

MIR: An Infrastructural Concept For Urban Traffic Management

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ABSTRACT

This paper discusses the limitation of existing methods of reducing the traffic congestion, where width wise expansion of roadways has got limitations, which leads a solution of vertical expansion only. In considering this aspect, an approach for Multi Layer Roadway is suggested in a very comprehensive manner to overcome the problem in the present situation. Multi Layer Roadway is the concept in which the roadways are plying one above other in layers and at the same level parking places are provided at the level of each layer at intermittent required places to accumulate vehicles. Stair box is suggested near the parking lot for vertical movements of road user.

Keywords

MLR (Multi Layer Roadway), Infrastructure, traffic management

1. INTRODUCTION

Traffic congestion is a traffic flow phenomenon resulting from the interaction of supply and demand for transportation. The vehicular flow (i.e. demand) passing through a roadway (i.e. supply) of fixed capacity creates congestion. Due to rapid urbanization, the tremendous rise in number of vehicles is variably accompanied by ever increasing volume of traffic and intense traffic congestion on roads. Almost every city in our country is facing acute traffic problems in regards to accidents, delay, congestion, pollution and parking. These problems contribute not only for human lives but also loss of precious manpower and traffic congestion involves additional fuel consumption, ultimately results in financial loss.

2. WHAT IS TRAFFIC CONGESTION

It is a condition on any network as use increases and is characterized by slower speeds, longer trip times, and increased queuing. The most common example is for physical use of roads by vehicles. When traffic demand is great enough that the interaction between vehicles slows the speed of the traffic stream congestion is incurred. As the demand approaches the capacity of a road (or of the intersections along the road), extreme traffic congestion sets in, where vehicles are fully stopped for periods of time, is colloquially known as a traffic jam.

2.1 Necessity

Traffic congestion occurs when a volume of traffic or modal split generates demand for space greater than the available road capacity. There are a number of specific circumstances which cause or aggravate congestion; most of them reduce the

capacity of a road at a given point or over a certain length, or increase the number of vehicles required for a given throughput of people or goods. As width wise expansion of roadways has got limitations, which leads a solution of vertical expansion only. In considering this aspect, an approach for multi Layer Roadway is suggested in a very comprehensive manner to overcome the problem in the present situation.

Traffic congestion has a numerous effects:

- Wasting time of motorists and passengers ("opportunity cost"). As a non-productive activity for most people, congestion reduces regional economic health.
- Delays, which may result in late arrival for employment, meetings, and education, resulting in lost business, disciplinary action or other personal losses.
- Inability to forecast travel time accurately, leading to drivers allocating more time to travel "just in case", and less time on productive activities.
- Wasted fuel increases air pollution and carbon dioxide emissions contributing to global warming owing to increased idling, acceleration and braking. Increased fuel use may also in theory cause a rise in fuel costs.
- Wear and tear on vehicles as a result of idling in traffic and frequent acceleration and braking, leading to more frequent repairs and replacements.
- Stressed and frustrated motorists, encouraging road rage and reduced health of motorists.
- Emergencies: blocked traffic may interfere with the passage of emergency vehicles traveling to their destinations where they are urgently needed.
- Spillover effect from congested main arteries to secondary roads and side streets as alternative routes are attempted ('rat running'), which may affect neighborhood amenity and real estate prices.

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3. ALTERNATE SOLUTION

3.1 Road infrastructure

3.1.1 Junction improvements

Grade separation, using bridges (or, less often, tunnels) freeing movements from having to stop for other crossing movements

3.1.2 Ramp signalling,

'drip-feeding' merging traffic via traffic signals onto a congested motorway-type roadway

3.1.3 Reducing junctions

Local-express lanes, providing through lanes that bypass junction on-ramp and off-ramp zones

Limited-access road, roads that limit the type and amounts of driveways along their lengths

3.1.3 Reversible lanes,

where certain sections of highway operate in the opposite direction on different times of the day/ days of the week, to match asymmetric demand. This may be controlled by Variable-message signs or by movable physical separation

3.1.4 Separate lanes

for specific user groups (usually with the goal of higher people throughput with fewer vehicles)
Bus lanes as part of a busway system

3.1.6 Car pooling

Market-based carpooling with pre-negotiated financial incentives for the driver

4. SUPPLY AND DEMAND

Congestion can be reduced by either increasing road capacity (supply), or by reducing traffic (demand). Capacity can be increased in a number of ways, but needs to take account of latent demand otherwise it may be used more strongly than anticipated. Critics of the approach of adding capacity have compared it to "fighting obesity by letting out your belt" (inducing demand that did not exist before). Reducing road capacity has in turn been attacked as removing free choice as well as increasing travel costs and times.

Increased supply can include:

- Adding more capacity at bottlenecks (such as by adding more lanes at the expense of hard shoulders or safety zones, or by removing local obstacles like bridge supports and widening tunnels)

- Adding more capacity over the whole of a route (generally by adding more lanes)

- Creating new routes

4.1 Traffic management improvements

4.1.1 Reduction of demand can include:

- Parking restrictions, making motor vehicle use less attractive by increasing the monetary and non-monetary costs of parking, introducing greater competition for limited city or road space. Most transport planning experts agree that free parking distorts the market in favour of car travel, exacerbating congestion.

- Park and ride facilities allowing parking at a distance and allowing continuation by public transport or ride sharing. Park-and-ride car parks are commonly found at metro stations, freeway entrances in suburban areas, and at the edge of smaller cities.

- Reduction of road capacity to force traffic onto other travel modes. Methods include traffic calming and the shared space concept.

- Road pricing, charging money for access onto a road/specific area at certain times, congestion levels or for certain road users

- Policy approaches, which usually attempt to provide either strategic alternatives or which encourage greater usage of existing alternatives through promotion, subsidies or restrictions.

- Incentives to use public transport, increasing modal shares. This can be achieved through infrastructure investment, subsidies, transport integration, pricing strategies that decrease the marginal cost/fixed cost ratios, and improved timetabling.

- Cycling promotion through legislation, cycle facilities, subsidies, and awareness campaigns. The Netherlands has been pursuing cycle friendly policies for decades, and around a quarter of their commuting is done by bicycle.

- Telecommuting encouraged through legislation and subsidies.

- Online shopping promotion, potentially with automated delivery booths helping to solve the last mile problem and reduce shopping trips made by car.

5. MULTI LAYER ROADWAY: A CONCEPT

Multi Layer Roadway is the concept in which the roadways are plying one above other in layers and at the same level parking places are provided at the level of each layer at intermittent required places to accumulate vehicles. Stair box is suggested near the parking lot for vertical movements of road user.

5.1 Multi Layer Roadway and Parking

Existing flyovers fails to provide an alternate solution to the traffic congestion. Flyovers can only be used as the direct pass from one destination to another, which can not reduce the traffic congestion as such. Hence the need of Multilayer Roadway concept comes in picture, which comprises of roadways in layers (at least two layers) along with parking at Intersection space at the level of each layer. The suggested concept is applicable to road network within the city limit such as Commercial, Business area like CBD's.

The components of MLR (Multi Layer Roadway) are

1. Roadways in layers
2. Parking at each layer near Intersections
3. Stair Box

While moving through layer 2, parking zone with stair box for vertical movement of user which is provided at CBD (Commercial Business District) and at the required locations. For the provision of parking and stair box, cantilever slab type arrangement is suggested which is resting on piers. Stair box user from layer 2 to layer 1 or vice-versa will not put any

obstacle to traffic on layer 1 (ground level) as stair box is suggested along the pier.

5.2 Concluding Remarks

With Multi Layer System type of arrangement, unnecessary movement of vehicle on the road can be restricted. Such kind of arrangement is possible with the existing system of flyovers also.

This system is advantageous in the following manner:

It is most convenient to the users

This may be treated as source of revenue generation

Provides solution to the problem of traffic congestion

Minimise the rate of accident

Minimise the pollution due vehicular movement

Saves the travel time

Restrict unnecessary travel

This is only a concept that is introduced; it has further scope of advancement. This kind of concept is looked to be feasible by introducing actual planning and design at the time of implementation. It has got serious limitation on the application of this concept as it is applicable to the city roads of heavy traffic where horizontal expansion is restricted.

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