Traffic Management

Workshop and Training on Urban Transport Planning and Reform. Baku, April 14-16, 2009
The Context and Problems
The Context

- Motor vehicle ownership is rapidly growing
- The supply and management of road space is not adequate to meet the increasing demand
- This situation will get progressively worse without comprehensive city-wide programs to address the problem
Motor Vehicle Ownership

![Graph showing the relationship between GDP per capita and motor vehicle ownership per 1000 population for various countries including Japan, Singapore, Hong Kong, China, Korea, Malaysia, Philippines, Indonesia, and Thailand.](image-url)
Typical Urban Transport Problems in Eastern European and Central Asian Cities

- Emerging traffic congestion
- High accident rate
- Deteriorating pedestrian conditions
- Deteriorating public transport
- Increasing air pollution
Typical Responses to Traffic Problems

- Build more roads
- Construct grade separated intersections and other major improvements to existing roads
- Encourage land development in outlying locations away from city center
- Build subway systems (in larger cities)
- Limited effort and funding toward improving the efficiency of the existing street system (This is more cost effective.)
Modal Split (excluding walking)

- 45% Bus
- 34% Car
- 21% Metro

Source: Baku Urban Passenger Transport Reform Project (ROM)
Investment in transport sector (Baku 2008)

Annual Budget Transport Sector Baku (million AZN)

- Roads: 497 million AZN
- Metro Construction: 80 million AZN
- Metro Subsidy: 19 million AZN
- Other Urban Transport: 0 million AZN

Source: Baku Urban Passenger Transport Reform Project (ROM)
Consequences of Road Expansion without a Balanced Approach Featuring Public Transport and Traffic Management

- Traffic volumes increase faster than the road network can be expanded
- As a result:
  - Traffic congestion increases
  - Public transport service declines
  - Air pollution intensifies
- A balanced approach is needed with more emphasis on:
  - Improvements to the public transport system
  - Travel Demand management measures (especially paid parking) to restrain car usage
  - Traffic management measures (to improve safety and traffic carrying capacity)
Definition and Objectives of Traffic Management
Definition of Traffic Management:

- Maximizing the Traffic Carrying Efficiency and Safety of the Existing Street System
Street Maintenance & Rehabilitation

- Street maintenance and rehabilitation of the existing street system is an important complement to the introduction of traffic management measures.
**Cross section of a street:** public city road, bordered by properties.

**Guttler:** channel alongside a sidewalk for draining off water.

**Manhole:** opening that provides access to drains.

**Carriageway:** centre part of a street reserved for vehicle traffic.

**Curb:** edge of a raised passage on the side of the road for pedestrian traffic.

**Sidewalk:** raised passage on the side of the road for pedestrian traffic.

**Water main:** pipe that transports water fit to drink.

**Gas main:** pipe for transporting gases used for lighting, heating, etc., of homes and buildings.

**Electricity cables:** set of electricity-conducting wires.

**Telephone cables:** set of wires conducting communication waves.

**Sewer:** system for evacuating waste water.

Source: www.infovisual.info
Objectives of Traffic Management

- Increase the traffic carrying capacity of the existing street system (moving vehicles)
- Increase the ability of the street system to transport more people (public transport priority)
- Accommodate parking needs but in proper relationship to the above two objectives
- Improve pedestrian mobility and safety
Increase the Traffic Carrying Capacity of the Existing Street System
Traffic Signal Systems
Typical Traffic Signal System Problems

- Poorly maintained
- Energy inefficient
- Lack capability of several timing plans
- Timing plans not kept up to date
- Inability to accommodate pedestrian movements
- Lack of central monitoring and control
- Several important intersections are not signalized
- Poor or inadequate signal placement at intersections
# Traffic Signal System Options

<table>
<thead>
<tr>
<th>Traffic Control Strategy</th>
<th>Advantages</th>
<th>Disadvantages</th>
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</thead>
</table>
| **Fixed Time**           | - Cheapest to install and maintain  
- Can be implemented using non-centrally controlled equipment  
- Familiarity with setting for regular users | - Aging of signal timing plans requires a large amount of data for updates  
- Requires operator reaction to incidents  
- Disruption of plan changing |
| **Responsive**           | - Requires as much or more data to be collected as for fixed time control | - Requires fewer detectors than adaptive control, hence may be cheaper  
- Disruption of plan changing  
- Detector failure risk |
| **Adaptive**             | - Less data needed to be collected in advance  
- Collects extensive traffic data, thereby providing traffic conditions throughout the network  
- Trends in traffic are monitored and when detected, may be used to update plans permanently  
- Automatic response to incidents | - Detector failure risk  
- Requires central control  
- Most expensive to install  
- Most expensive to maintain (e.g., data parameters, detectors)  
- Requires unique operator training and experience to maintain data parameters  
- Inconsistent with transit and pedestrian specific requirements (e.g., pedestrian countdown displays are not feasible) |
Intelligent Transport Systems (ITS)
Baku ITS System

- Control traffic lights through detectors
- Detect traffic events and advise motorists
- Detect and manage bus locations and advise passengers
- Control and enforce parking through license plate recognition
- First phase includes electronic information boards for motorists and passengers, surveillance cameras, and detector loops in pavement
Comprehensive Corridor Improvements
Elements of Corridor Improvements

- Determine primary function of the street
  - Arterial (moving traffic)
  - Collector
  - Local (land access)
- Intersection geometric design modifications
- Pedestrian treatments (sidewalks, crossings)
- Traffic signal installations
- Parking provisions (peak hour banning, charging)
- Public transport treatments (bus lanes, bus stops)
- Road signing & street marking
- Landscaping
- Lighting (also consider energy efficiency)
- Utilities (water, sewer, drainage, electrical, etc)
Increasing the Ability of the Street System to Transport More People (as opposed to more vehicles)
Allocation of Road Space (Choices)

- Accommodating General Traffic
- Providing Exclusive Space for Public Transport
- Allowing Parking
- Making Provisions for Pedestrians
- Providing Landscaping and Street Furniture
Measures to Move More People on the Existing Street System

- Provide space for public transport vehicles
- Constrain Private Car Use
- Limit or charge for parking
# Means for Controlling Car Use

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<thead>
<tr>
<th></th>
<th>Ownership</th>
<th>Parking</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Physical</td>
<td>N/A</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Fiscal</td>
<td>X</td>
<td>X</td>
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</table>
Demand Management Measures

- Parking Charges
- Road Pricing (tolls on specific road links)
- Area Congestion Pricing
London Congestion Charging Area
London Example of Demand Management

- Motorists must pay 8 pounds ($13.30 equivalent) to enter the congestion pricing zone.
- System is in effect 7am to 6pm Monday to Friday.
- On-Street parking can cost up to $10 per hour.
- Parking garages are also expensive.
- City improved public transport as an alternative:
  - Metro
  - Bus service
  - Commuter rail
- Results: substantial reduction in congestion, improved travel speeds, and less pollution.
Public Transport Priority

- Exclusive bus lanes
- Segregated Bus Rapid Transit (BRT) / Light Rail Transit (LRT) lines
Candidate BRT/LRT Corridors in Baku
Appropriate Use of the Street System to Address Parking
Appropriate Provision of On-Street Parking

- Does the adjoining land use require parking?
- Assess competing road space needs:
  - General traffic
  - Public transport
- Alternative of off-street parking nearby
- Charging as a means to prudently restrain private motor vehicle use
Improve Pedestrian Safety and Mobility
Fig. 4.6 – Source: O/D household interviews
Typical Pedestrian Conditions

- The Pedestrian as a means of transport is neglected
- Pedestrian conditions are unsafe
- Pedestrian systems lack continuity
Pedestrian Facilities & Traffic Management

- Pedestrian Crossings
- Pedestrian sidewalks
- Pedestrian only areas (removing motor vehicle traffic)
Little things count when addressing pedestrian conditions
# Walkability Checklist

<table>
<thead>
<tr>
<th>Component</th>
<th>Indicator</th>
<th>Variable</th>
<th>Source</th>
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<tbody>
<tr>
<td>Safety &amp; Security</td>
<td>1 Pedestrian Fatalities and Injuries</td>
<td>1 Proportion of road accidents that resulted in pedestrian fatalities (most recent year available)</td>
<td>2</td>
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<tr>
<td></td>
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<td>2 Proportion of road accidents that resulted in pedestrian injuries (most recent year available)</td>
<td>2</td>
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<td></td>
<td>2 Modal Conflict</td>
<td>3 5-minute interval count of pedestrians walking in street among other modes</td>
<td>1</td>
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<td>4 Pedestrians concerned about modal conflict on walking path</td>
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<td>5 Walking path modal conflict 1-5 LOS</td>
<td>1</td>
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<td></td>
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<td>6 Pedestrians who do not feel safe from road accidents</td>
<td>1</td>
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<tr>
<td></td>
<td>3 Crossing Safety</td>
<td>7 Crossing safety 1-5 LOS (surveyed crossings)</td>
<td>1</td>
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<tr>
<td></td>
<td>4 Crossing Exposure</td>
<td>8 Average time waiting to cross (surveyed crossings)</td>
<td>1</td>
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<tr>
<td></td>
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<td>9 Judgement: sufficient time given for healthy adult to cross (surveyed crossings)</td>
<td>1</td>
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<td></td>
<td></td>
<td>10 Judgement: sufficient time given for person with small children to cross (surveyed crossings)</td>
<td>1</td>
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<td></td>
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<td>11 Judgement: sufficient time given for elderly / disabled people to cross (surveyed crossings)</td>
<td>1</td>
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<tr>
<td></td>
<td>5 Traffic Management at Crossings</td>
<td>12 Type (e.g., pedestrian signal as function of 4 lanes and avg. traffic speed)</td>
<td>1</td>
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<td></td>
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<td>13 Perception of security from crime 1-5 LOS</td>
<td>3</td>
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<td></td>
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<td>14 Proportion of walkable roads with street lights</td>
<td>3</td>
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<td></td>
<td></td>
<td>15 Pedestrians who do not feel streets are well lit at night</td>
<td>3</td>
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<td></td>
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<td>16 Security of crossings (particularly subways) 1-5 LOS</td>
<td>1</td>
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<tr>
<td></td>
<td>6 Security</td>
<td>17 Existence of relevant pedestrian safety laws and regulations</td>
<td>2</td>
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<tr>
<td></td>
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<td>18 Enforcement of relevant pedestrian safety laws and regulations</td>
<td>2</td>
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<tr>
<td></td>
<td>7 Safety Rules and Laws</td>
<td>19 Presence of pedestrian safety education programs</td>
<td>2</td>
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<tr>
<td></td>
<td>8 Pedestrian Safety Education</td>
<td>20 Yielding to pedestrians</td>
<td>3</td>
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<td></td>
<td>9 Motorist Behavior</td>
<td>21 Safe driving speed in heavily pedestrianized areas</td>
<td>3</td>
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<td></td>
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<td>22 Running red traffic lights and stop signs</td>
<td>3</td>
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<tr>
<td>Convenience &amp; Attractiveness</td>
<td>10 Trees</td>
<td>23 Average number of trees per km of road</td>
<td>1</td>
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<td></td>
<td>11 Cleanliness</td>
<td>25 Cleanliness of walking paths 1-5 LOS</td>
<td>1</td>
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<td></td>
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<td>26 Presence of open sewers along walking paths</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>12 Quality and Maintenance of Walking Path Surface Material</td>
<td>27 Quality and maintenance of walking path surface material 1-5 LOS</td>
<td>1</td>
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<tr>
<td></td>
<td></td>
<td>28 Pedestrians inconvenienced by poor walking path surface quality and maintenance</td>
<td>3</td>
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<td></td>
<td></td>
<td>29 Proportion of roads without sidewalks</td>
<td>1</td>
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<td></td>
<td>13 Disability Infrastructure</td>
<td>30 Existence and quality of facilities for blind and disabled persons 1-5 LOS</td>
<td>1</td>
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<tr>
<td></td>
<td>14 Coverage</td>
<td>31 Proportion of walking paths that are covered (e.g., arcades) with climate weight</td>
<td>1.4</td>
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<tr>
<td></td>
<td>15 Obstructions</td>
<td>32 Permanent and temporary obstacles on walking paths 1-5 LOS</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33 Pedestrians inconvenienced by obstructions</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>16 Availability of Crossings</td>
<td>34 Sufficient safe and convenient opportunities available to cross streets</td>
<td>3</td>
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<tr>
<td></td>
<td>17 Walking Path Congestion</td>
<td>35 Pedestrian congestion 1-5 LOS</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>18 Pedestrian Amenities</td>
<td>36 Amenities (e.g., benches, public toilets) 1-5 LOS</td>
<td>1</td>
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<td></td>
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<td>37 Pedestrian wayfinding signage 1-5 LOS</td>
<td>1</td>
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<tr>
<td></td>
<td>19 Connectivity</td>
<td>38 Connectivity between residential and employment centers 1-5 LOS</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>20 Overall Convenience</td>
<td>39 Pedestrian perception of convenience – rating</td>
<td>3</td>
</tr>
<tr>
<td>Policy Support</td>
<td>21 Planning for Pedestrians</td>
<td>40 Presence and quality of pedestrian planning program</td>
<td>2</td>
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<td></td>
<td></td>
<td>41 Incorporation of pedestrian plans in transportation or city master plan</td>
<td>2</td>
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<tr>
<td></td>
<td></td>
<td>42 Relative importance of pedestrian plans in city planning (agency self-rating)</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>43 Degree of centralization among bodies responsible for different aspects of pedestrian planning</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>22 Relevant Design Guidelines</td>
<td>44 Presence of relevant urban design guidelines</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>45 Presence of relevant building design guidelines</td>
<td>2</td>
</tr>
</tbody>
</table>
Traffic Safety
Traffic Safety Conditions & Solutions

- Traffic accidents are a serious cause of death and personal injury
- Pedestrians are particularly at risk
- Comprehensive road safety programs are needed
- Many organizations and public must be involved
- Traffic management is an essential element of traffic safety programs
Traffic Enforcement
Improving Traffic Enforcement

- Police play a particularly important role in enhancing road safety
- Police also have an important role in management of traffic incidents
- Police forces need to be reformed
  - Move away static to mobile enforcement
  - Move away from traffic engineering
Institutional Considerations
Typical Institutional Problems

- The traffic management function is scattered among several entities
- Respective roles of central and local government not clear
- Roles of civilian and police also not clear (traffic management planning and design versus traffic enforcement)
- Lack of traffic management training and experience
Emerging Trends in Traffic Management

- Central government establishes general policies and legislation
- Cities handle most traffic management responsibilities due to need to respond to local concerns
- Clear separation of traffic management design and operations from traffic enforcement
  - Police handle enforcement
  - Civilian entities handle design and operations
- Consolidation of traffic management with passenger transport planning and regulation in a single transport department
Example of Basic proposal for the structure of the Transport and Traffic Department

Transport & Traffic Dept.

- Road safety
  - Road safety Research center
- Traffic Planning & control
  - Master Plan Team
- Parking
  - Control Center
- Public Transport
  - Parking operator
  - License And Control
  - Planning And financial
  - Hot line And Public
- Front office
  - Inter. And PR
  - Strategic Planning
  - Transp. Infra.
  - Finance & Economic
- 50 Private operators
- Bus company
- Taxi
- General unit
### Functions and Responsibilities of a Traffic Management Agency

<table>
<thead>
<tr>
<th>Division</th>
<th>Functions and Responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic Management Policy</td>
<td>Formulate and Implement city wide “Traffic Management Policy” to comply with objectives defined by the “city council” which would include, at least such areas as determination of (i) a functional road hierarchy; (ii) the appropriate balance between transport system users (private transport/public transport/NMT/pedestrians; (iv) priority programs for action and, (iv) a “5 year” investment plan”.</td>
</tr>
<tr>
<td>Traffic Research</td>
<td>Assemble/survey, monitor, analyze and evaluate all traffic and accident data to enable trends to be identified, problems quantified and traffic management plans and improvements to be prepared.</td>
</tr>
<tr>
<td>Traffic Management Plans and Improvements</td>
<td>Plan, design, implement, monitor, evaluate, fine-tune and continuously up-date traffic schemes and policies to realize the agreed Traffic Management Policy. The program would cover all motorized road based modes (cars, public transport, trucks, etc.) and all non-motorized modes (pedestrians, cycles). Plans and improvements would range from simple junction improvements or marking and signing programs through to far reaching city wide strategies such as extensive bus priority or pricing. Safety considerations are part of any scheme planning and design process but specific safety programs and accident counter measures would be a responsibility.</td>
</tr>
<tr>
<td>Traffic Control Devices</td>
<td>Plan, design, install, operate, and maintain all traffic control devices including (i) traffic signal systems including computer controlled systems; (ii) road markings; (iii) road signs and, (iv) enforcement devices (cameras etc.)</td>
</tr>
<tr>
<td>Traffic Regulations</td>
<td>Formulate traffic regulations to realize the proposed Traffic Management Plans and Improvements, for enactment by city government and for enforcement by the traffic police.</td>
</tr>
<tr>
<td>Parking Management</td>
<td>Prepare off and on street parking policies and programs including approval for the location of and access to parking areas proposed by others. Parking enforcement and administration (for example, where paid parking applies) would be carried out by a separate parking authority” or equivalent.</td>
</tr>
<tr>
<td>Approvals and Co-ordination</td>
<td>Evaluate and advise city government on all schemes (e.g., new roads) and developments (developed both by public and private sector agencies and including major new land or building developments) which have a significant traffic impact to ensure that they are consistent with agreed traffic policy. In effect carry out traffic impact studies for all major development proposals.</td>
</tr>
<tr>
<td>Consultation</td>
<td>Consultation with the public and stakeholders on traffic policy and on the impacts of specific schemes and measures.</td>
</tr>
<tr>
<td>Budget</td>
<td>Preparation of an annual budget for submission to city government for (i) implementation of Traffic Plans and Improvement Schemes; (ii) traffic operations and maintenance of control devices; and, (iii) the continuous work of the traffic management agency itself.</td>
</tr>
</tbody>
</table>

### Notes:
- Not all functions would necessarily be carried out by the “traffic management agency” itself. For example, maintenance of traffic control devices and signals would most commonly be contracted out; in this case, the agency would assume the functional responsibility of supervision.
- Traffic regulation enforcement is not included as this is regarded as a traffic police function; however, there are cases where some enforcement, such as curbside parking, could be a traffic agency function and a Parking Division” would be needed.
Summary of Presentation
Summary

- Traffic Management measures are very cost effective.
- Traffic Management typically does not receive proper attention or funding in relation to other urban transport activities and expenditures.
- More emphasis is typically needed in giving priority to public transport (moving people rather than vehicles) as a traffic management activity.
- Pedestrian safety also does not receive enough attention.
- Institutional considerations are especially important in planning and implementing traffic management measures.