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URBAN PUBLIC TRANSPORT PLANNING STRATEGIES

ABSTRACT

The work considers the strategy of urban public transport planning through the problem of road and public transport with traffic congestion. Approaches and measures for their elimination are presented.

The aim is to organise urban transport with urban environment.

KEY WORDS

planning, urban transport planning

INTRODUCTION

Problems with traffic are present in the majority of countries regardless of whether they are developed or developing countries. Traffic jams occur every day and their number is growing especially in big city centres, intercity corridors and in frequent tourist routes. All this reduces the comfort of passengers and increases the costs and also increases the number of traffic accidents. Attitude is accepted that due to economic, social and ecological reasons the construction of new roads is not the only solution of the current and future transport problem, especially in urban centres.

In practice, the majority of traffic plans in cities includes five opposing approaches:

1. minimal efficiency,
2. planning of traffic surfaces so as to reduce the travelling length,
3. developing of traffic network designed for passenger cars,
4. developing of transport network oriented towards public transport,
5. controlling the needs for travelling.

Traffic planning strategy depends on whether the major influences are related to supply or demand.

Measures of supply usually tend to increase the road system capacity with the aim of improving the traffic flow in all aspects of the used transport.

Measures of demand tend to reduce the demand for passenger cars, increasing the usage of public transport, increasing the occupancy of vehicles, and reducing the need for travelling at times of peak traffic load.

1. MINIMAL EFFICIENCY APPROACH

At its extreme this approach assumes that traffic congestion, traffic accidents, and environmental degradation are inescapable features of the modern way of living.

In spite of economic changes, and with a restricted number of new road constructions, in many big cities today, the average travelling speeds have not changed over the decades. The reason lies in the traffic congestion which can be described as recurring or non-recurring.

Recurring congestion refers to the expected delays caused by a great number of vehicles which travel at the same time (e.g. during peak or holiday periods) at the same places.

Non-recurring congestion refers to the unpredictable delays caused by spontaneous traffic incidents, such as accidents.

Both recurring and non-recurring congestion are related to stop-start driving conditions, which reduce fuel efficiency, and increase air pollution, raise the cost of freight transport and distribution, hinder the movement of buses, increase the number of accidents and delay emergency vehicles.

Traffic congestion results in long-term negative consequences and reinforcing of car-dependent lifestyles.

Table 1 - Impacts of congestion management measures, divided according to the type of strategy

			Impacts of measures							
Type of measure	Type of strategy	Measures	Reduce need to make trip	Reduce length of trip	Promote non-motorised transport	Promote public transport	Promote car pooling	Shift peak-hour travel	Shift trips from congested locations	Reduce traffic / traveller delays
Supply side	Road traffic operations	Entrance ramp controls on motorways				XX	XX	X	XX	XX
		Traveller information systems		X		X	X	XX	XX	XX
		Traffic signalisation improvements				X			X	XX
		Motorway traffic management		X		X	X	X	X	XX
		Incident management							XX	XX
		Traffic control at construction sites				X	X	X	XX	XX
	Preferential treatment	Bus lanes				XX		X	X	X
		Car-pool lanes				X	XX	X	X	X
		Bicycle and pedestrian facilities			XX					
		Traffic signal preemption for HOVs				XX				X
	Public transport operations	Express bus services				XX				X
		Park-and-ride facilities				XX	XX		X	X
		Service improvements				XX				X
		Public transp. image				XX				X
		High capacity public transport vehicles				XX				X
	Freight movements	Urban goods movement						X	X	XX
		Inter-city goods movement	X					X	X	XX
Demand side	Land use and zoning policy	Land use and zoning policy	X	XX	XX	XX	X	X	X	X
		Site amenities and design	XX	XX	XX	XX	XX	X		X
	Communica-tion substitutes	Tele-commuting	XX	XX	X	X			X	X
		Teleconferencing	XX	XX						
		Tele-shopping	XX	X						
	Traveller information services	Pre-trip travel information	X	X	X	XX	XX	XX	XX	X
		Regional rideshare matching	XX			XX	XX	X	X	X

Source: Transport Planning and Traffic Engineering, Chapter 6.

xx = significant impact, x = some impact

Table 2 - Total distance travelled by one mode of transport

Area	All modes km*	Car km* (%)	Local bus km* (%)	Railway km* (%)	Walking km* (%)	Other[1] km* (%)
Urban areas with populations:						
0.1m - 0.25m	161	115(72)	8.6(5.4)	11(7.0)	3.2(2.0)	23(14)
0.05m - 0.1m	155	110(72)	7.2(4.7)	13(8.4)	3.7(2.4)	20(13)
0.025m - 0.05m	151	111(73)	5.7(3.8)	13(8.3)	3.7(2.5)	18(12)
0.003m - 0.025m	176	133(76)	7.2(4.1)	8(4.6)	3.0(1.7)	24(14)
Rural areas	211	164(78)	5.7(2.7)	11(5.2)	1.7(0.8)	29(14)
All areas	160	114(71)	9.3(5.8)	11(7.1)	3.2(2.0)	22(14)

Source: Transport Planning and Traffic Engineering, Chapter 6.

*Kilometres per person per week (excluding trips < 1.6km). [1]Other refers to 2-wheeled motor vehicles, taxis, domestic air travel, other public transport and other types of bus travel.

2. THE LAND USE PLANNING APPROACH

Transport plans that emphasise the land use planning approach and design of certain traffic constructions, reflect needs for transport and its impact on the environment.

Land use approach is usually accompanied by transport measures to increase competitiveness and attractiveness of urban centres as opposed to the development of suburbs, and promote choice by increasing the relative advantage of travel other than by car.

In transport plans the practical measures of land use control are as follows:

1. Limit the spread of cities in order to keep up the residential density and protect green belt of the open land.
2. Concentrate higher density residential developments near public transport centres or along the corridors well serviced by public transport.
3. Facilities that attract large number of people from a wider area e.g. universities and other educational institutions, conference centres, hospitals, city libraries and government offices, have to be located at sites in urban areas well served by public transport. Business blocks and shopping centres have to be located at sites with organised public transport easily reached by bus, bike or walking.
4. Promote employment near the residential quarters, the so-called "urban villages".
5. Locate developments which attract significant movements of freight, e.g. large-scale warehousing and distribution centres, away from residential areas, and close to transport networks, ports, harbours, or railway shunting yard.

Practical traffic management measures related to land use-based traffic plans include:

- limiting the use of cars to travel to employment developments that are well served by public transport, by imposing low maxima on the required number of parking spaces provided by the developers,
- shifting a significant portion of supply of parking from central and inner-city areas to outer park-and-ride interchange locations
- limiting new road construction to those essential for servicing new developments
- implementing priority measures that promote the use of public transport and safe cycling and walking
- establishing car-free zones at concentrations of shopping.

3. THE CAR-ORIENTED APPROACH

This approach is usually associated with the requirement for huge numbers of parking spaces in and

Table 3 - Growth in person travel, 1965-91 (Note: 1965 = 100)

	1965	1975/76	1985/86	1989/91
Population	100	102	104	106
Journeys/person	100	113	118	132
Km/person	100	114	120	131
Person - Km	100	129	148	183

Source: National Travel Survey

around the town centres. The public transport system declines to the basic level of service.

As example of favouring car transport, Los Angeles could be mentioned, where in 1997 the highest traffic congestion of any city in the United States was noted:

- there was more than one registered vehicle per licensed driver
- 77% of workers drive to work alone
- 15% use car pool
- 5% travel by public transport
- 3% walk, cycle, jog

Cities that have adopted this approach place considerable emphasis on the importance of road hierarchy and on the implementation of traffic operations which provide motorists with real-time information regarding congested locations and times, and improve traffic flows using traffic control technology.

4. THE PUBLIC TRANSPORT-ORIENTED APPROACH

With this approach the proposals are emphasised which result in improvements of quality and quantity of roads and rail public transport services. This is associated with land use, economic, administrative and passenger information which encourage the usage of public transport.

Public transport systems, irrespective of whether they are based on road or rail transport, are more energy efficient, emit less airborne pollutants, minimise the amount of land used for transport including parking, and result in better physical environment in urban areas.

Good public transport, especially rail transport helps to facilitate pedestrianisation and allows a greater proportion of new jobs and facilities to be located in the centre.

In order to attract users, public transport has to offer a reasonable price, clean and comfortable vehicles, and regular, predictable and reliable services.

4.1. Rail public transport

Rail systems are most effective when used in service through densely populated cities with relatively long journeys towards the central region.

In London, some 70% inhabitants of those commuting every day to work, use rail to travel to central London. The average travelling speed is 56 km/h.

New rail systems generally offer a more attractive alternative to car users than bus systems. Particularly great efforts are invested in reducing the **lack of safety** by providing real-time electronic information displays.

Reliability is also critical, and many rail operators are now publishing **charters** which set out their target standards of service to passengers. Thus, the London Underground Ltd.'s charter has a compensation scheme that applies when delays of 15 minutes or more occur within its control or when the service falls by more than a small margin below its standards.

4.2. Bus public transport

Over the recent years there has been particular effort made in the world in creating an image of conventional bus transport emphasising cleanness and comfort of buses, improving personal safety and access for senior and disabled people at bus terminals and stops.

Strategies used to favour bus public transport over the private car transport include:

- land use planning which locates large traffic generators at sites which are capable of being well served by buses,
- improving of bus services,
- introduction of traffic restraints that make car travel more difficult.

4.2.1. Improving services

The London "Red Route" scheme, has resulted in faster and more reliable travelling, stimulating bus users, because they shorten the travelling time and expenses.

Measures used to assist in the improvement of services include limited number of stops, use of the bus control system, and a scheme which give priority to buses over cars on congested roads.

Express bus services pick up passengers at a limited number of stops in an outer residential area and travel non-stop to a town centre or industrial area. The fare is usually low, and the services are most heavily used when applied to peak period travel over longer distances.

Bus control is primarily concerned with regularity of travelling at maximal congestion providing immediate information about traffic conditions, which enables the bunching of buses to be reduced or gaps in services to be filled. Methods used for this purpose range from fitting buses with telephones to allow direct communication between a control centre and drivers, to the use of location systems which promote more efficient scheduling and better service reliability.

Priority measures for use of buses in public transport include:

1. with-flow priority lanes reserved for buses, that allow them to bypass congested traffic travelling in the same direction

2. contra-flow priority lanes that allow buses to travel in the "wrong direction" on one-way streets, in order to avoid a detour or serve the street
3. reserved bus lanes that would provide access to urban motorways
4. bus-only streets, either the already existing ones or segregated roads that are designed and constructed for buses only
5. allowing buses to have access to pedestrian zones
6. providing bus detection at traffic signals (automatic or driver-initiated), when bus flows are low or roads are narrow and insufficient to accommodate a bus lane, i.e. programming area-wide urban traffic control schemes to give favourable attention to buses
7. using traffic regulations to give priority to buses when leaving bus stops, to impose parking restrictions on bus routes, and to provide exemptions for buses from prohibitions affecting turning movement at intersections

World-wide, the most common bus priority measure is the with-flow lane allowing buses to bypass queues of vehicles on the approaches to traffic signal-controlled intersections. The length of the lane is about 250 m and the efficiency and regularity of usage is constantly controlled. They are mainly used during morning and evening peak hours.

Other conventional improvements of bus services include route extensions, expanded hours of operations, all-day services through residential areas, and during peak hours circulator services that operate between residential and employment areas and railway or bus stations.

Demand-responsive services have received much consideration in industrialised countries, and their aim is to provide a quality of service between that of a taxi and a stage-bus at a lower cost, and to service locations where the travel demand for buses is low.

With demand-responsive services *time flexibility* is achieved since the potential bus users are able to call the next bus and thus reduce their waiting time. *Space flexibility* is provided by allowing the bus drivers to undertake pick-up/drop off deviations from the fixed route.

One of the methods of the dial-a-bus service is the division of a wider region into sections serviced by one or several minibuses that collect passengers at their homes following phone requests.

4.2.2. Traffic restraints

If we want to increase the number of bus and rail users and reduce the road congestion, then public transport improvements have to be accompanied by measures that discourage the use of private cars in urban areas.

The mostly used restraint tool used in developed countries is the car parking control in the areas well serviced by public transport. This includes limiting the parking time and the parking cost. Also, the traffic signal control using traffic signals as restraint mechanisms is used.

5. MEASURES FOR THE SELECTION OF TRANSPORT STRATEGY

Transport plans and selection of strategy intend to reduce the road system congestion and stimulate usage of public transport. It is necessary to promote the following measures:

1. Car-pooling
2. Varying working hours
3. Technological improvements
4. Charging for road use

5.1. Car-pooling

The travelling concept may be as follows:

- *informal*, formed by a group of people acting on their own who share the driving and thereby reduce the cost of driving alone, and
- *organised*, by the employer, government or private agency.

Car-pooling is most efficiently used when the travelling is relatively long, and the time spent gathering the users is relatively small in relation to the trip length. The participants have the same travel schedule each day, work in the same employment area and have regular working hours.

Research has shown that car-pooling has been most heavily promoted in the United States, and it is organised by large employers by creating car-pools/van-pools. The names of potential users, their telephone numbers, addresses, home and work locations, working hours, and personal characteristics (e.g. smoker/non-smoker) are advertised and they are then matched by a computer.

The participants usually pay a monthly amount, and, as compensation, the driver has the free use of the vehicle over the weekend.

The drawback is that in very big cities car- or van-pooling in heavily travelled corridors has the effect of seducing passengers from the existing public transport services.

5.2. Varying working hours

There are three forms in practice:

1. with staggered hours
2. with flexible working hours
3. with compressed working week.

With *staggered hours* from 15 to 30 minutes, without changing the amount of working hours each day. The effect is to spread the morning and evening traffic "peaks". It is appropriate for offices and piece-manufacturing establishments.

With *flexible working hours* the employees can start and finish work each day at the personally selected time. They also spread the morning and evening "peaks", and they are usually applied for employees who work in offices or to administrative and information workers.

With *compressed working week* the employees work more hours per day over a smaller number of week days. total number of everyday trips to work is reduced and they are moved to off-peak hours.

5.3. Technological improvements

The majority of strategic plans for urban centres emphasises the importance of improving the traffic signals and of applying the integrated urban traffic control (UTC) at intersections.

The developments in **telecommunication technology** in the near future are expected to reduce the amounts of travel, especially at peak hours.

The greatest potential lies in the following three measures:

1. **Telecommuting** or *telework* is the partial or total substitution for daily journey to/from work. The employees are at locations remote from the traditional offices, and linked by computer and modem.
2. **Teleconferencing** is the substitution for business trips. It requires a substantial investment in premises and transmission equipment.
3. **Tele-shopping** involves the use of telephone and facsimile, as well as videotext, to shop and purchase items without physically travelling to the place of sale.

Specialised applications such as telebanking or computer bookings for sporting and art events and travel will lead to a small reduction in the number of trips made.

The use of **advanced electronic systems** to control vehicle movements on major roads, and fitting vehicles with intelligent cruise-control guidance and collision-avoidance systems would increase road capacity and road safety in traffic peak hours.

5.4. Charging for road use

To constrain the use of private cars on congested roads the use of radical mechanisms such as charging for road use is recommended. The road pricing system applies the user-pay principle to make a car driver think whether or not to use the controlled road.

The simplest way of levying the charge is at a toll-collection point, provided that space is available for queuing vehicles. Alternatively, special licenses can be pre-purchased which allow access onto the controlled roads. Technology is also available which uses electronic number plates on the vehicle. When the vehicle enters or leaves the controlled road system, a central charging computer is activated (similar to telephone charging). Also, a contactless smart-card (with prepaid stored value) is used, mounted on a vehicle's windscreen, so that the charge can be automatically deducted each time it passes a toll point. The advantage is that personal privacy is protected since it requires no record of a vehicle's whereabouts.

6. CONCLUSION

Starting from the consideration that traffic is regarded as the basis for the future development of cities, the strategic priorities need to be assessed.

Among the strategic priorities that should match the significance and function of each section of the traffic system, public demand, and urban economic and "green" strategic aims, the emphasis is on the need to:

1. remove through traffic from the pedestrian city centre, by constructing inner and outer ring roads, linked with the centre by underground rail
2. improve public transport that would meet the passenger requirements and offer attractive alternative for car use, including improvements in existing transport means by introducing priority signals, stops with better and immediate information, and expansion of the park-and-drive program
3. design stops adapted to disabled persons, by lowering the carriageway, for people with damaged eyesight and platforms at stations for wheelchairs
4. reduce traffic in residential areas, high-quality environment for pedestrians, easy access to public transport and electronic traffic information.

The presented approach is used for the development of interactive features included in the preparation of the basic traffic planning strategy in cities with the emphasis on the use of public transport.

SAŽETAK

STRATEGIJA PLANIRANJA JAVNOG PROMETA U GRADOVIMA

U radu se razmatra strategija planiranja javnog prometa u gradovima kroz problem cestovnog i javnog prijevoza gdje je prisutna prometna zagušenost. Predočeni su pristupi i mjere za njihovo otklanjanje.

Cilj je organizirati promet u gradu s uređenim gradskim okolišem.

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