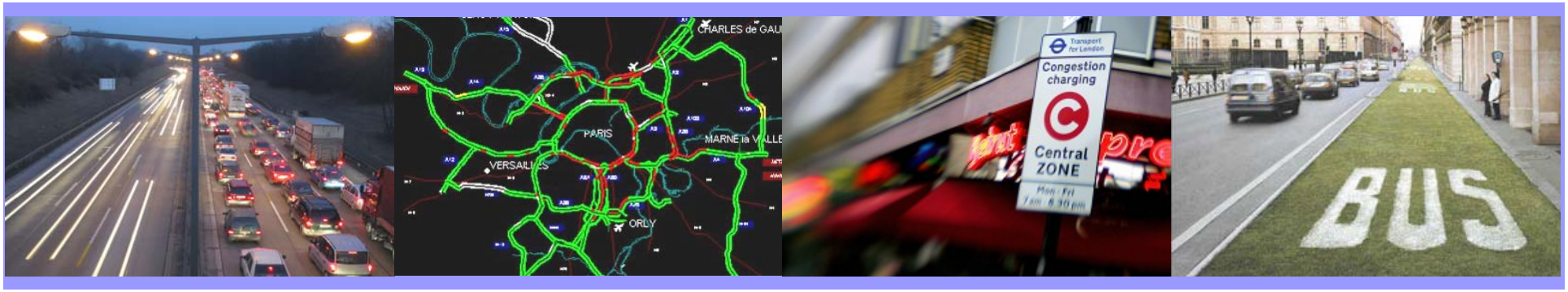
Managing CONGESTION in large urban areas



Philippe Crist, Administrator,
Working Group on Managing Urban Traffic Congestion in Large Urban Areas
OECD-ITF Transport Research Centre



What is Congestion?

Don't we all know?

- Absolute vs. relative phenomenon?
  - *Demand for road space exceeds supply*
  - *Difference between road users expectations and how the system actually performs*
- Users vs. Road Managers?
- Negative outcome of Agglomeration (positive)
- Avoiding excessive congestion….

When is Congestion Excessive?

Two Answers:

- When people (road managers?, users?) say it is – but what about the cost of delivering improved road performance?
- Congestion is excessive when the marginal costs of efforts to reduce congestion are lower than the marginal costs to society of congestion itself.

How Should Congestion be Measured?

- Different metrics for different audiences
- Road managers interested in speed, flow queue length, etc., road users interested in predictability of travel times and trip quality.

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Duration

Speed

Reliability

Causes

Trends

Spread

Federal Highway Administration

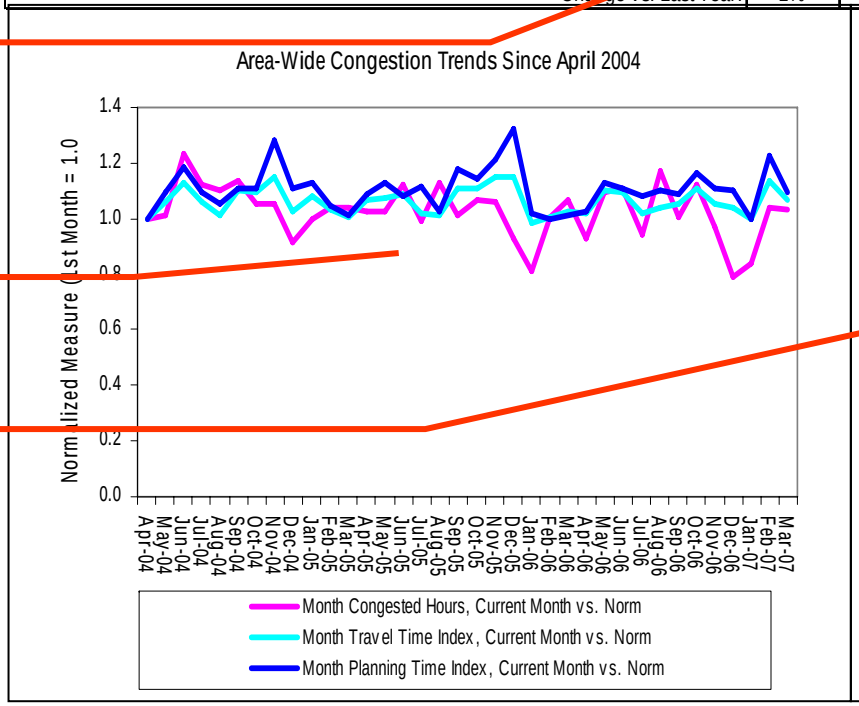
URBAN CONGESTION REPORT

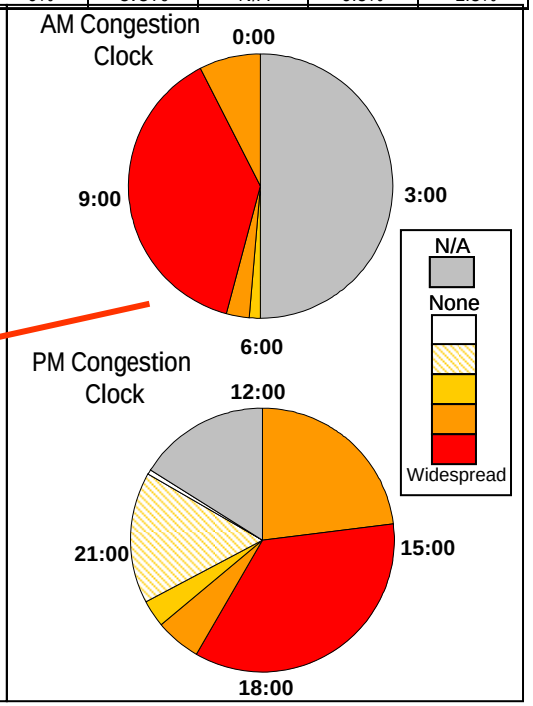
January 2007 - March 2007

Chicago, IL

Metropolitan Area Executive Summary

UCR Congestion Indicators													Contributing Factors (Peak Period)			
YEAR	Congested Hours Weekday			Weekend	Travel Time Index Weekday Peak			Planning Time Index Weekday Peak			Data Quality % Available Data:	Data Quality Useable Days	Weather [1]	Work Zone [2]	Incidents [3]	Travel Demand K [4]
	Total	AM	PM		Total	AM	PM	Total	AM	PM						
2007	12.35	5.36	6.99	1.9	1.483	1.45	1.52	2.080	1.94	2.22	97%	31 of 31	9.8%	N/A	184.3	24.6
2006	12.51	5.48	7.04	1.7	1.408	1.38	1.44	1.899	1.75	2.05	96%	31 of 31	9.2%	N/A	168.3	24.9
Change vs. Last Year:											1%	0%	0.6%	N/A	9.5%	-1.3%





How Should Congestion be Measured?

- Different metrics for different audiences
- Road managers interested in speed, flow queue length, etc., road users interested in predictability of travel times and trip quality.
- Indicators should be policy-neutral:
  - free-flow speeds should not be used as a direct benchmark to measure congestion policy outcomes.

Free-flow? Who expects it at rush hour and who can afford it?

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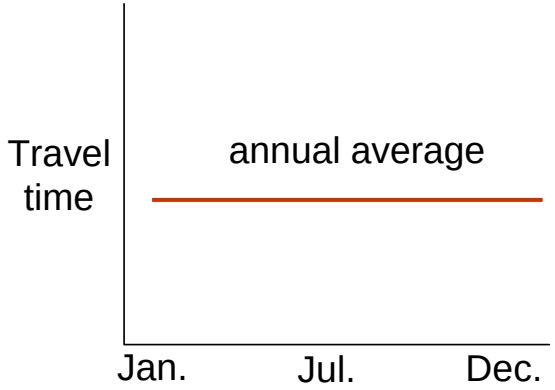
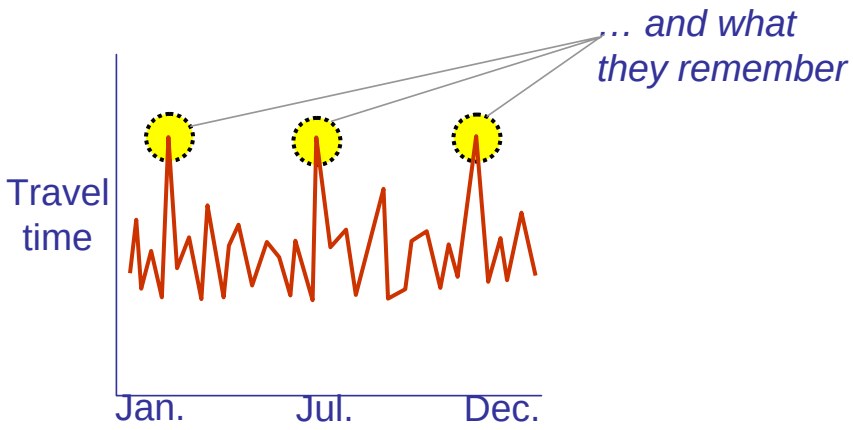
- Road managers interested in speed, flow queue length, etc., road users interested in predictability of travel times and trip quality.
- Indicators should be policy-neutral:
    - free-flow speeds should not be used as a direct benchmark to measure congestion policy outcomes.
- Reliability indicators are crucial for road users.

I. Average vs. real system performance

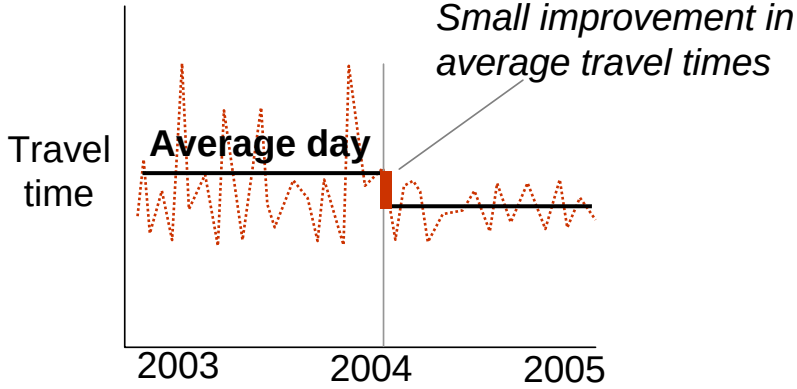
How traffic conditions have been communicated to users

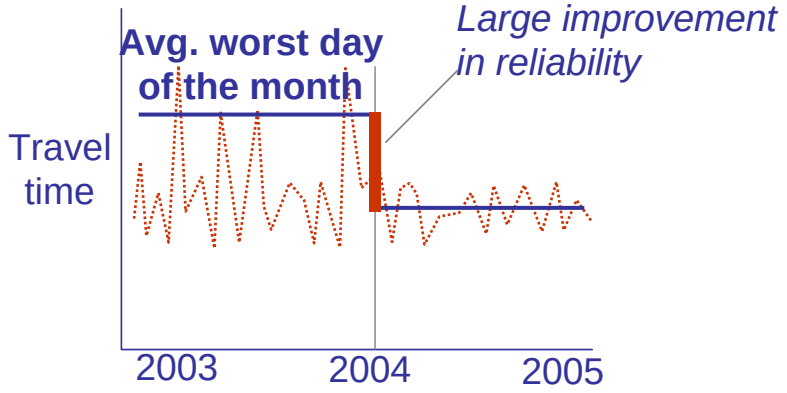


How users experience traffic…



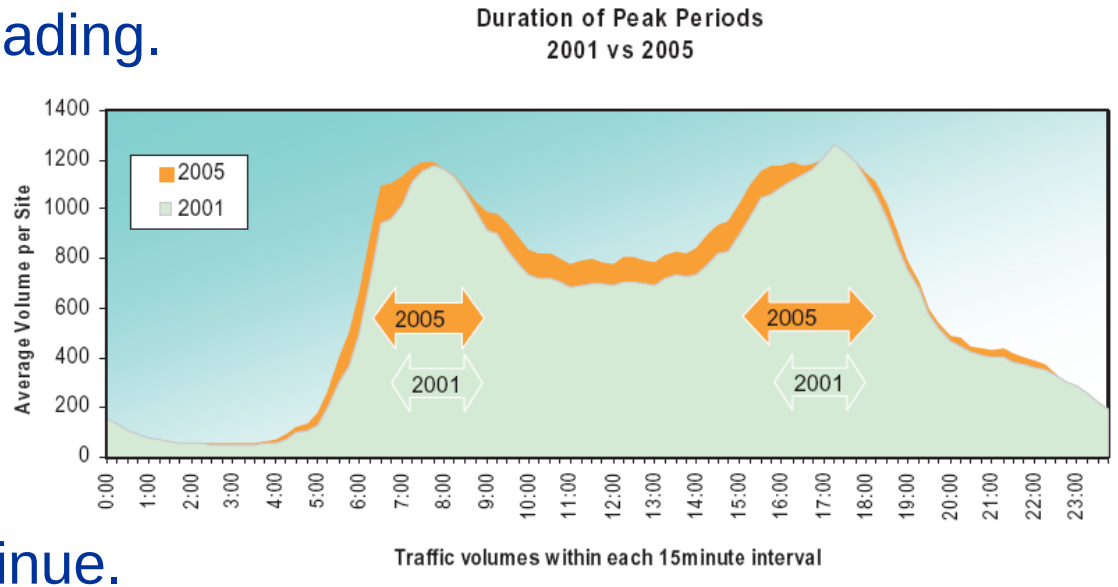
II. Road user perception of improvements: travel time vs. travel reliability





Is Congestion Getting Worse?

- Travel times are increasing in many urban areas (alongside with urban economic activity)
- Travel time variability increasing in some urban areas.
- Peak hours are spreading.



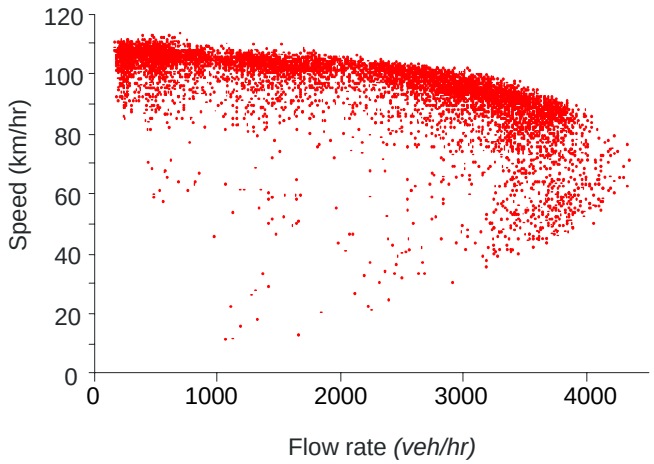
- Trends likely to continue.

What Should Policy-Makers Know about the Causes of Congestion?

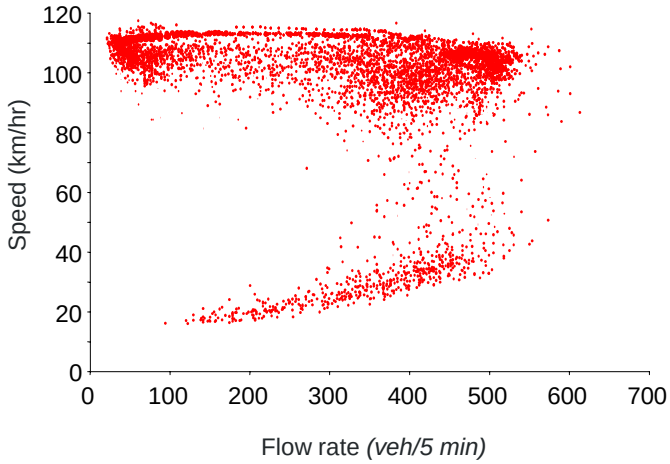
- Congestion is *triggered* on the road but is *driven* by macro-level factors (contributing to overall travel demand)
  - *While congestion takes place on the roads, its long-term management is not only, nor necessarily primarily, a traffic engineering problem.*

Conceptual Approaches to Managing Congestion

- Maximise Flows: (can lead to inherent instability and sudden phase switches into congested flow)



Autobahn A-40 Bochum, Germany (x lanes)



Interstate 10 East, Los Angeles, USA

- Optimise flows taking into account the balance between supply and demand as arbitrated by people's willingness to pay for better performance (technical vs. economic optimisation – need new hybrid approaches)

What Can We do Now to Better Manage Congestion?

Strategic principles to guide policy

1. Manage congestion in the context of the *urban area*: integrated transport and urban planning
2. "*Lock-in*" the benefits of congestion policies
3. Deliver *reliable and predictable* travel conditions

Principle #2: "Lock-in" the Benefits of Congestion Measures

- "Traditional fixes" = More capacity (released or new),
- More capacity = More traffic (Induced traffic) – declining effect?
- More traffic = More congestion

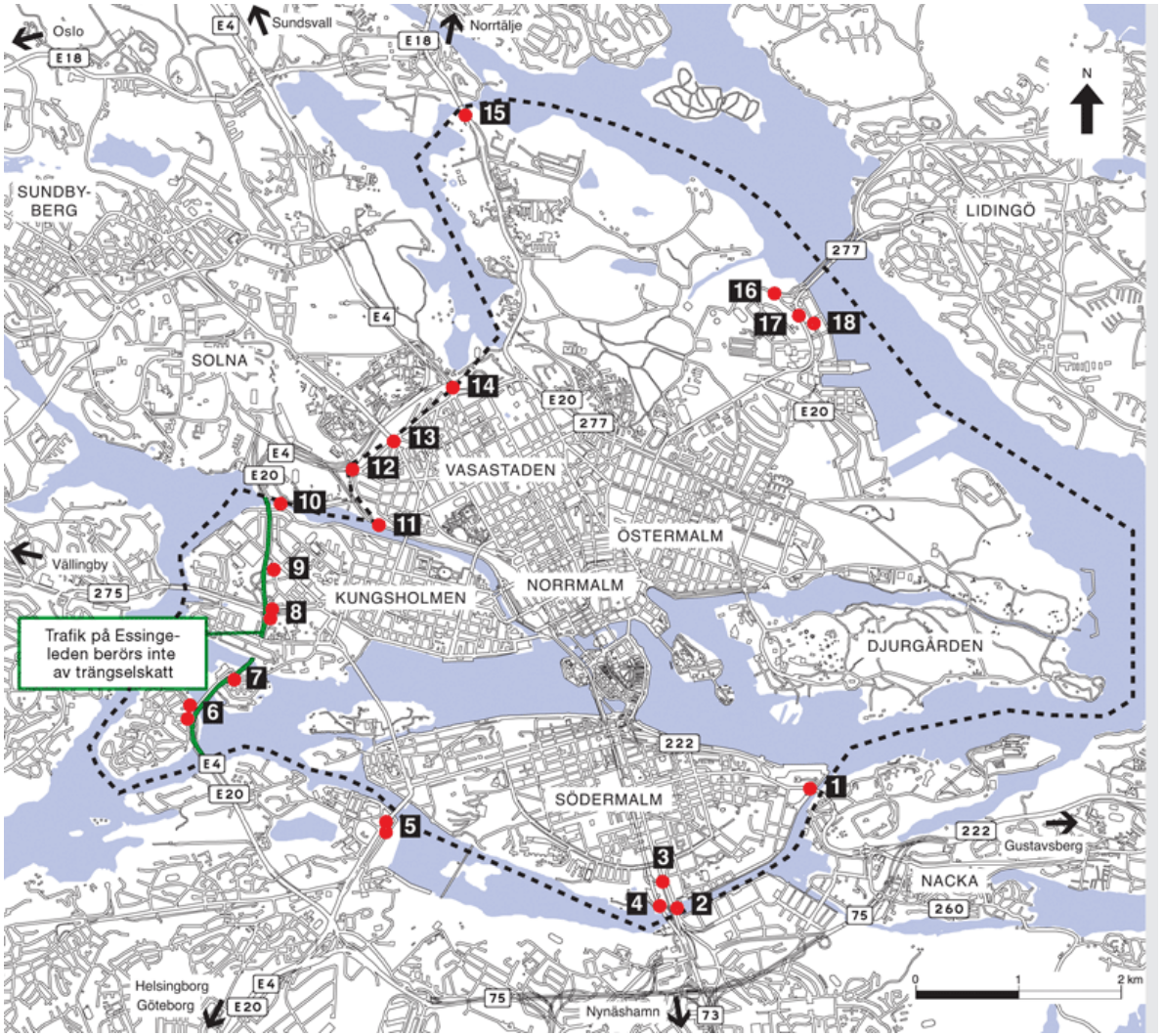
Three Types of Policies Qualitatively Different re. Outcomes:

1. Access Management
2. Parking Management
3. Road Pricing

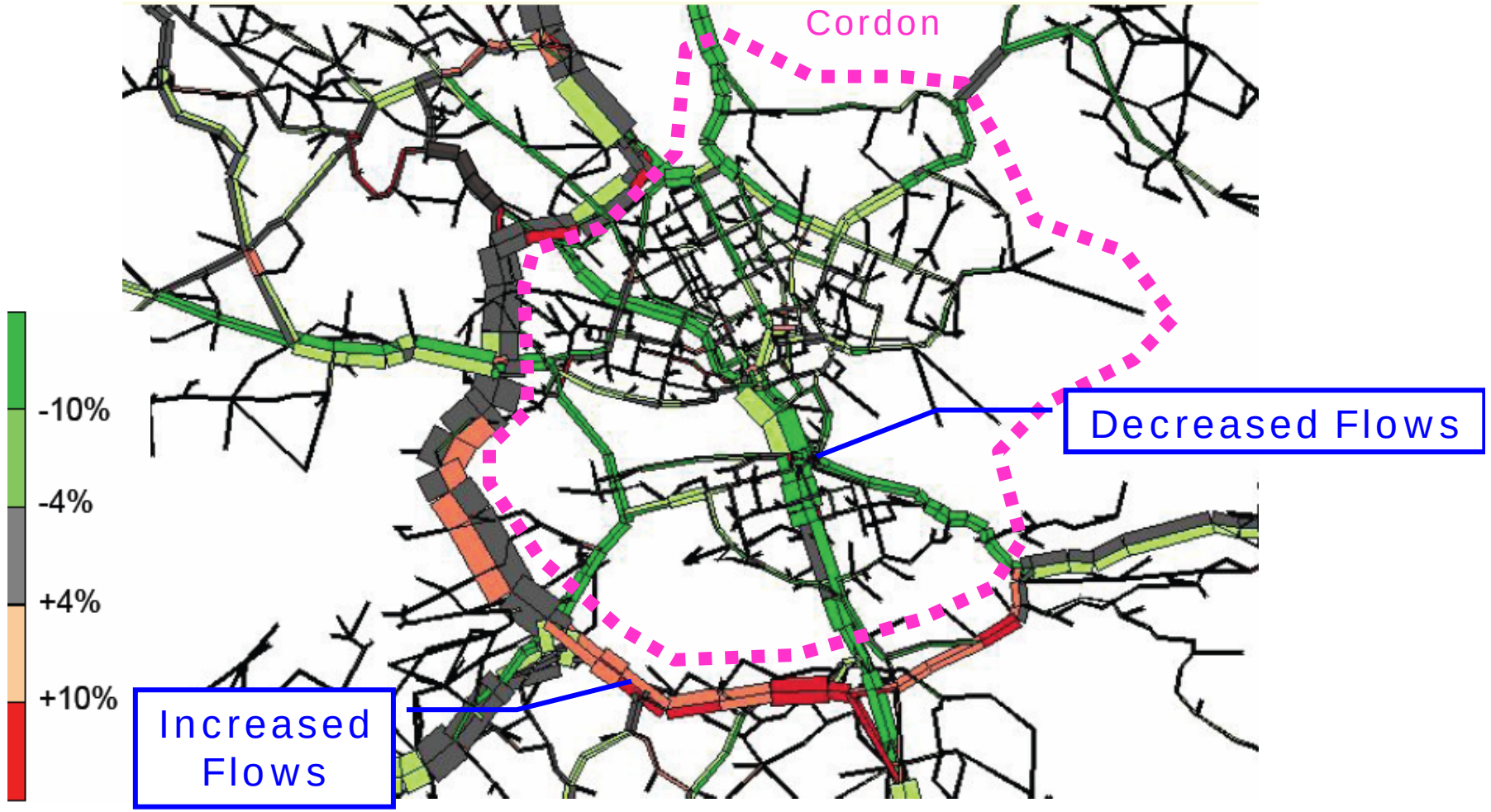
Urban Road Pricing

- Double consensus
  1. Analysts and academics all for,
  2. Politicians against
- New Developments in Stockholm, London and California

Stockholm Charging Cordon

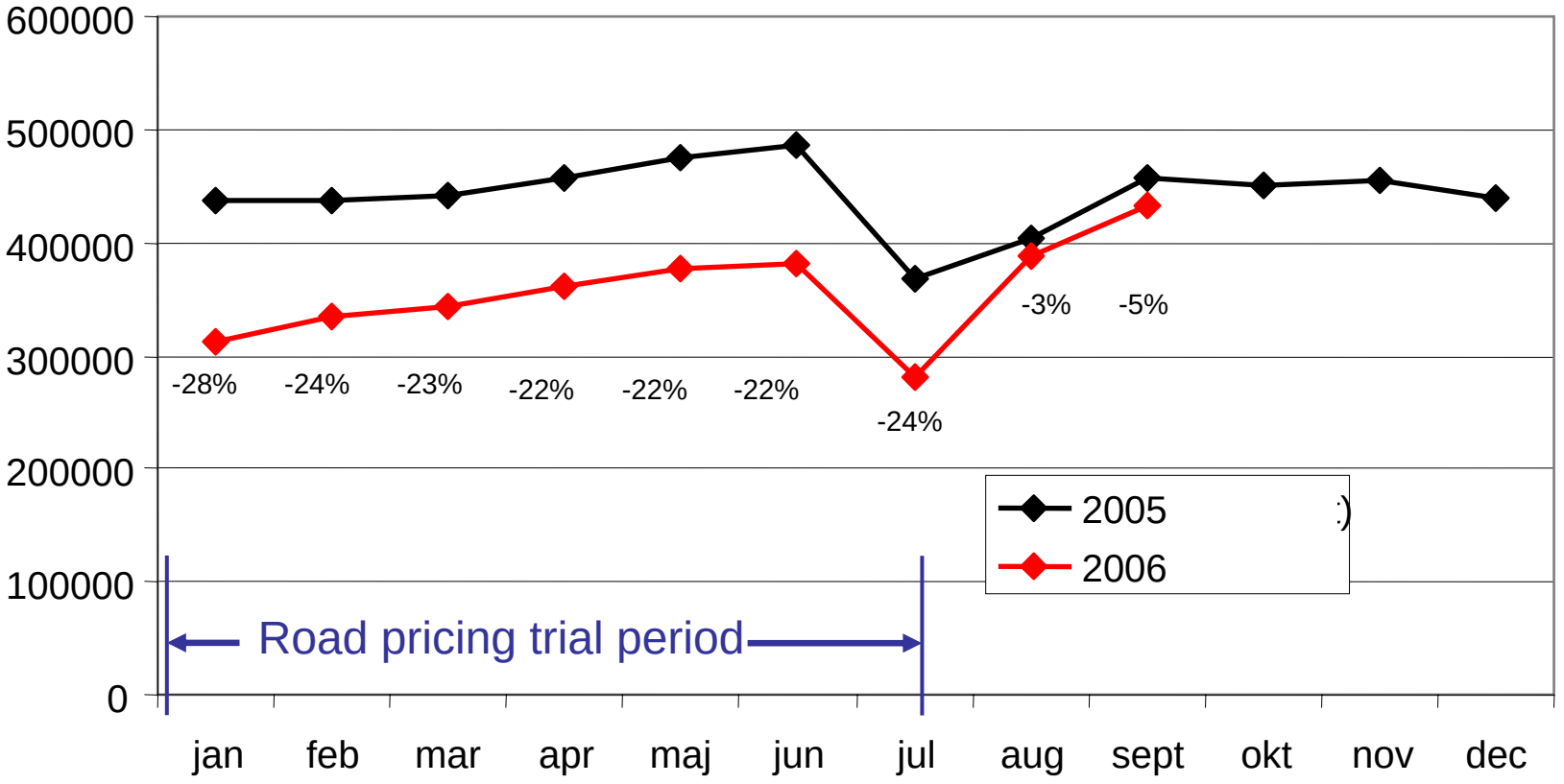


Stockholm Charging Cordon: Impact on Flows

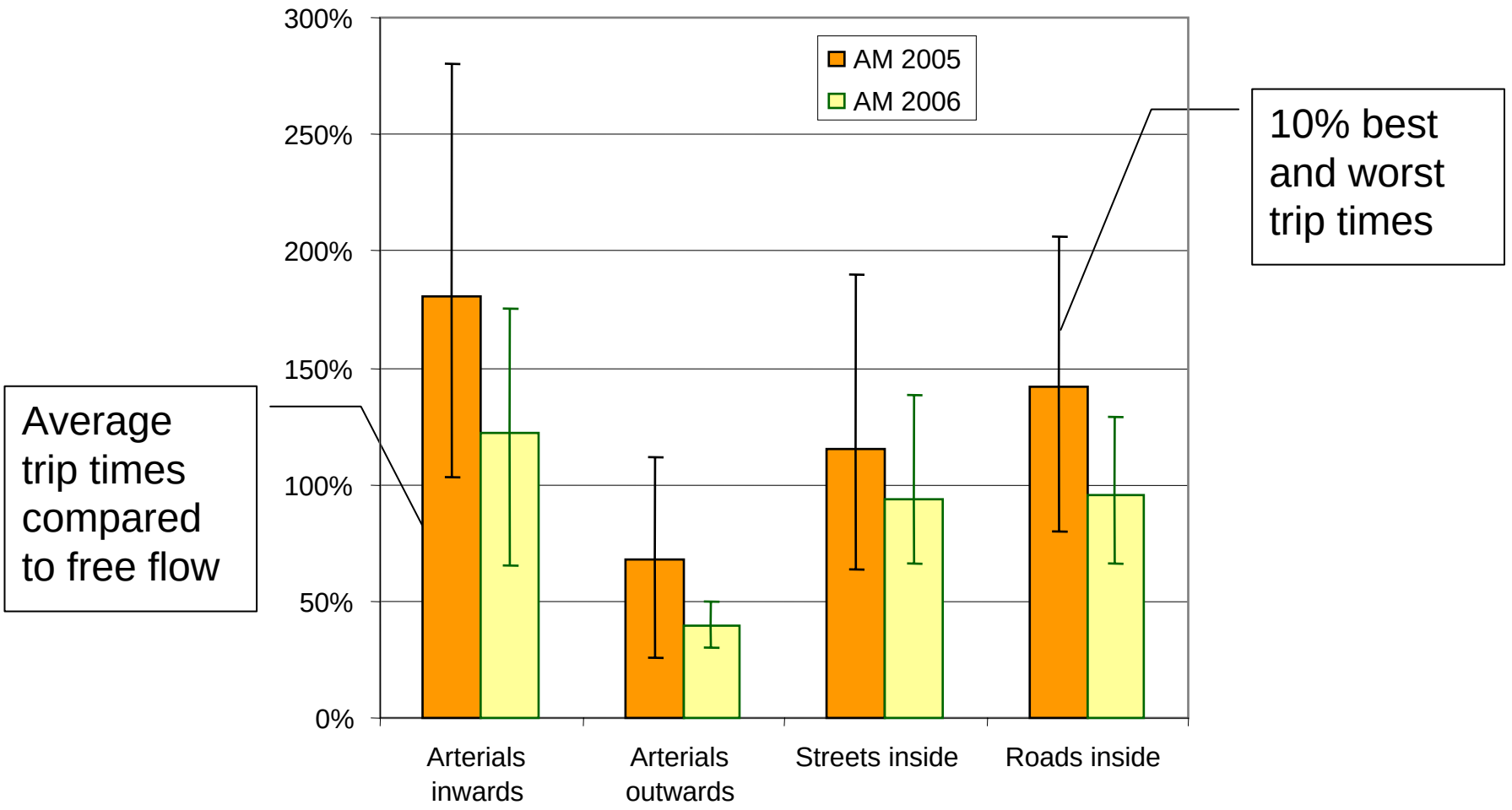


Did the Stockholm Charge Work?
Vehicles crossing cordon on weekdays:

22% drop in traffic



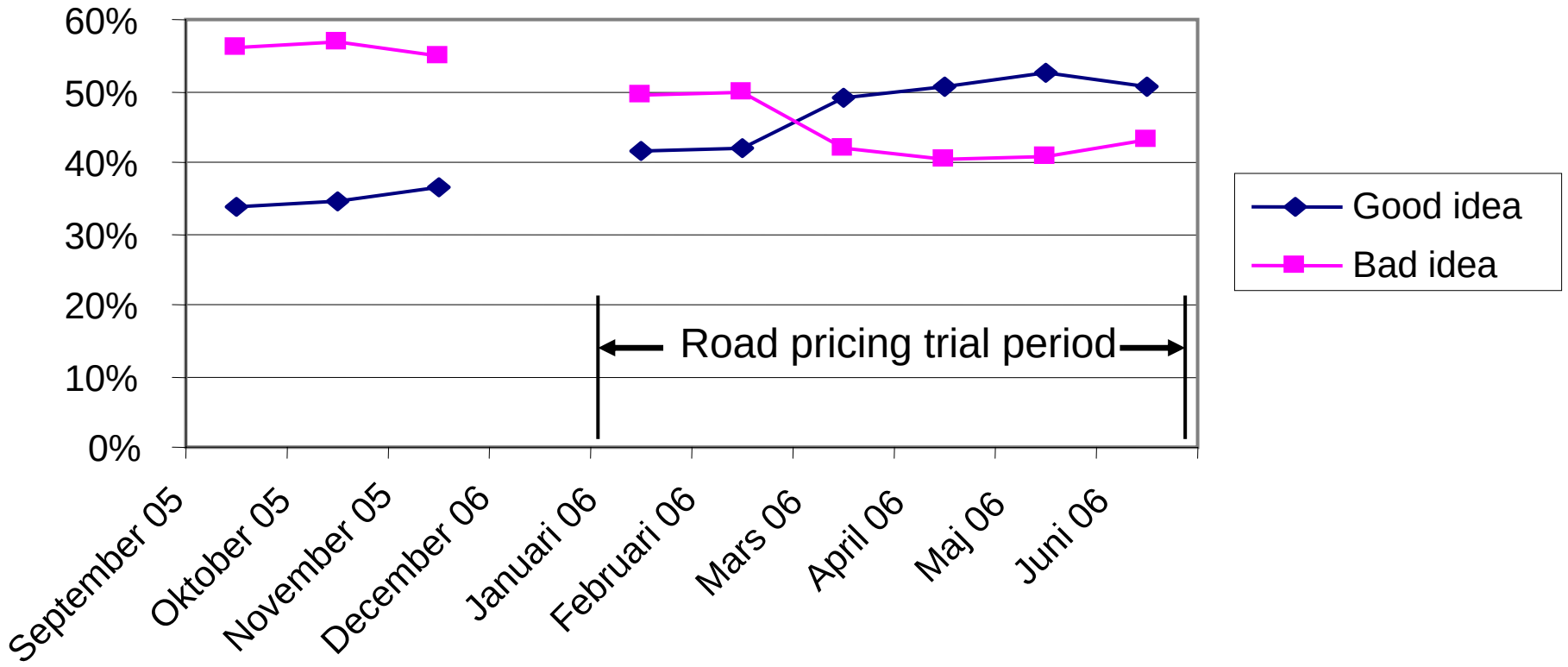
Delays Reduced, Reliability Improved



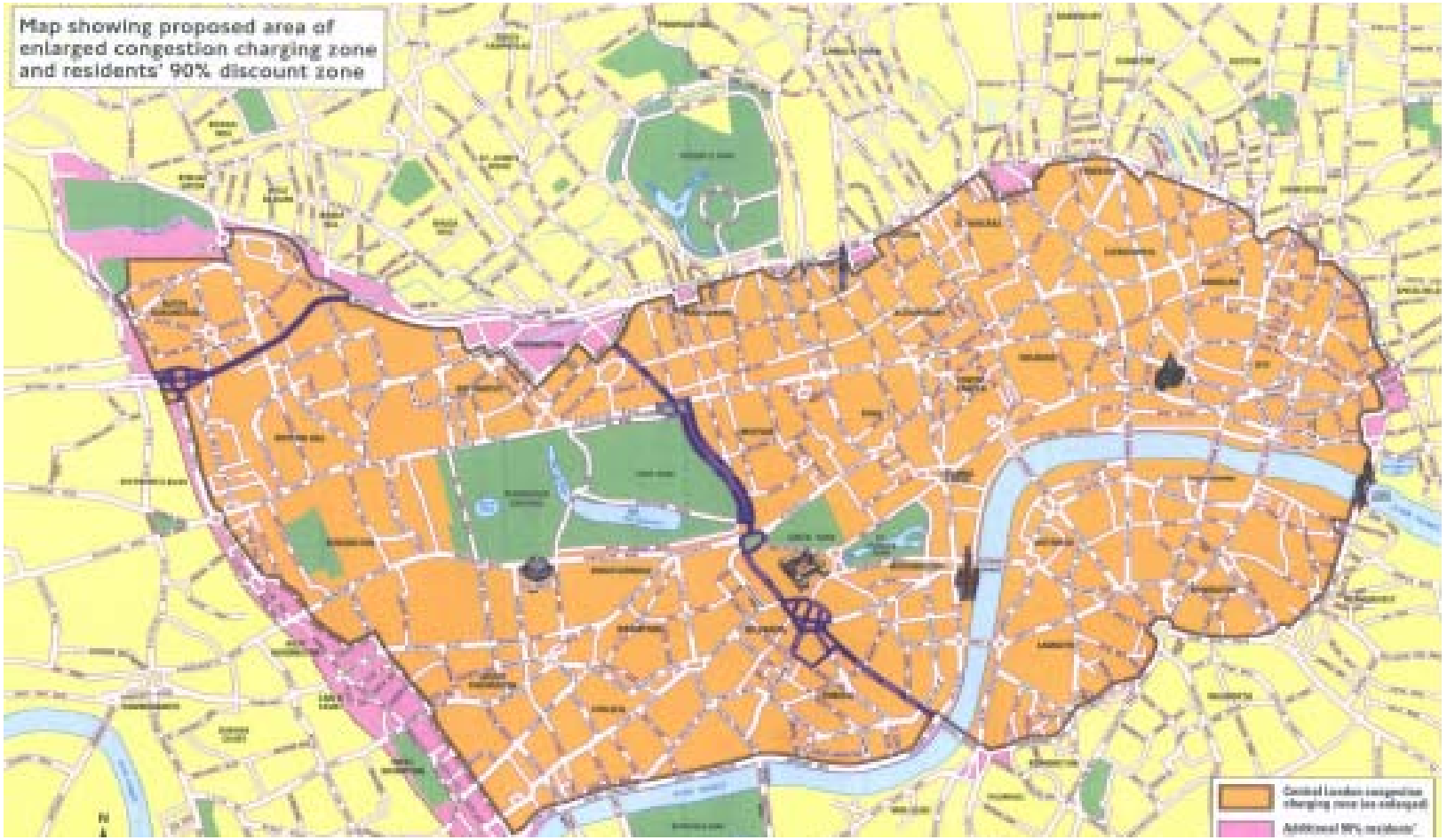
Stockholm: Economic Assessment

- Positive
- Assuming emissions reductions are added to congestion relief
- Assuming bus capacity expansion is not an integral part of scheme, as there was spare capacity
- Result is very sensitive to differentiation of values of time assigned to users
- Note, technology performed better than expected and 2008 version will reduce costs by eliminating redundancies

Acceptance: Seeing is believing
Public opinion in Stockholm



London Congestion Charge



Impact on traffic in City zone: Delays down 30%

Charge relative to cost of congestion

- Oxford University Transport Studies Unit, G. Santos, supportsTfL modelling that charge about right but:
- Cars over-charged
- Trucks under-charged
- Vans about right at 8 pounds – undercharged at previous 5 pounds level
- Residents “priced on to roads”

Western Extension

- 10-14% veh-km decrease forecast by TfL
- 2/3 vehicles pay no additional charge:
  - Paid already for City zone
  - Residents
  - Buses, taxis etc.
- Congestion impact and cost effectiveness less than for City zone

US: Value Pricing

- Two examples in Southern California.
- Offers a choice: toll and fast travel, or no toll and slow travel ("product differentiation"), also "instant" pricing.
- Attractiveness of toll lanes relies on considerable congestion on free lanes.
- Assesments:
  - Value pricing is better than no pricing,
  - Gains in reliability as important as reduction of average travel time.

How Can We be More Effective in Managing Congestion than We Have Been in the Past?

Four Principal Options

1. Operations and traffic management

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Rate of Return: Integrated Traffic Management Systems in France

(million Euros)	Lille (Alegro)	Grenoble (Gentiane)	Bordeaux (Alienor)	Strasburg (Gutenberg)
Annual Benefits	12.80	3.65	3.40	1.70
Annual Operating Costs	3.80	0.95	1.42	0.77
Net Benefits	9.00	2.70	1.99	0.95
Investment/Capital Costs	50.40	15.11	16.00	9.70
Immediate Rate of Return	19.6%	17.9%	12.4%	9.8%

19.6% 17.9% 12.4% 9.8%

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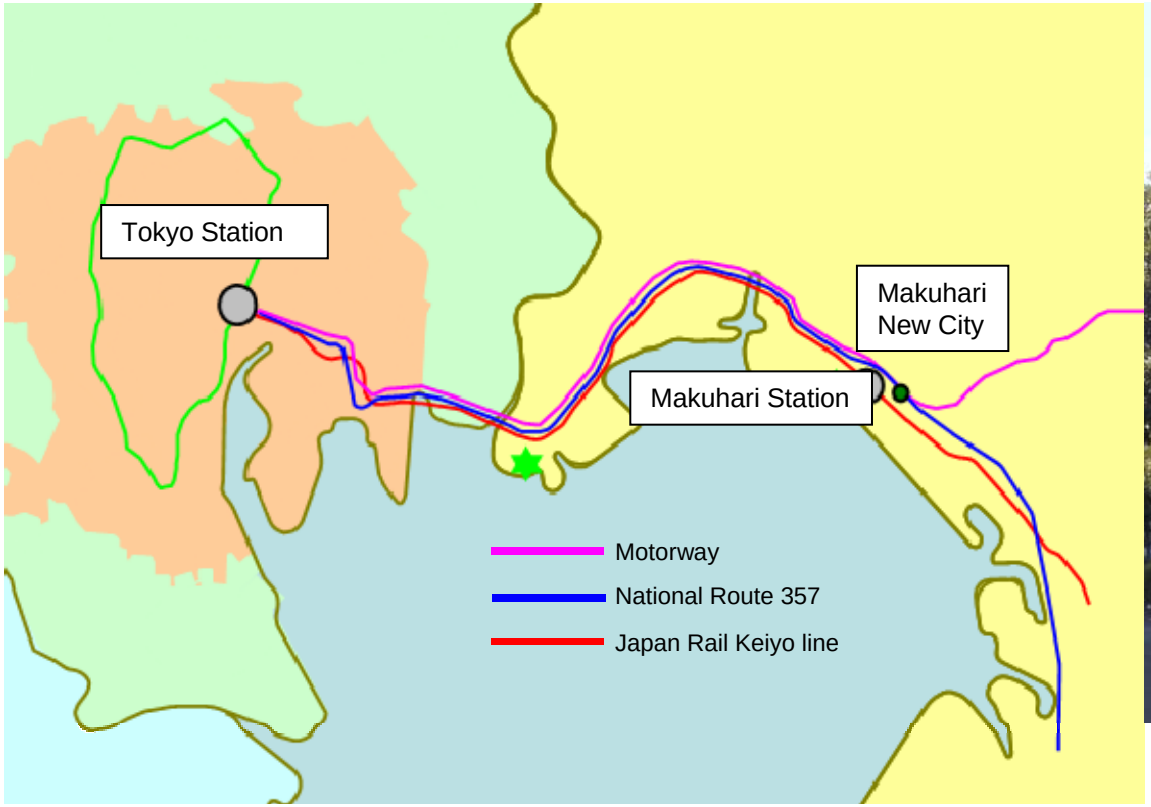
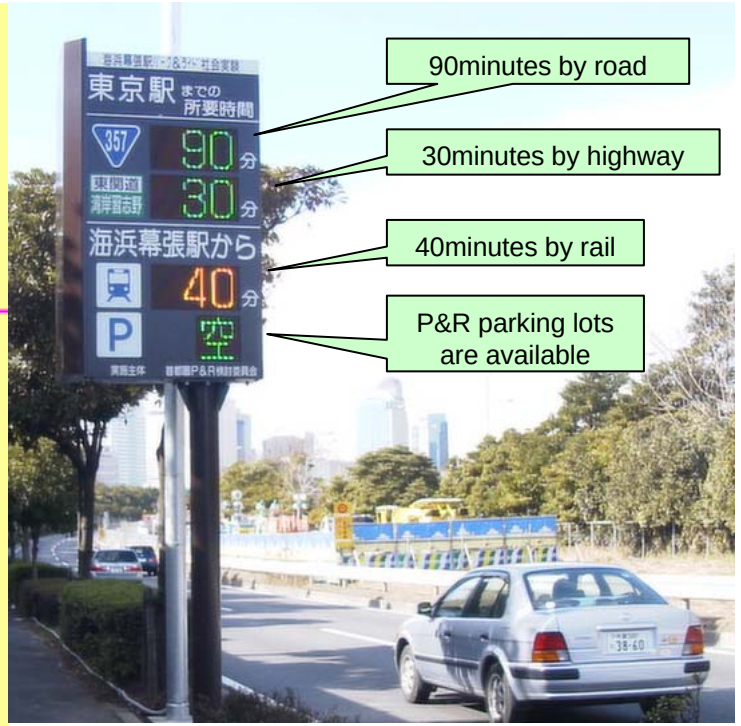
2. Public transport

Combined Public Transport/Road/Parking Information (National route 357 at Makuhari, Tokyo Region)





How Can We be More Effective in Managing Congestion than We Have Been in the Past?

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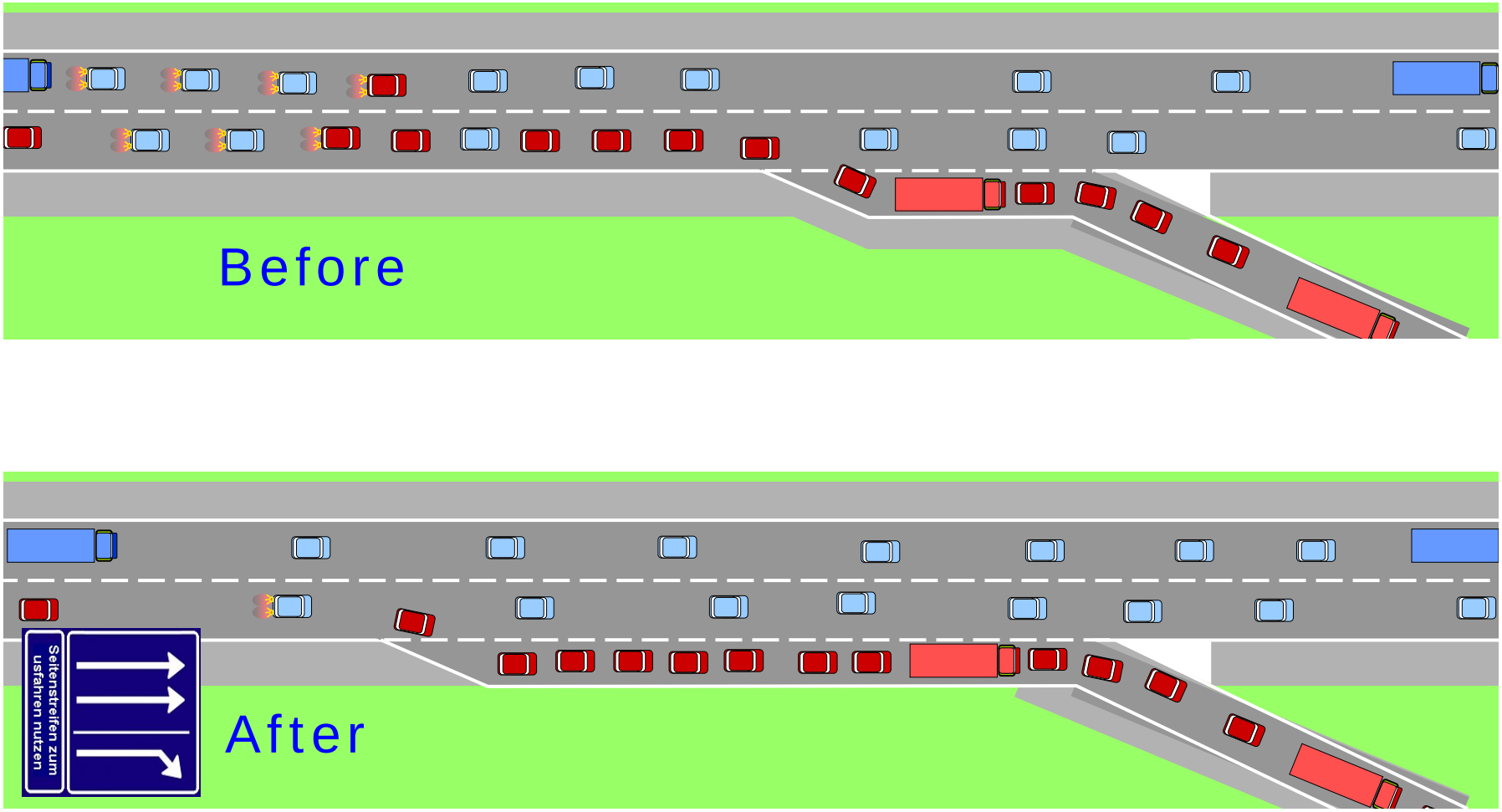
1. Operations and traffic management
2. Public transport
3. Mobility management
4. Infrastructure modification



On-ramp/Off-ramp Lengthening: Stauventil (Germany)

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Above Measures Free-up Existing Capacity

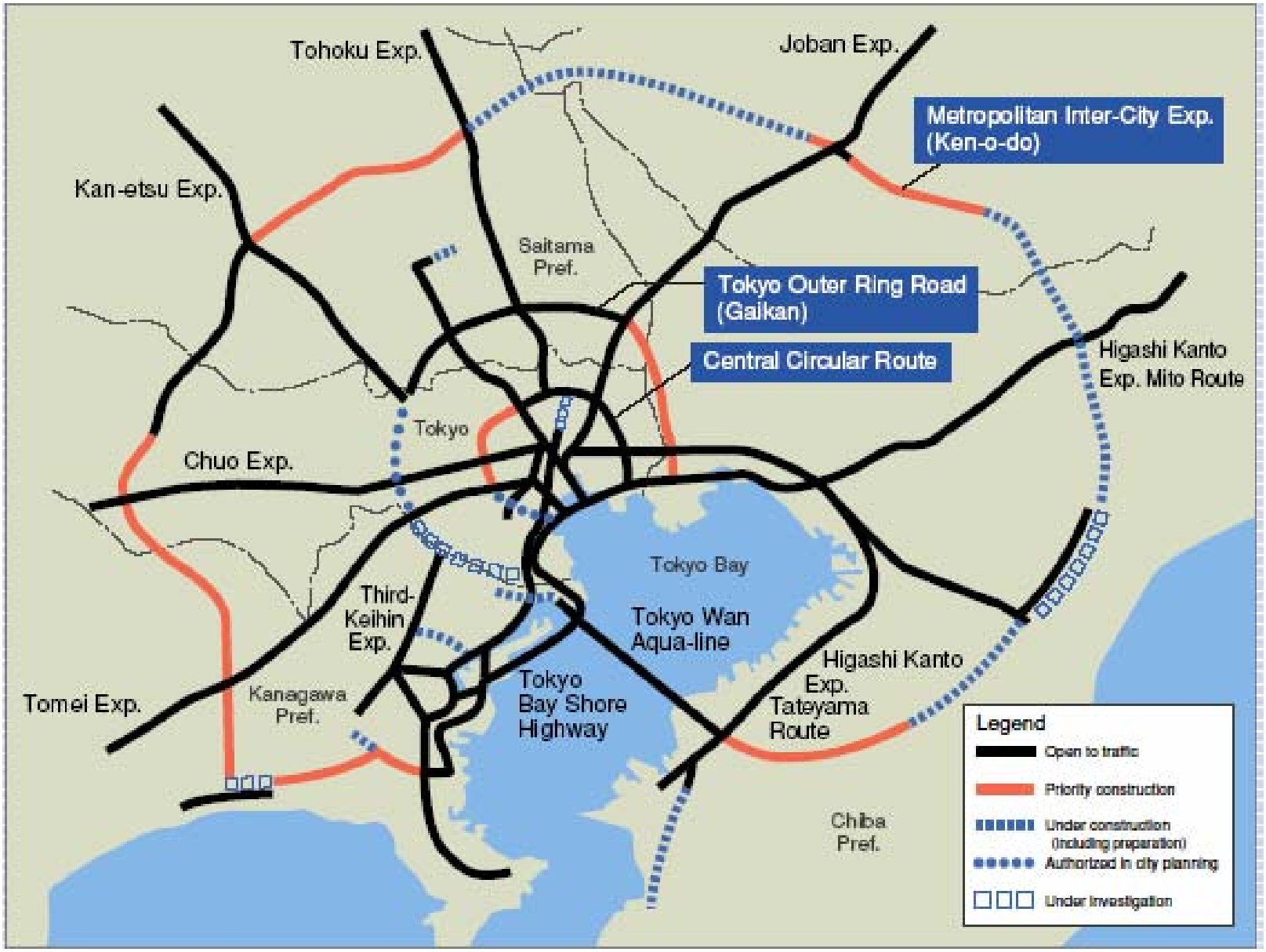
- Manage traffic to preserve capacity
- Consider alternative use/allocation of capacity
- Provide alternative modes

Road Construction/Expansion Often Constrained in Urban Areas – But Can be Effective

When and Where Does it make Sense?

- By-passes to remove through traffic
- Incomplete orbital networks
- Pinch points – tunnels,river crossings
- Cost benefit assessment is key
- Again, consider options for use of new capacity

Incomplete Orbital Road Network (Tokyo)



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