

International Transport Forum

Joint Transport Research Centre

OECD

Managing **CONGESTION** in large urban areas

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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)
- Something to be eradicated... or something to be managed?
- Avoiding excessive congestion....

When is Congestion Excessive?

Two Answers:

- When people 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 is 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.
- 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.

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, it is not only, nor necessarily primarily, a traffic engineering problem.
- Recurrent vs. non-recurrent congestion.

Conceptual Approaches to Managing Congestion

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

Practical, Outcome-oriented Questions

- (Why) and when should I act?
- What should I do?
- How should I do It?

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

Practical, Outcome-oriented Questions

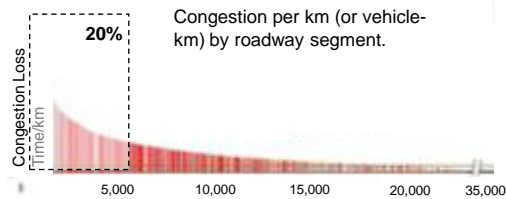
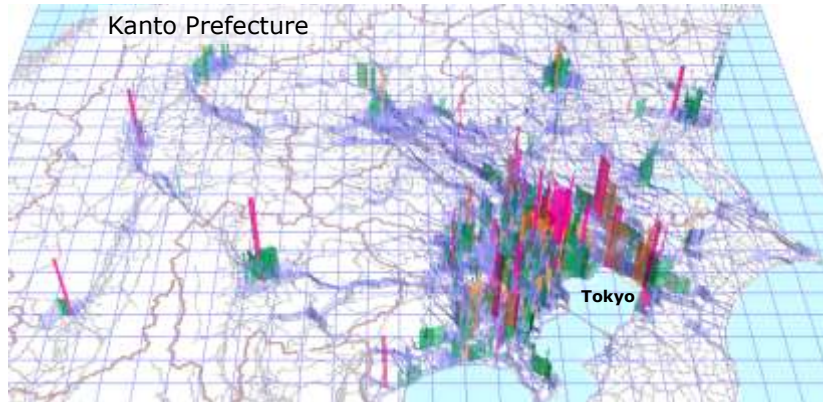
- (Why) and when should I act?
- What should I do?
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What are the Impacts of Congestion and are we Measuring them Accurately?

Practical, Outcome-oriented Questions

- (Why) and when should I act?
- What should I do?
- How should I do It?

Targeting the Worst Congestion (Tokyo Region) Time "losses" by segment



Congestion per km (or vehicle-km) by roadway segment.

1/3 of Japan's Congestion impacts (measured in time "losses" occur in the Tokyo Metropolitan Area. The Government tracks congestion impacts by road segment (color-coded map above) and targets the worst 20% (see left) of congested road segments for priority action.

Policy-makers: Key questions about Congestion

Practical, Outcome-oriented Questions

- (Why) and when should I act?
- What should I do?
- How should I do It?

Questions often not explicitly articulated

- What is congestion? (Don't we all know?!)
- What does success look like? (Policy goals)

What is Congestion? ... some considerations

Characterisation of Congestion:

- Congestion and *Agglomeration*
- Congestion and *Access*
- Absolute vs. *Relative* phenomenon
- Congestion vs. *Excessive* congestion

Policy Indicators:

- Not to be based on *free-flow* speeds
- Track system performance: *Speed and reliability*
- Use to prioritise action

Why and When Should I Act?

When Congestion is Excessive

- Cost of congestion higher than the cost of relief

What is the Cost of Congestion?

- Relative vs. Total Costs
- Delay and Unreliability, but also...
 - Environment
 - The urban economy
 - Safety and health

What Should I Do?

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

Integrate These Principles into Congestion Management Policies

- All policies should address desired urban outcomes, manage demand & supply and take account of user expectations

Principle #1: Align Congestion Management Policies with Land Use and Planning Processes

Land Use & Urban Form: Key Driver of Demand

- Adopt and implement sustainable land-use policies
- Integrate transport decision-making and land-use planning
- Traffic outcomes should be compatible with citizens’ wishes for, and visions of, life in the urban area

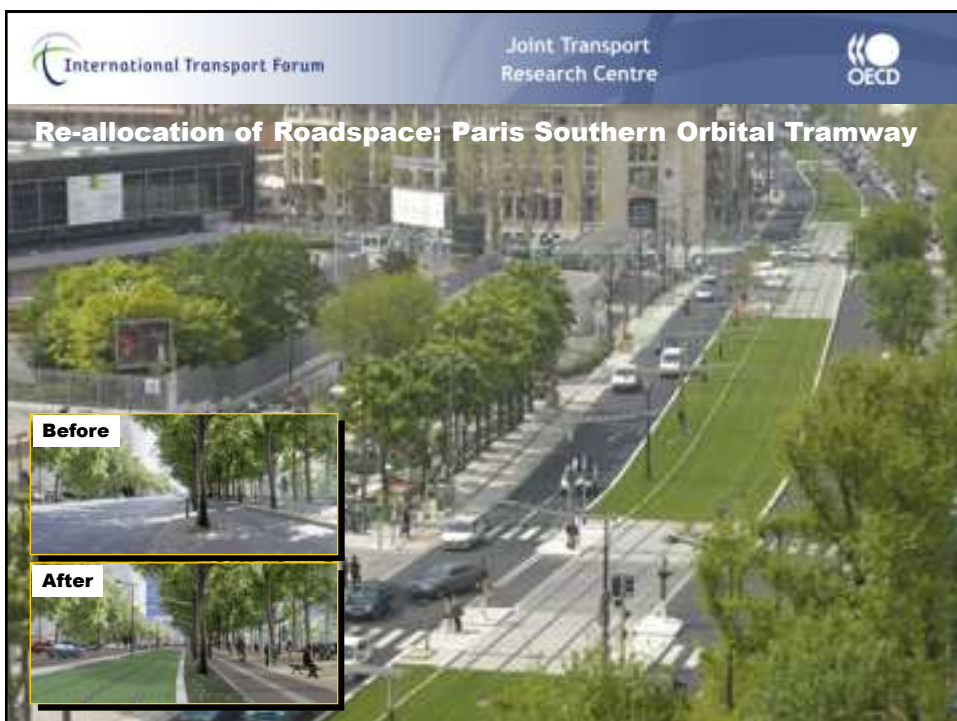
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Principle #2:
“Lock-in” the Benefits of Congestion Measures

- “Traditional fixes” = More capacity (released or new),
- More capacity = More traffic (Induced traffic),
- More traffic = More congestion

Three Types of Policies Qualitatively Different re. Outcomes:

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



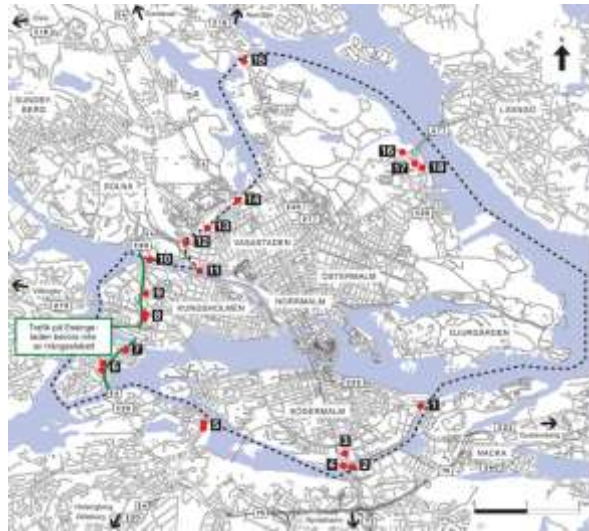
Road Pricing

- **Long academic pedigree**
Dupuit (Fr, 1849), Pigou (UK, 1920),
Knight (US, 1924) Walters (UK, 1961),
Smeed REport (UK, 1964), Vickery (USA, 1963)
- **Double consensus**
 1. Analysts and academics all for
 2. Politicians against

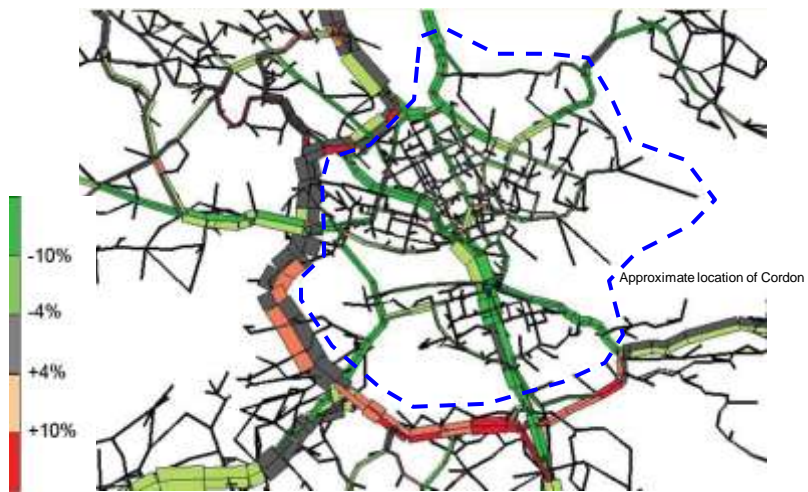
New Developments

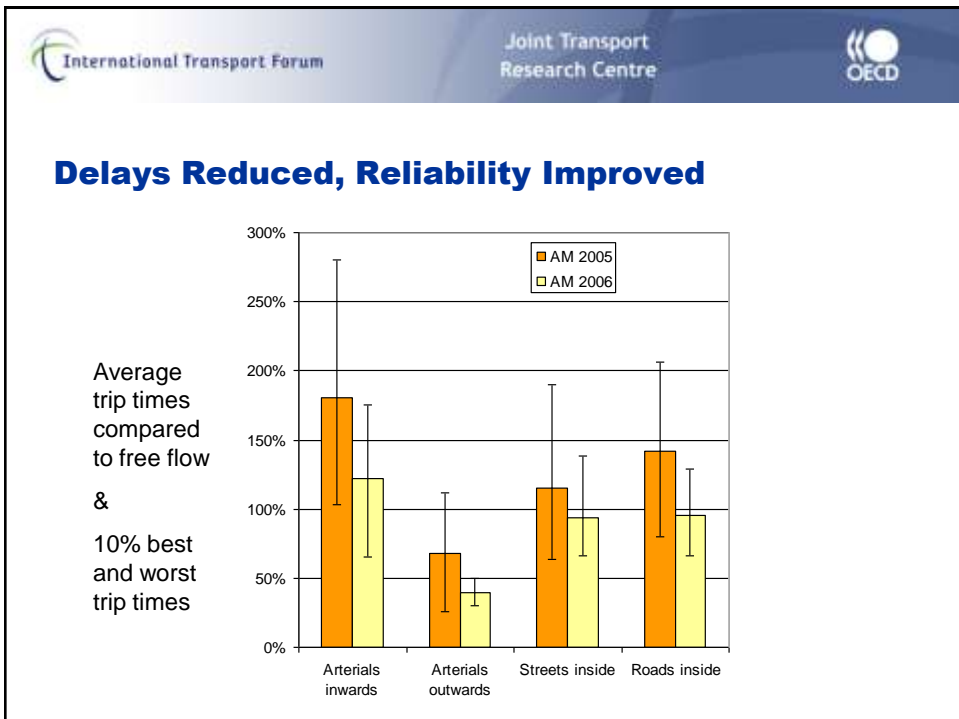
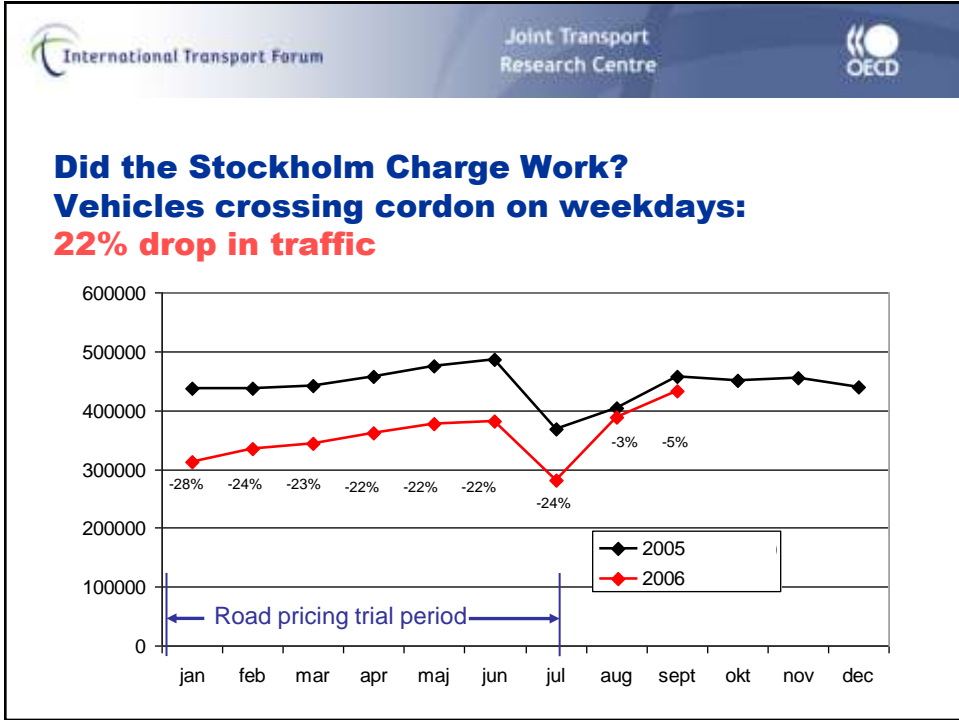
- **Concrete trials and applications**
- **Schemes different in many ways**
 1. Applications
 2. Policy objectives
 3. Economic arguments
 4. Technology used

Stockholm Charging Cordon



Stockholm Charging Cordon

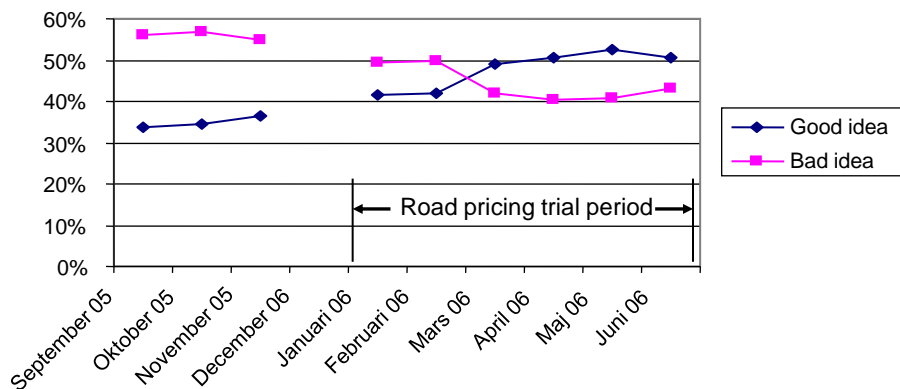


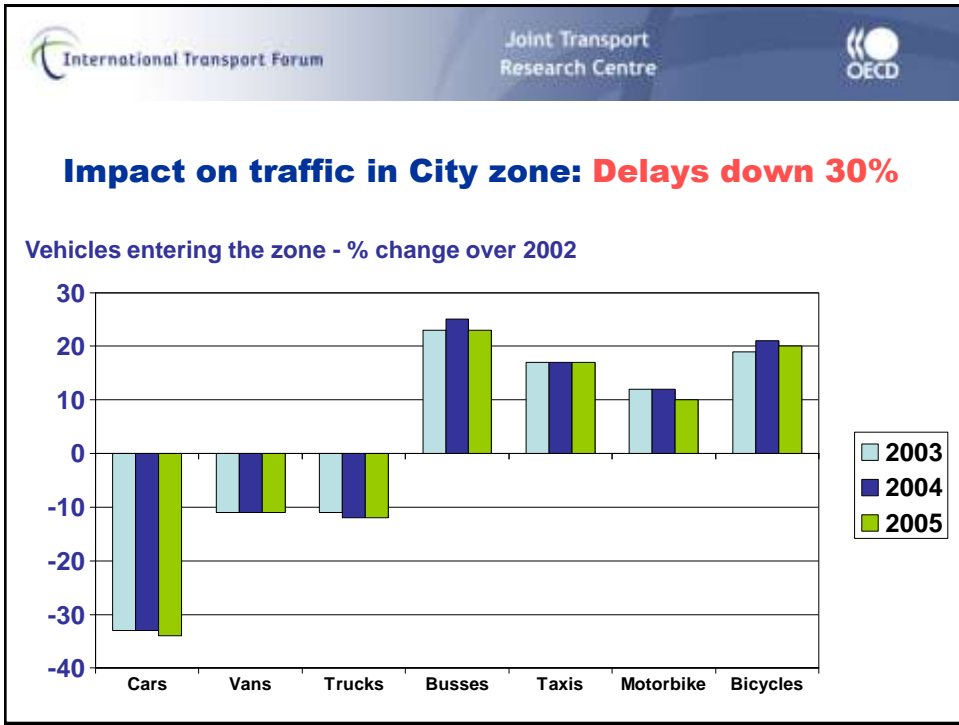
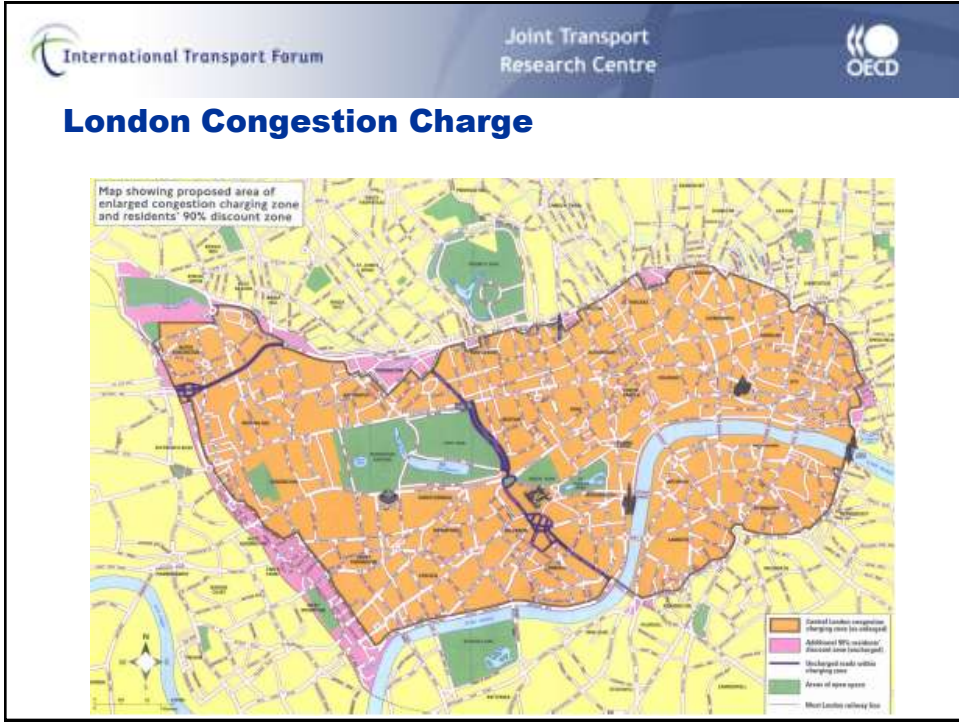


Economic Assessment

- 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





Charge relative to cost of congestion

- Oxford University Transport Studies Unit, G. Santos, supports TfL 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

Kilometre charging

- **HDV/Freight precedents (AT, DE, CH)**
- **Dutch Target: 2010 for national km charging system**
 - To replace fixed vehicle charges
 - With “fairer” pay-as-you go charge: “Fairness” means a national scheme, that is revenue neutral and identical for all users
 - Costs must not exceed 5% of revenues
- **UK charging Proposal: Goal – national electronic km charge for all vehicles**
 - differentiated for congestion
 - to replace part of fuel excise

US: Value Pricing

- Two examples in Southern California:
 - I-15 (near San Diego),
 - SR-91 (connects Riverside and Orange Counties).
- Offers a choice: toll and fast travel, or no toll and slow travel (“product differentiation”).
- Value pricing is facility pricing (US way), different from cordon pricing (European way).
- Attractiveness of toll lanes relies on considerable congestion on free lanes.
- Assessments:
 - Value pricing is better than no pricing,
 - Gains in reliability as important as reduction of average travel time.

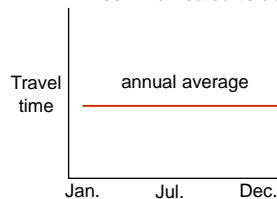
Principle #3: Improve the Reliability and Predictability of Travel Time

Reliability and Predictability: User focus

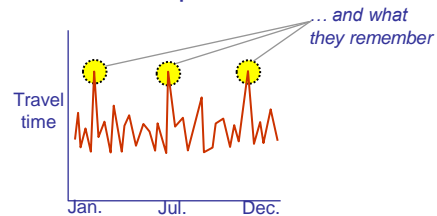
- Identify causes of irregular delays
- “Low-hanging” fruit
- Delivers tangible benefits for (relatively) small investments
- Co-ordination and management (e.g. road works, incident response) – often outside of road management authority
- Targets

I. Average vs. real system performance

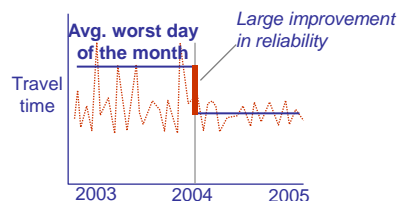
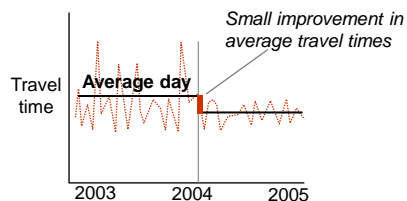
How traffic conditions have been communicated to users



How users experience traffic...



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



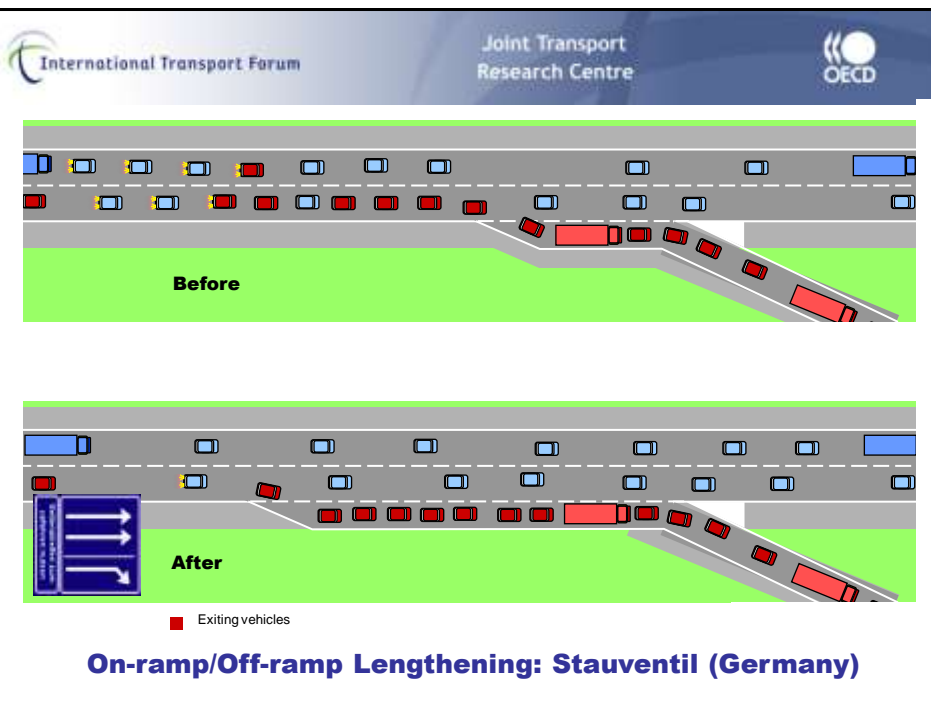
Congestion Management Measures: Non-Road Building Measures

Four Principal Options

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

Above Measures Free-up Existing Capacity

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





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Combined Travel Time/Parking Information (National route 357 at Makuhari, Tokyo Region)

90minutes by road
30minutes by highway
40minutes by rail
P&R parking lots are available

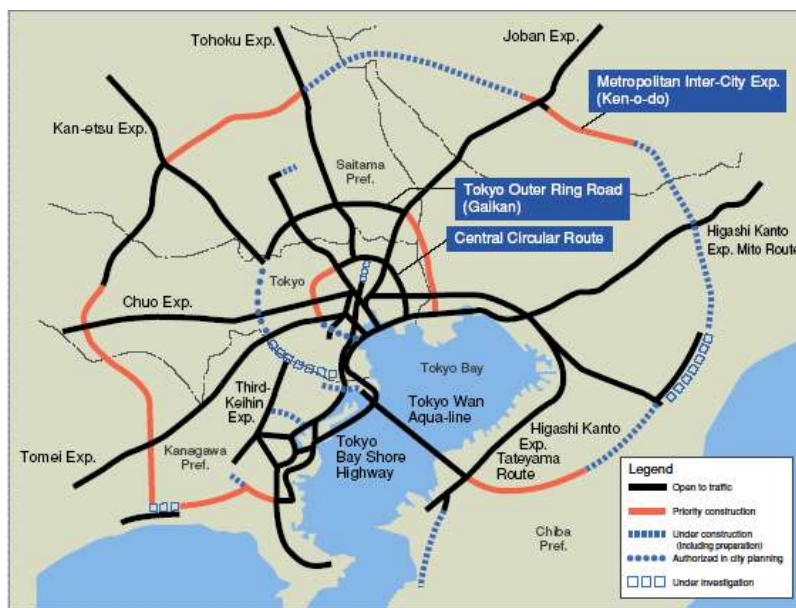
Motorway
National Route 357
Japan Rail Keiyo line

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 – river crossings
- Cost benefit assessment is key
- Again, consider options for use of new capacity

Incomplete Orbital Road Network (Tokyo)



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How Should I Implement My Congestion Management Policy?

Matching the Policy Response to the Problem

- Involving key actors
- Including the public (urban areas complex with many interactions)
- Aligning incentives and powers to act with agents responsible for delivery
- Aligning scope of policy response to geographic scope of congestion (travel-to-work area)
- Funding may only be available for specific (not necessarily best-suited) responses – address this

Ex-post Assessment (Improve/build on Past)

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