Managing CONGESTION in large urban areas

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Background on Working Group Project

- Working Group Composition
- Background/Meetings
- Task
- Target
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
Causes of Congestion

... Key Points

**Triggers and Drivers:**
- Triggers: On-road, initiates congestion incidents
- Driving forces: cause traffic growth

**Representation of Congestion on the Network:**
- Speed-Flow relationship (uninterrupted facilities)
- Junction queuing (urban street networks)

**Variability of Demand (and supply!)

**Importance of Generated/Diverted Traffic**

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**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...

**Indirect Costs of Congestion:**
- Environment
- The Urban Economy
- Safety and Health
Congestion Management: Policy Goals

What Are We (Should We Be) Aiming for?
- Maximum throughput? -- Still widely used.
- Contribution from economics: Optimum levels

Gaps between Theory and Practice:
- User heterogeneity
- Charging for optimum levels: technology limits
- Spatial and temporal dynamics of congestion
- Different types of networks
- Maximising flows & economically optimal approaches likely to lead to different levels of traffic/congestion

What Should I Do?

Think Before Acting: Strategic Principles
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

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. Pricing
Principle #2: “Locking in” the Benefits

1. Access Management

Physically Managing and Filtering Access by:

- Limiting access to, or through zones, (Rome, Vienna, Athens, etc, …)
- Indirectly limiting access by removing or re-allocating roadspace for traffic (Paris On-street PT)
- Filtering access to links in the network (Ramp Metering)

2. Parking Management

Reduce Demand for Destination Traffic:

- Increase price/reduce supply of parking spaces
- Manage network to discourage through traffic
- Combination with other measures (Public Transport and access management)
- Coordination across neighbourhoods (competition)
- Revenues can be used for alternatives
- Enforcement essential
Principle #2: “Locking in” the Benefits

3. Pricing

Long Discussed, Little Implemented. Why?:

- Acceptance (linked to use of revenues)
- Cost, itself linked to….
- Technology

However, when implemented, very effective

- London, Stockholm, Singapore, others in planning
- Link-based initiatives (H.O.T lanes, tolls, etc…)

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
**Managing Congestion in Large Urban Areas**

**JTRC Committee Meeting Berlin, 23-24 October 2006**

### 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

### Congestion Management Measures: Non-Road Building Measures

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 process is key
- Again, consider options for use of new capacity
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)

Parting thoughts...

- Managing congestion not a one-off policy but an urban governance process …congestion arises on the roads but it cannot be managed solely by the authorities responsible for transport
- Free flow speeds 24/7 not a tenable goal, avoiding excessive congestion is
- Age of un-managed urban roads coming to an end
- Need to lock in the benefits of traffic management policies and infrastructure expansion
- Urban areas should be managed to provide high quality and reliable access to their inhabitants
Managing CONGESTION in large urban areas

Joint Transport Research Centre, Berlin 23-24 October 2006

Thank You
Questions?
Distribution of Travel Times:
SR 520 Seattle, WA (USA) - Eastbound, 4:00-7:00 p.m. Weekdays

Targeting the Worst Congestion (Tokyo Region)
Time “losses” by 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.
Whence Congestion?

Activity Patterns
- (land use, demographics, economy, fuel price, motorisation, etc...)

Weather, light conditions, topography

Roadway surface condition, roadway network pattern

Exogenous factors

Macro
- Travel generation
- Travel demand pattern
- (land, origin, destination, time/schedule)
- Travel behaviour
- (time/schedule, mode, mode choice, etc...)

Experiences and information about congestion

Micro
- Traffic composition
- Dynamic Capacity
- Roadway design capacity
- Roadway flow level
- Critical zone

Congestion

Fundamental Diagram of Traffic Flow

Average speed

Traffic flow on a link

Autobahn A-40 Bochum, Germany (x lanes)

Interstate 10 East, Los Angeles, USA
Urban Networks: Intersection Clearing Times

Integrated Framework for Congestion Mitigation Measures (Germany)

| Plans and measures of higher levels and from neighbouring regions or cities |
| Urban development and land use planning |
| Integrated transport development planning |
| Congestion management |
| 'hard' measures |
| 'soft' measures |
| Traffic management |
| Mobility management |
| Transport planning |
| Supply oriented |
| Demand oriented |
Rome: Impacts of Automatic Access Control


Re-allocation of Roadspace: Paris Southern Orbital Tramway
Ramp-metering (Munich): Motorway Travel Times
Metering vs. different metering strategies

Average journey time on the main carriageway

No metering

Ramp-metering (Munich): Motorway+Ramp Wait Travel Times
Metering vs. different metering strategies

Average journey time in the entire motorway

No metering
Cordon Charging: Stockholm (-22% During Peaks)

Cordon Charging: London (-20-30%)

Total traffic entering the charging zone
During charging hours
Incomplete Orbital Road Network (Tokyo)