MONASH University

Transport and Crowd Management Forum,
May 2nd, 2010
Park Hyatt Resort, Jeddah, Saudi Arabia

Olympic Transport Planning Experience - Lessons for Hajj

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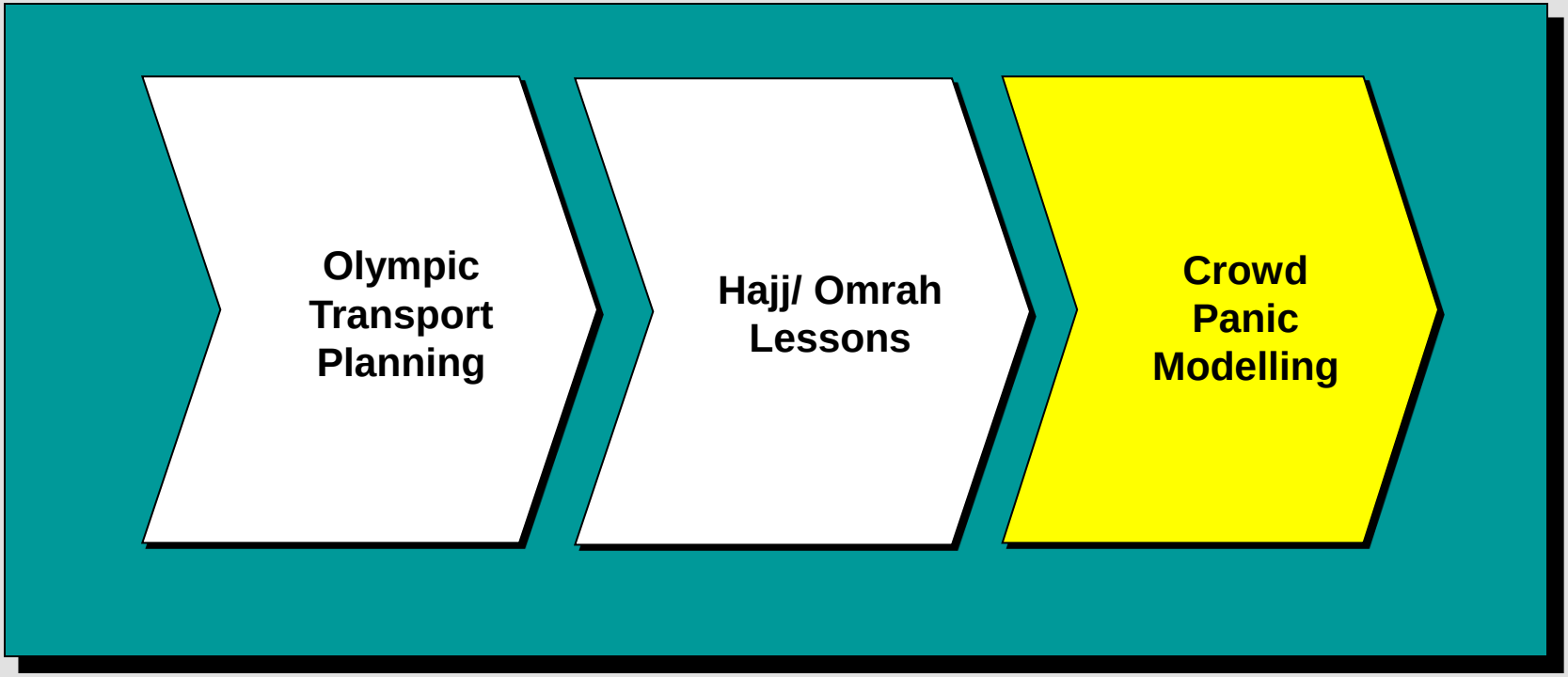
This paper outlines Olympic Transport Planning experience relevant to the Hajj



Agenda

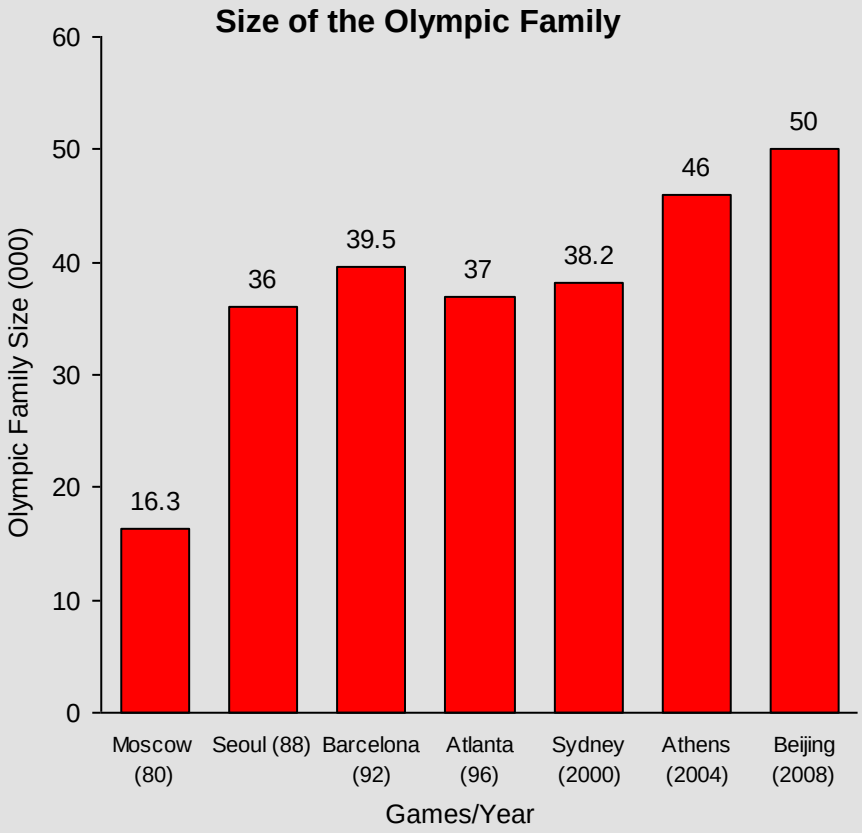
1. Olympic Transport Planning
2. Hajj/Omrah Lessons
3. Crowd Panic Modelling

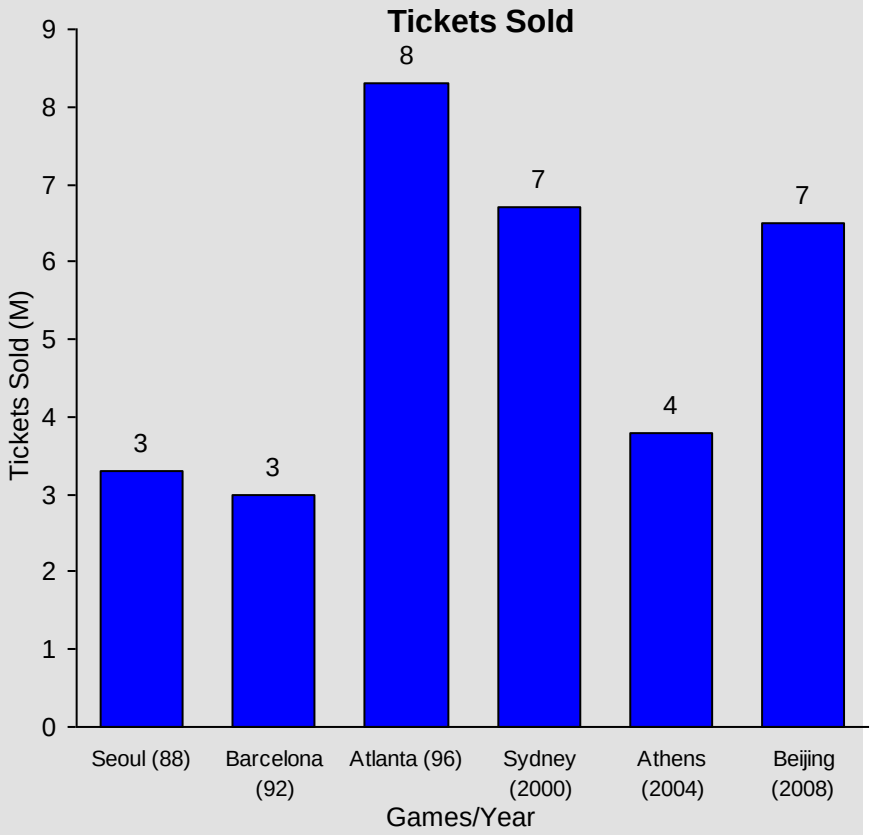
Some of the worlds biggest & most congested cities run the summer Olympic Games – how?

The summer Olympic games represents the biggest city transport planning challenge in the world

- **Cities will experience the largest demand for travel in their history**
- **Trip Demand:**
  - Olympic Family and Spectators
  - Base Load – usual city resident travel
- **Media scrutiny means the actions of planners are watched by a worldwide audience**

Olympic transport is for 3-8 M spectators and 40-50K athletes/officials each day over 2 weeks





Source: Based on Bovy, P. 'Mega-events : catalyst for more sustainable transport in Cities' UITP Latin America Division -- RECIFE - Brazil Seminar / Nov. 2009

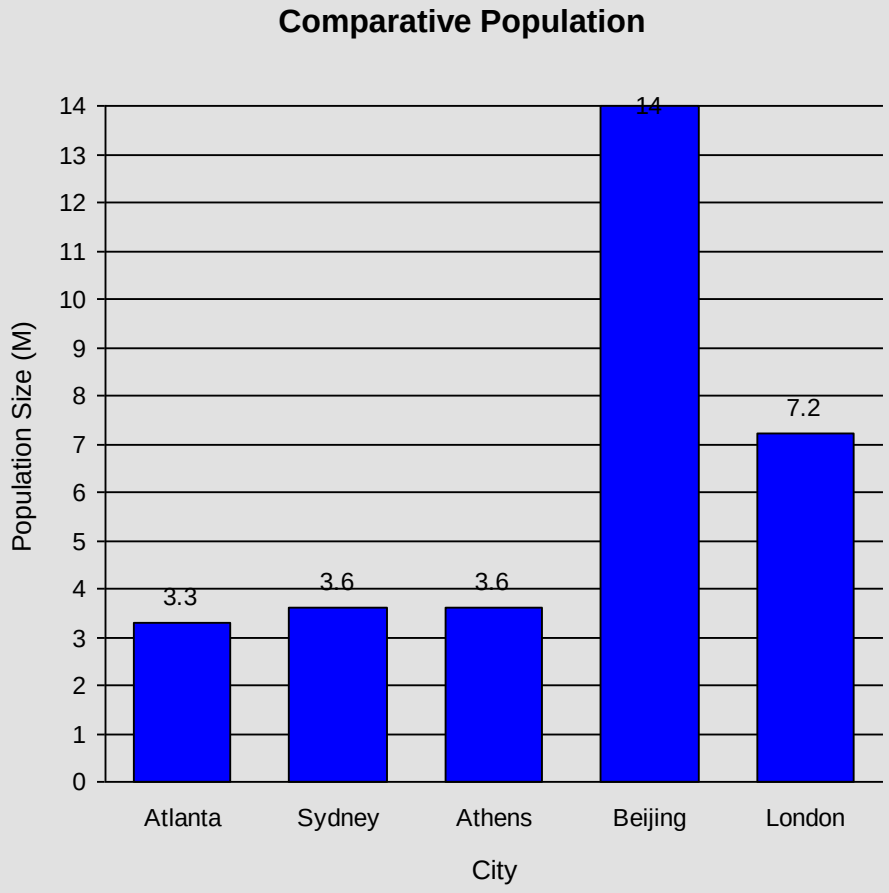
A range of markets must be catered for using substantial and diverse transport resources

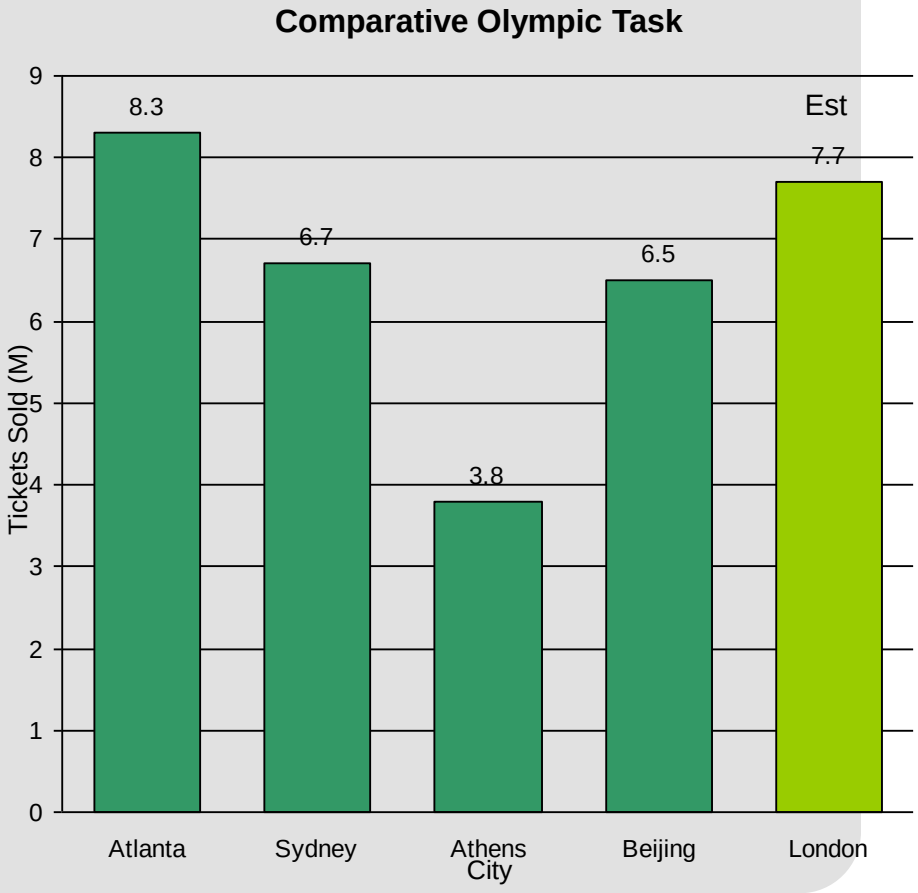
Scale of Participants and Transport Resources – Sydney 2000

Market	Size	Services	
T1-T3 – Olympic VIP's	4,650	Olympic Car Fleet – 4,700 vehicles	
T4 – Athletes	10,800	Athlete Bus Network	3,850 Buses
T4 – Officials	7,600	Officials Bus Network	
T5 – Media	19,800	Media Bus Network	
Spectators	7,000,000	Public Transport	

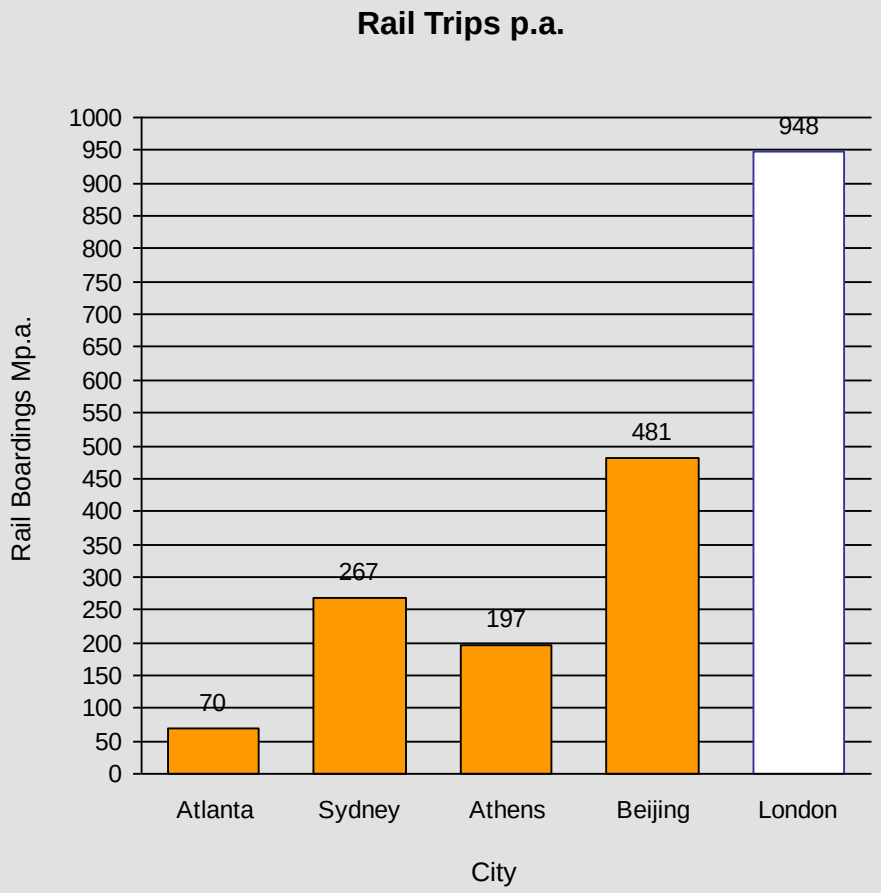
Source: Based on Bovy, P. 'Transport and Exceptional Public Events' ECMT Feb 2002

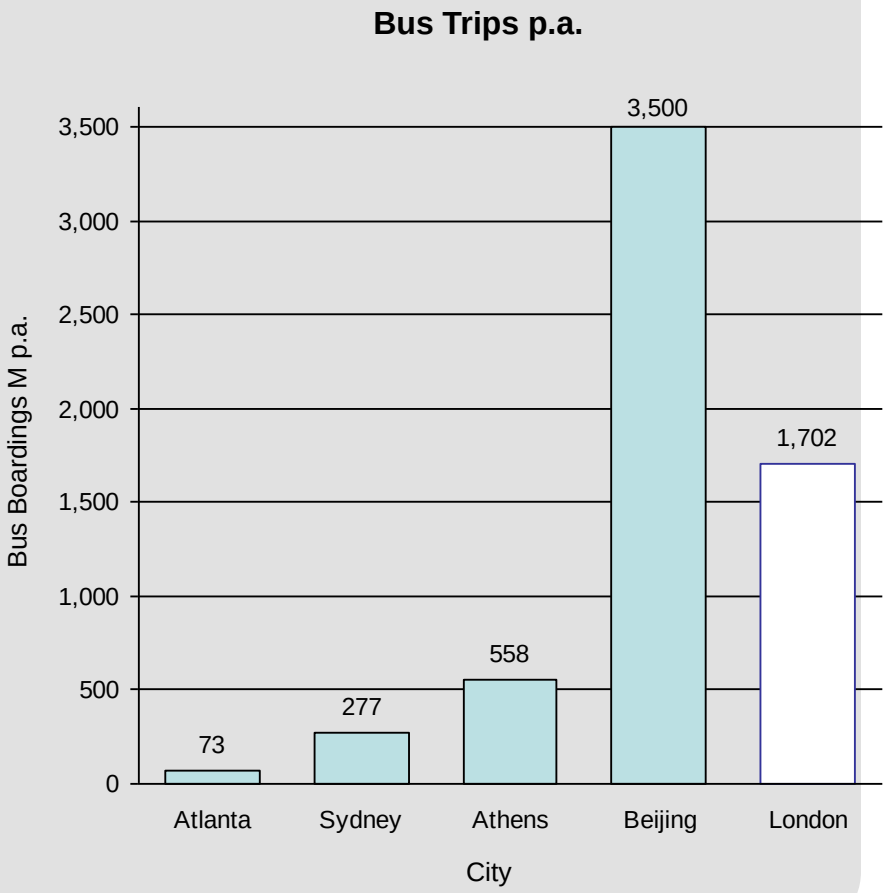
There are big differences in the circumstances for the games in each city…..



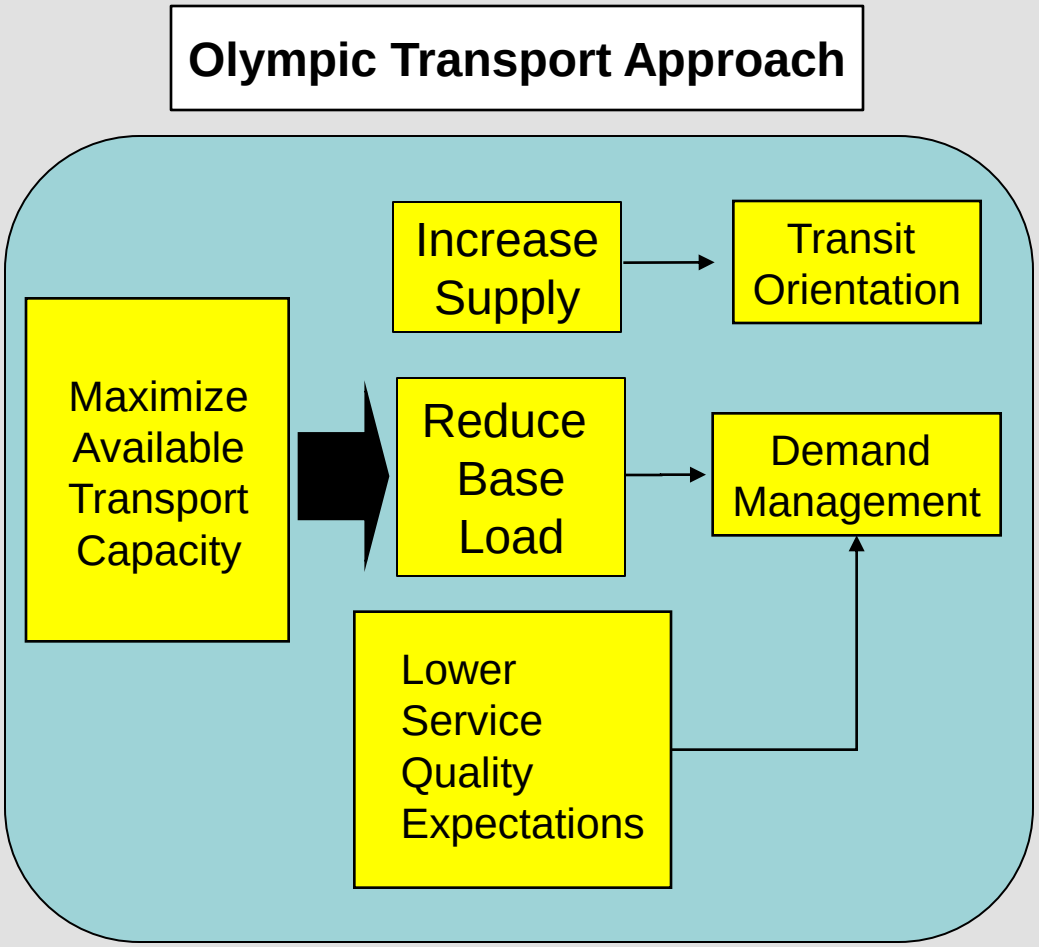


...these require different approaches and explain variations in games transport performance





All Olympic transport strategies aim to maximise available transport capacity



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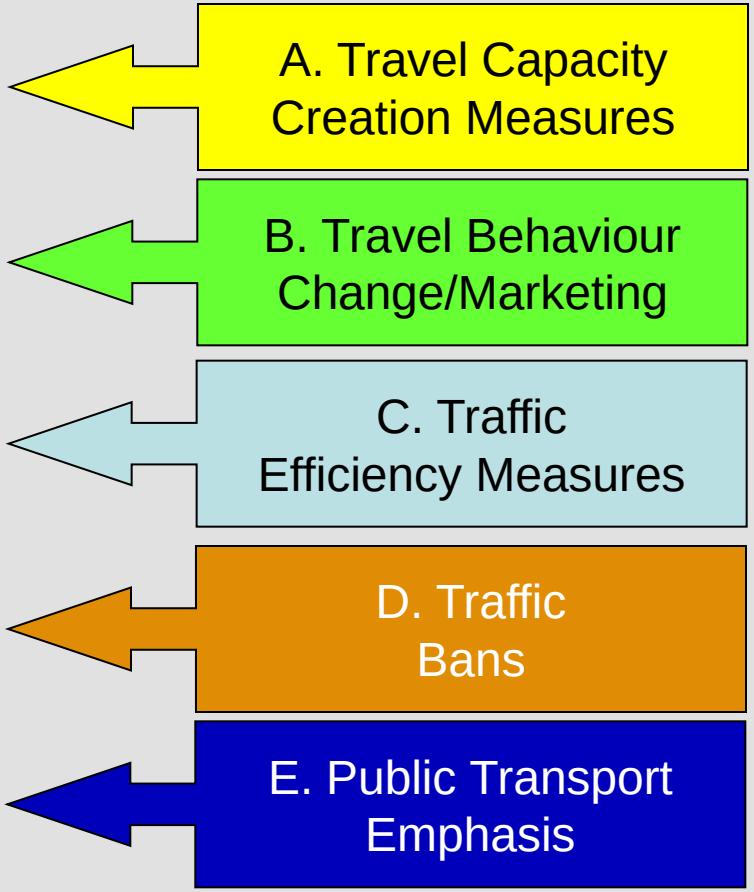
ITS (Monash)

5 key TDM strategies are adopted

Olympic Travel Demand Management Measures

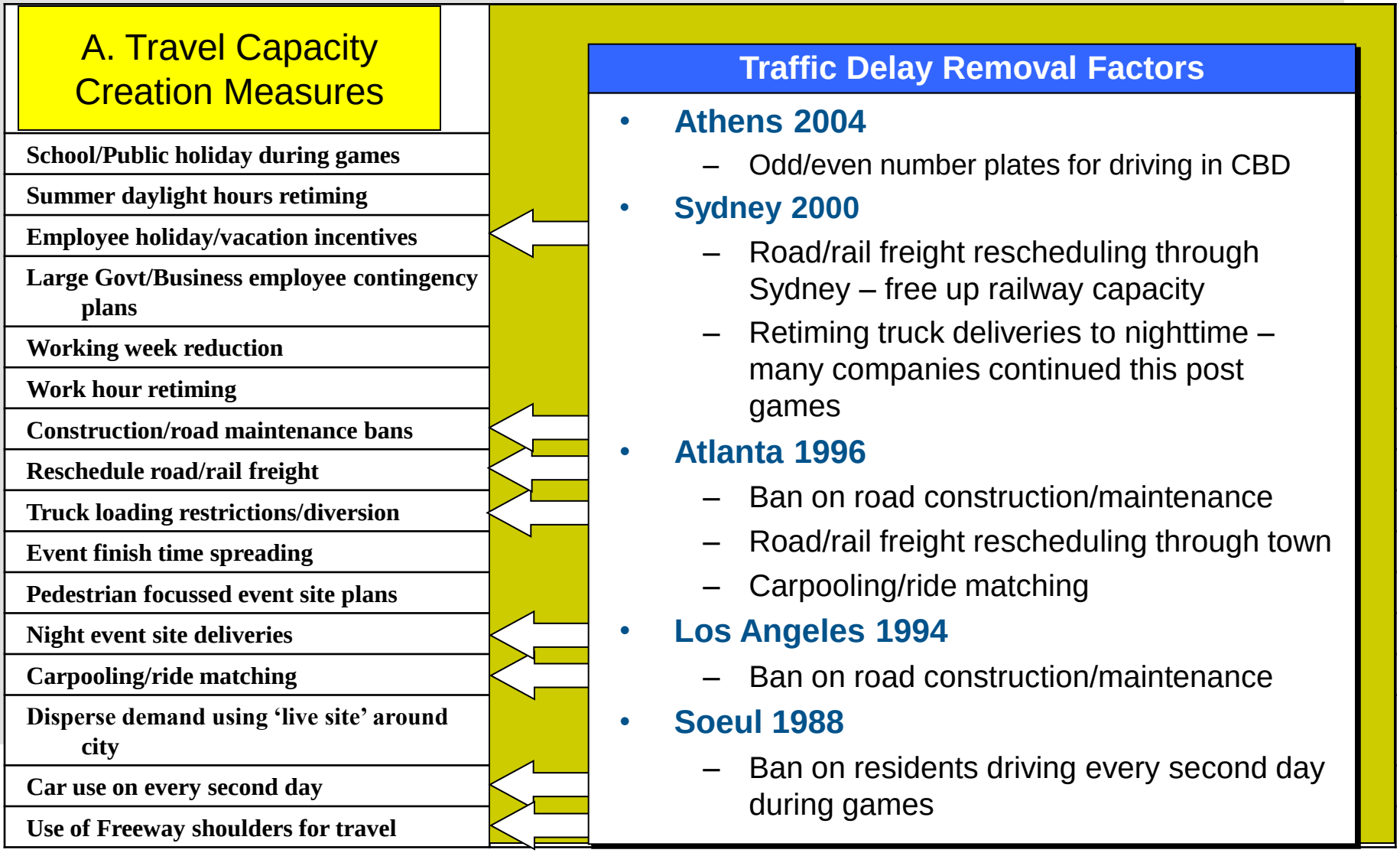


A. Travel Capacity Creation measures aim to reduce ‘base load’ demand during the games

	Athens 2004	Sydney 2000	Atlanta 1996	Barcelona 1992				Lake 002
School/Public holiday during games		✓			✓			
Summer daylight hours retiming		✓						
Employee holiday/vacation incentives	✓	✓	✓		✓	Promoted		
Large Govt/Business employee contingency plans		✓						
Working week reduction			✓			✓		
Work hour retiming	✓	✓			✓	✓		✓
Construction/road maintenance bans			✓			✓		
Reschedule road/rail freight		✓	✓					
Truck loading restrictions/diversion	✓	✓	✓	✓		✓		
Event finish time spreading			✓					
Pedestrian focussed event site plans		✓	✓					
Night event site deliveries	✓	✓	✓					
Carpooling/ride matching			✓			✓		✓
Disperse demand using ‘live site’ around city		✓						
Car use on every second day	Some				✓			
Use of Freeway shoulders for travel						✓		

A. Travel Capacity Creation Measures

Such as removing factors blocking traffic...



... and spreading event timing to reduce per hour load

A. Travel Capacity Creation Measures
School/Public holiday during games
Summer daylight hours retiming
Employee holiday/vacation incentives
Large Govt/Business employee contingency plans
Working week reduction
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Construction/road maintenance bans
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Disperse demand using 'live site' around city
Car use on every second day
Use of Freeway shoulders for travel

Demand Time Spreading Factors

- **Athens 2004**
  - Numerous events with 24 hour focus
- **Sydney 2000**
  - 'live' sites throughout the city at interesting venues to watch all features

Event “node” location can spread demand or reduce transport needs

A. Travel Capacity Creation Measures

- School/Public holiday during games
- Summer daylight hours retiming
- Employee holiday/vacation incentives
- Large Govt/Business employee contingency plans
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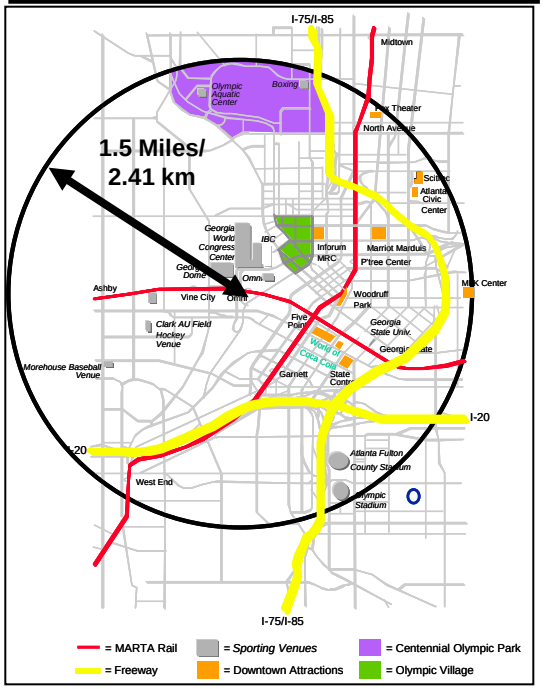
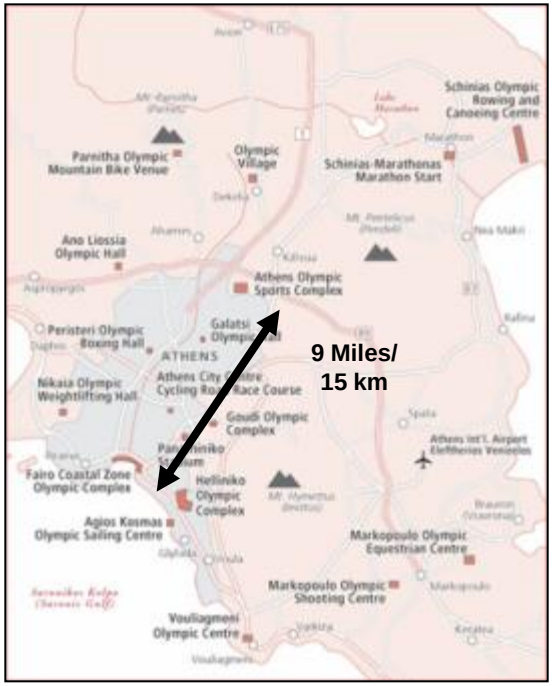
Spatial Demand Spreading Factors

Atlanta 1996



Athens 2004



Travel behaviour change matches demand to available capacity

B. Travel Behaviour Change/Marketing	Athens 2004	Sydney 2000	Atlanta 1996	Barcelona 1992	Soeul 1988	Los-Angeles 1984	Moscow 1980	Salt Lake 2002
The big scare, travel warnings & communications strategies	✓	✓	✓			✓		✓
Employer/business telecommuting/ work retiming	✓	✓	✓					
Test events as education	✓	✓						
Spectator public transport use education		✓						✓
Resident public transport use education		✓						✓
Affected business/community consultation and travel plans	✓	✓	✓			✓		✓

The big scare and 'managed expectations' aim to carefully reduce 'base load'

B. Travel Behaviour Change/Marketing

- **The big scare, travel warnings & communications strategies**
- **Employer/business telecommuting/ work retiming**
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The Big Scare/Communication Strategy

- **Athens 2004/Sydney 2000**
  - Single coordinated 'voice' of system management
  - (Continuous) message of 'biggest ever challenge' – start early, avoid busy areas, plan ahead, use public transport
  - UNDER PROMISE AND OVER DELIVER
- **Atlanta 1996**
  - Multiple uncoordinated messages
  - Too much wishful thinking (e,g, world standard quality) a long way from the truth
  - Over promise and under deliver?
  - Some evidence that negative messages about 'gridlock' in Atlanta and LA reduced road demand

‘Test Event’ strategies were a means of public education as well as operations training

B. Travel Behaviour Change/Marketing

- **The big scare, travel warnings & communications strategies**
- **Employer/business telecommuting/ work retiming**
- **Test events as education**
- **Spectator public transport use education**
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- **Affected business/community consultation and travel plans**

Test Events

- **Athens 2004/Sydney 2000**
  - Strategy of Test Test Test Test
- **Atlanta 1996**
  - Untested at high capacity/volume

More traditional brochure marketing is used to learn about Olympic transport

B. Travel Behaviour Change/Marketing

- **The big scare, travel warnings & communications strategies**
- **Employer/business telecommuting/ work retiming**
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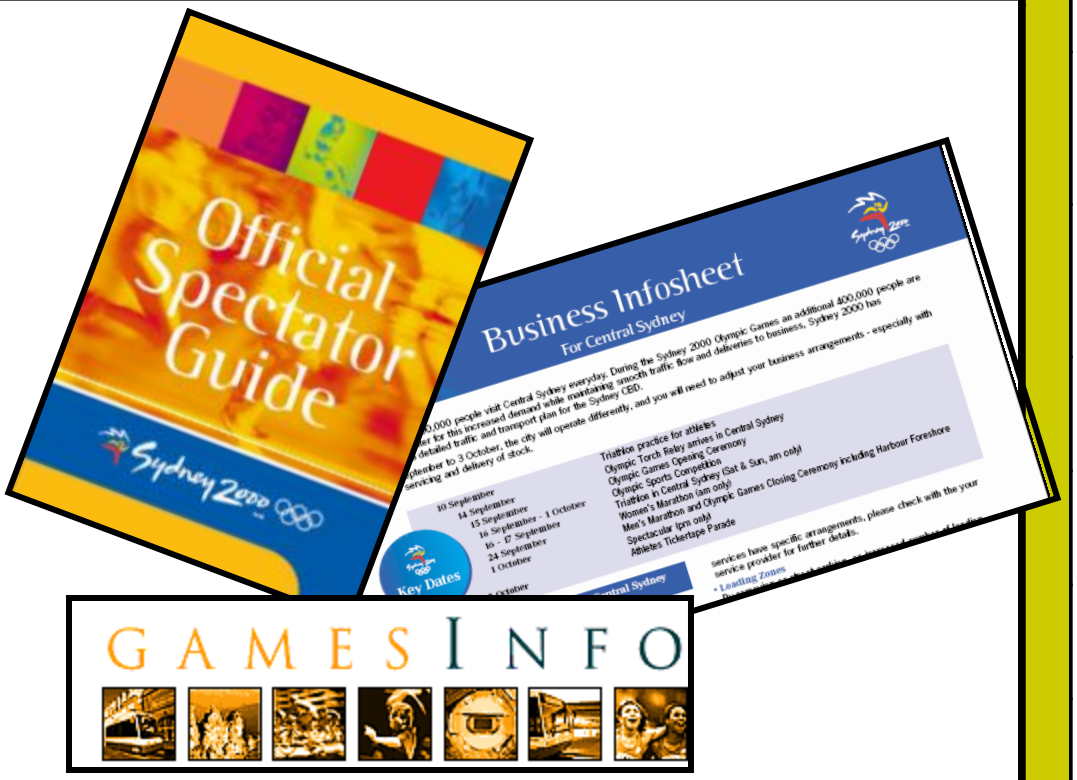
Marketing/ Travel Plans



A number of more tactical traffic efficiency measures have been adopted

C. Traffic Efficiency Measures	Athens 2004	Sydney 2000	Atlanta 1996	Barcelona 1992	Soeul 1988	Los-Angeles 1984	Moscow 1980	Salt Lake 2002
High occupancy vehicle lanes			✓					
Turning traffic bans	✓	✓						
Ramp metering			✓			✓		
Real time parking and road condition signing			✓					✓
Increase tow away trucks		✓						

Traffic bans are now a common feature of the modern games

D. Traffic Bans	Athens 2004	Sydney 2000	Atlanta 1996	Barcelona 1992	Soeul 1988	Los-Angeles 1984	Moscow 1980	Salt Lake 2002
Event/venue site traffic/car bans	✓	✓	✓	✓			✓	✓
CBD parking/traffic bans	✓	✓	✓	✓				✓
Dedicated Olympic lanes/parking bans	✓	✓					✓	
Enhanced traffic measure policing	✓							
Site fringe suburb parking bans	✓	✓						

Olympic family lane priority is now the norm

D. Traffic Bans
Event/venue site traffic/car bans
CBD parking/traffic bans
Dedicated Olympic lanes/parking bans
Enhanced traffic measure policing
Site fringe suburb parking bans

Olympic Lane Priority

Athens Olympic Lanes

Beijing “O” Lanes

As are measures to emphasise public transport...

E. Public Transport Emphasis	Athens 2004	Sydney 2000	Atlanta 1996	Barcelona 1992	Soeul 1988	Los-Angeles 1984	Moscow 1980	Salt Lake 2002
Expanded public transport system (particularly rail)	✓	✓	✓					✓
Rail capacity enhancement	✓	✓	✓					
Free spectator/Olympic family public transport	✓	✓						
Park and Ride	✓	✓	✓					✓

...mainly system expansion...

E. Public Transport Emphasis
Expanded public transport system (particularly rail)
Rail capacity enhancement
Free spectator/Olympic family public transport
Park and Ride

Expanded Public Transport Systems

...notably rail with high capacity design

E. Public Transport Emphasis
Expanded public transport system (particularly rail)
Rail capacity enhancement
Free spectator/Olympic family public transport
Park and Ride

High Capacity Rail Design

Sydney Olympic Park Station

- Well designed crowd handling
- Separate platform loading/unloading
- Estimated Capacity = 50,000 pax/ hour

Bus volume is a problem and also needs high capacity design

E. Public Transport Emphasis
Expanded public transport system (particularly rail)
Rail capacity enhancement
Free spectator/Olympic family public transport
Park and Ride

High Capacity Bus Design

Rio 2016

Athens 2004

Agenda

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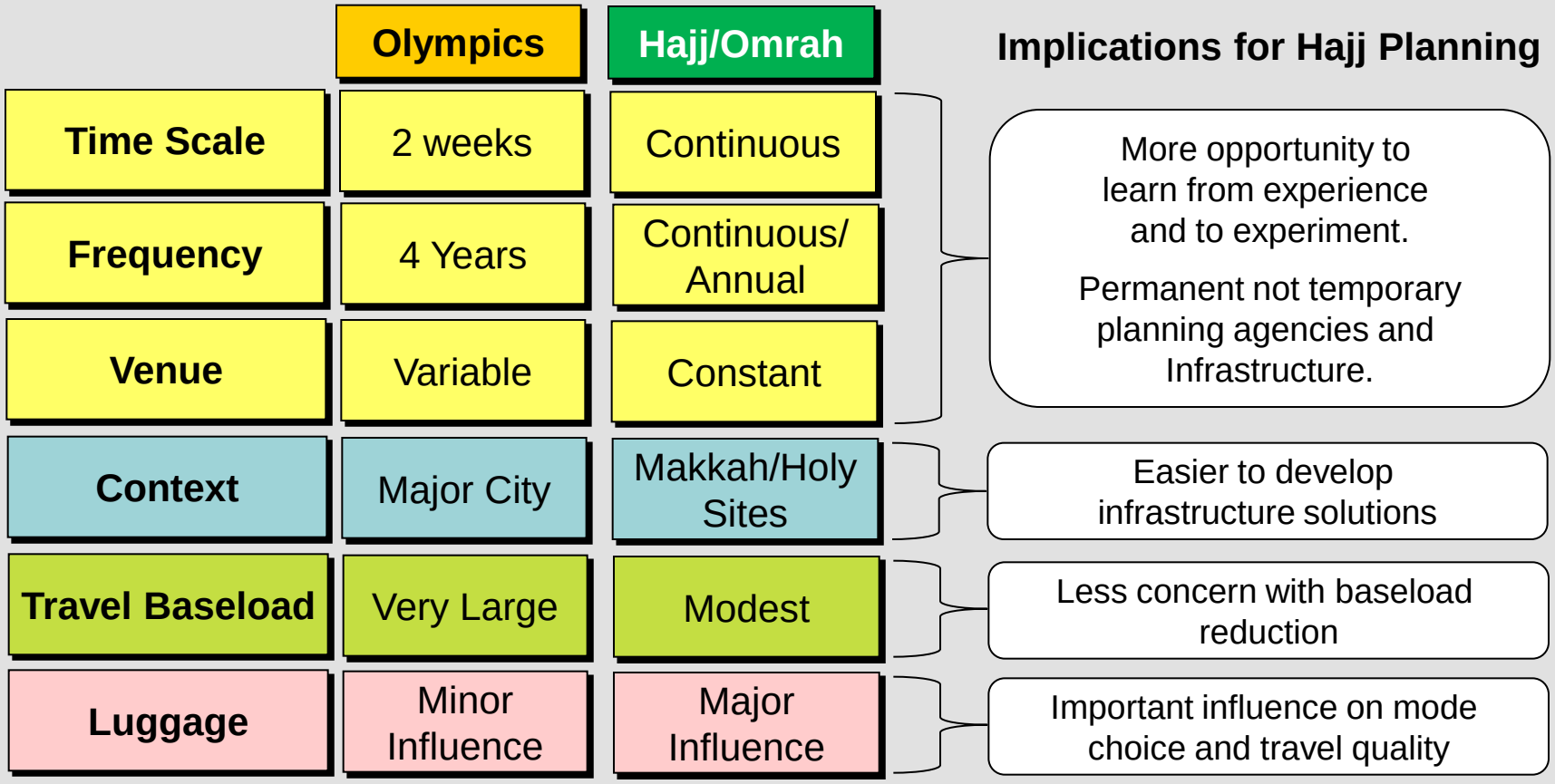
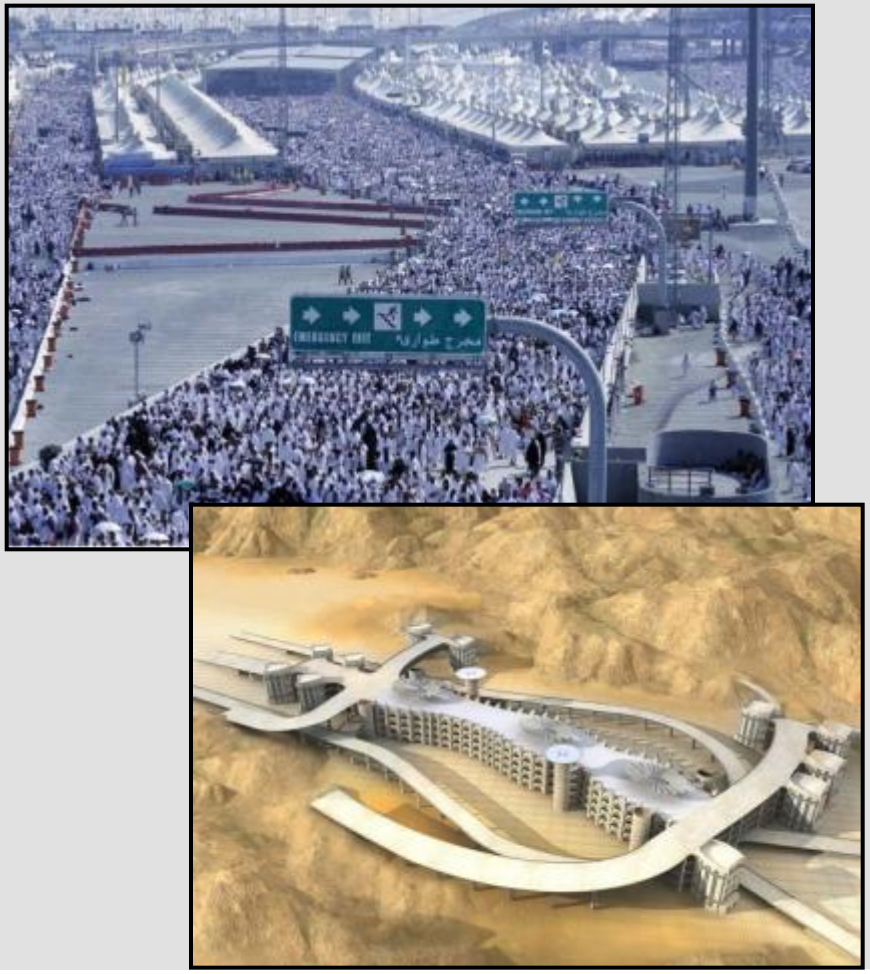
The Hajj and Olympic events have very different features



Many olympic “lessons” are already adopted



Jamarat Bridge – Key Features

Travel Capacity Creation Measures

- Splitting pedestrian access into multiple levels
- Grade separation – one way demand flows

Travel Behaviour Change/Marketing

- Timing of Group Visits – Marketing this

Traffic Efficiency Measures

- No waiting/sitting or blocking access

Traffic Bans

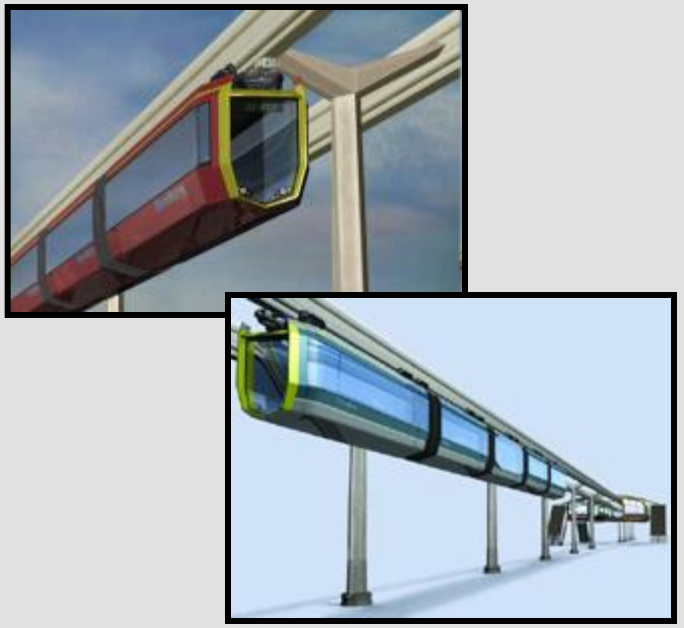
- No visitor personal transport access

Transit Emphasis

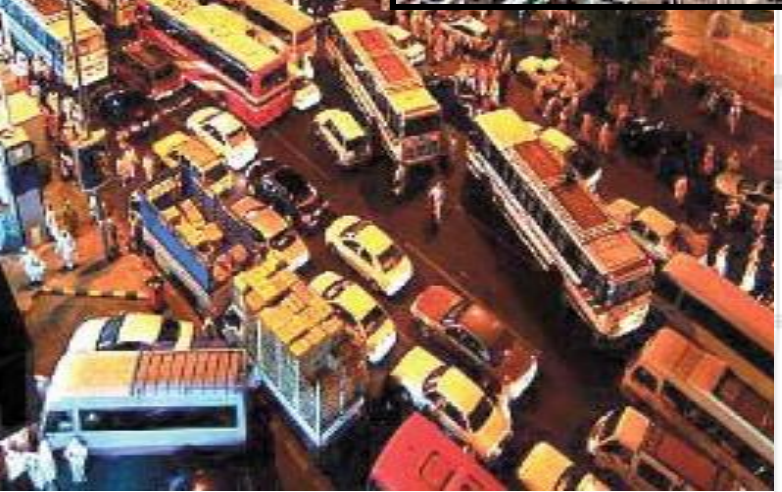
- Bus access for selected groups

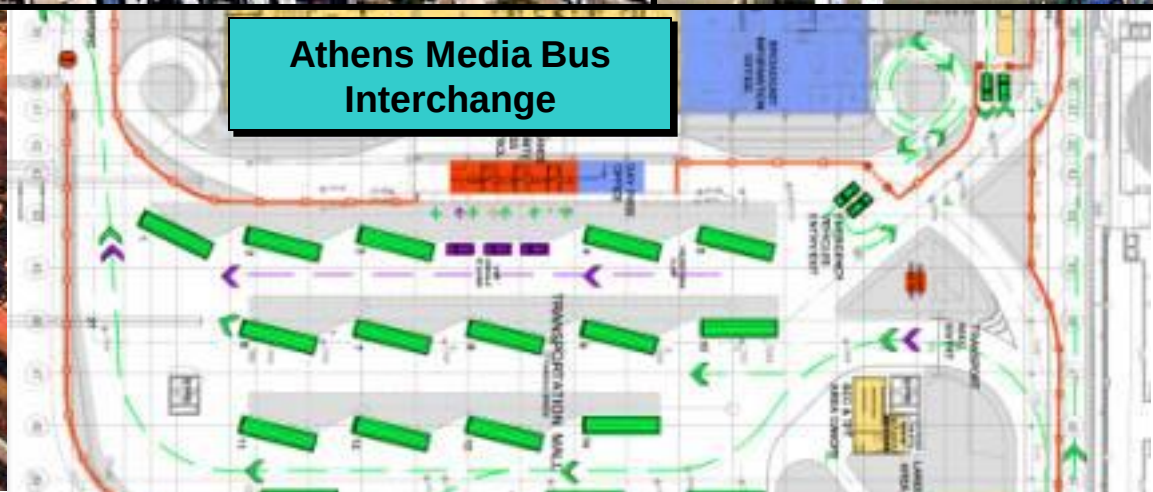
Preliminary comments: Quality & efficiency would be improved with high capacity rail...

Al Mashaaer Al Mugaddassah Metro



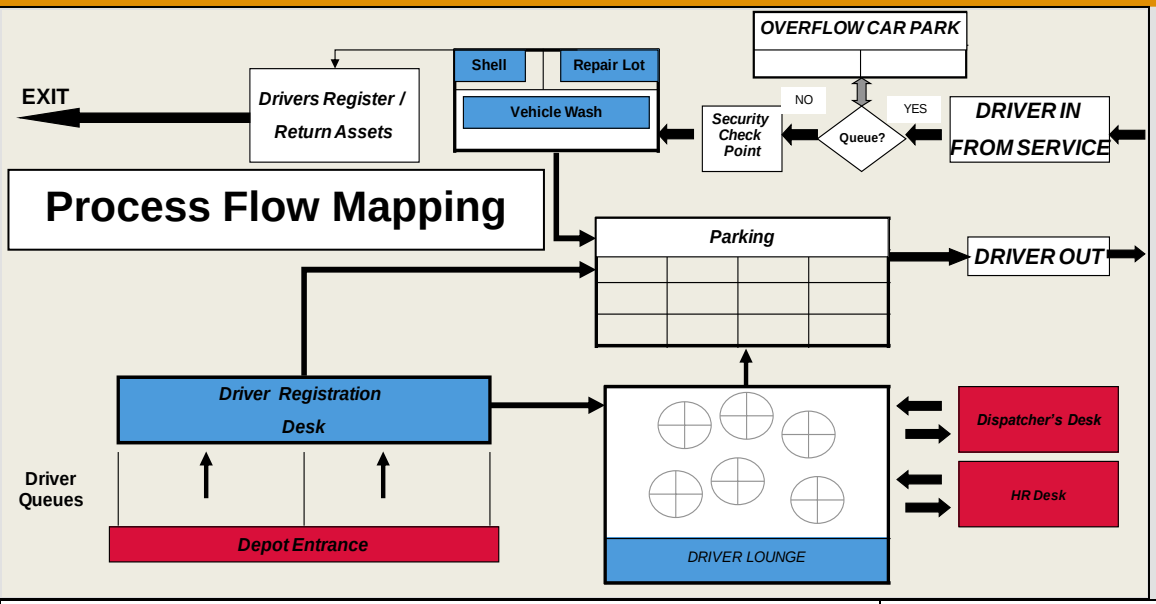
...bus priority, bus capacity management and removal of bus-pedestrian conflicts



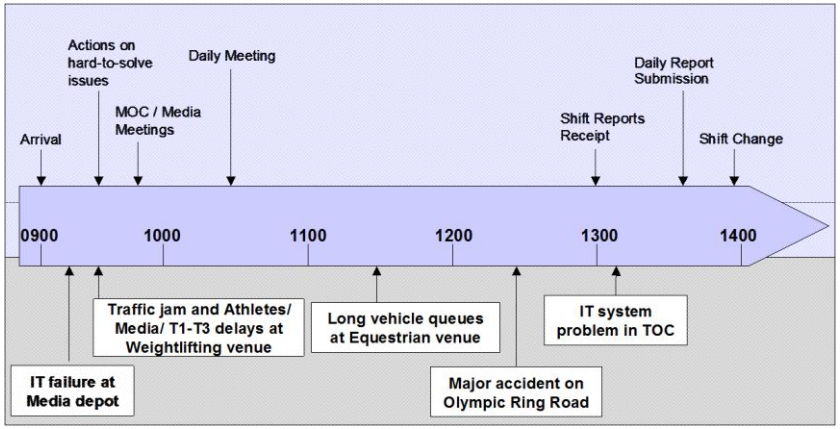


Athens Media Bus Interchange

Olympic planning methods and plan documentation may also be of value



Wargaming – Testing Resilience



Fleet Resource Risk Assessment Methodology

Illustrative

Key Risks Factors for Each Market and Estimated Size of the 'Contingency'

Market Segment	Demand Estimates	Travel Times	Operational Requirements	Overall Risk
Athletes	◔	◑	○	◑
Media	◑	◑	●	◕
Technical Officials	◔	◑	○	◔

Size of Fleet Contingency	
Moderate	10%
Large	25%
Small	5%

Scale of Risk

○ *Low* ◑ *Medium* ● *High*

Agenda

1. Olympic Transport Planning
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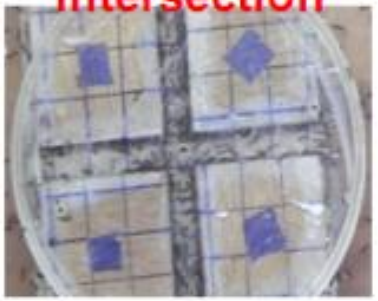
Our research focus is crowd panic models based on biological experimentation..

Symmetry Breaking as in Human panic

Panic at intersection



Movement affected by layout of escape area

Exit at middle of wall

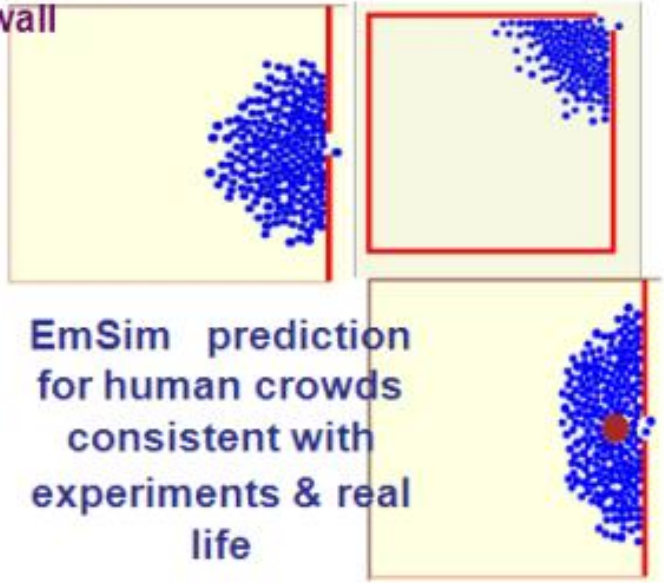
Corner exit efficient

Exit without column

Column near exit efficient

Collective patterns affected by geometrical structures as predicted by the model

Rare Real life data



EmSim prediction for human crowds consistent with experiments & real life

EmSim (Ver 1.6) has a clear role in Hajj planning for event design

Architectural Design and Crowd Safety – Indoor/Outdoor Environments

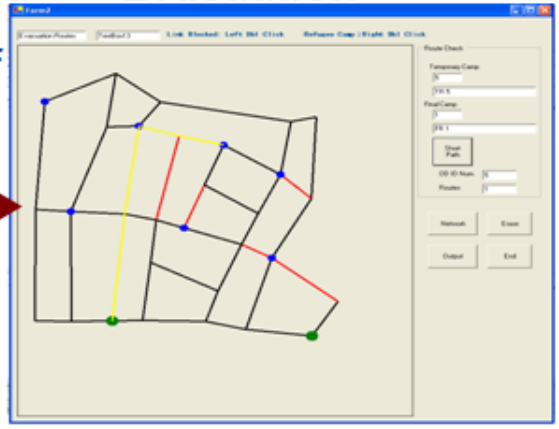
Olympic crowd

Possibility of designing architectural adjustments that enhances the safety of collective movement patterns in mass events such as Hajj or Olympic.

Hajj crowd

Community Evacuation

Network simulation of crowd dynamics in case of emergency evacuation in a community. Suitable to design refuge points for crowd in case of disaster.



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