

Parking supply Management Strategy in Cities

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Abstract: *The ever-increasing use of private cars is a result of the improving standards of residents in town, availability of motor vehicle and their needs. Traffic planners today are faced with numerous needs for mobility of commuters in city. Thus one of the basic aims of the overall traffic policy is the reducing the volume of private vehicle travelling to an acceptable amount, the parking measures and strategies are used commonly as a means of achieving this goal. Parking facilities can be optimized through parking management strategies which are based on demand and supply. Various cities in developed countries have proved through applied past experiences that parking Supply management strategies have influence on the traffic regulation in town and help to reduce Traffic congestion. This study focus on parking supply management measures and its implementation in various cities.*

Keywords:

Parking, parking policy, Parking supply management strategy.

I. Introduction

The rapid urbanization in our cities has resulted in increase in travel demand. Private vehicles are proliferating at a very high rate and consequently resulting in high percentage of personal vehicle use to commute to almost every place. The automotive industry in India is the second fastest growing in the world. In 2009 121.63 million registered motor vehicles. 22 per vehicles per thousand population of India is the motorization rate which is very low than other developing throughout the world. (Dayal Sharma et. al., 2011). India has experienced tremendous growth rate in motor vehicle in recent years as shown below in *Table I*. In India, the average growth rate of motor vehicle was 9% per year in the country. In India, the largest majority of vehicles are found in metro cities. Number of vehicles in Indian cities is 40 million with a share 30% of the total vehicles in India (Singh, 2010). Chennai, Bangalore, Kolkata, Delhi and Mumbai with 15.2 million vehicles constitute 38% of total vehicles of important cities and 13 % of total vehicles in India. (Dayal Sharma et. al., 2011).

Car ownership is growing at rate of 10-15% per year. The growth rate of motorcycle is 17.4% during last 6 year. Private vehicle accounts for 30% of total transport in India. With increase in motor vehicle number there is increase in parking space requirement. (Dayal Sharma et. al., 2011) Our policies always consider that its limited availability of parking that contributes to road congestion in a city and thus emphasis is always given on increasing the supply of parking spaces, this

has been a major goal of conventional planning policy. While the available spaces are ample, it's the vehicles intending to use these spaces are very large in number resulting in wastage of fuel in searching for parking spaces generating congestion and pollution on city roads. Time is valued in terms of money in transportation studies, because some drivers are willing to pay for travel time saving. Parking policy measures not only affect the parking operational system but also generate impact on mobility and socio economic systems in the city. Furthermore, parking policies can be designed for improving mobility in urban areas and can be used to influence the accessibility of some zones by capping parking regulation.

Proper application of parking management can significantly reduce the number of parking spaces required in particular situation, providing a variety of economic, social and environmental benefits. Thus parking can be used as a tool to manage the overall demand in the city and its management can help to reduce number of personal vehicle use and encouraging public transport usage. This paper consist a study on parking supply management strategy and also focuses on assessment of these strategy in various city of the world.

II. Parking Management and its Benefits

It refers to policies and programs that result in more effective use of parking resources. When properly applied, parking management can significantly reduce the number of parking spaces required in a particular situation, providing a variety of economic, social and environmental benefits. Improved management is often the best solution to parking problems. Parking management is necessary as vehicles are parked for 23 hours each day and also more parking in city invites more cars causing huge traffic jam on road. (Kadiyali, 2013). To reduce this traffic jam, large sum of funds are spent to create more infrastructure and parking lots. Thus appropriate application is necessary to reduce congestion. There are various benefits that can be gained by proper management of parking, this are facility of cost saving, improved quality of service, more flexible facility location and design, revenue generation, reduces land consumption, supports mobility management as well as transit, supports smart growth, it also improved walkability, educes storm water management costs, water pollution and heat island effects, supports equity objectives and creates more liveable communities. (Litman, Parking Management Strategies, Evaluation and Planning, 2006).

III. Various effective Parking Management Strategy

The main strategies for parking management fall into four categories economic mechanism, Regulatory mechanism,

Physical Design and quality of service. This is also classified as strategies that reduce parking demand and strategy that increase parking facility efficiency and support system.

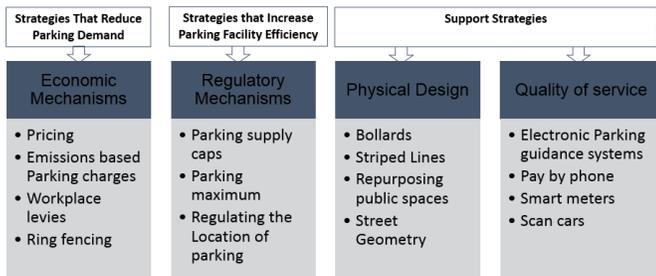


Figure 1: various effective Parking Strategies

Strategies that reduce parking Demand (Economic measures)

Mobility management

Mobility Management inspires more effective travel patterns, including changes in mode, timing, destination and vehicle trip frequency. Total reduction is around 10-30%. It is also called Transportation Demand Management which is general term for strategies that increases transportation system efficiency by changing travel behaviour (VTPI, 2005).

Parking Pricing

The motorist using parking Facility has to pay fees which is known as parking price. (Litman, Parking Managementstrategies, evaluation and planning, 2016). It may be executed as a parking management strategy (to reduce parking problems), as a mobility management strategy (to reduce transport problems), to recover parking facility costs, or to increase revenue for any purpose such as improving public transportation and footpath facilities.

Improve pricing Methods

There should be use of better charging techniques to make pricing more convenient and cost effective.

Financial Incentives

Commuters are offered financial benefits for reducing their Private vehicles trips. This help to reduce parking demand by providing various type of incentives like *Parking cash-out*, *Transit benefits*, *Universal transit passes and discounted or preferential parking* for rideshare (carpool and vanpool) vehicles. There is typical reduction in private vehicle use by 10-30%. (Litman, Parking Managementstrategies, evaluation and planning, 2016)

Unbundle parking

Parking space is rented or sold separately, rather than automatically included with building space. Typically there is reduction of 10-30% in private vehicle use. (Litman, Parking Managementstrategies, evaluation and planning, 2016)

Smart growth

This form of strategy encourage more compact, mixed, multi-modal development. Parking management reduces the amount of land required for parking facilities, reduces private vehicle

use and increases infill affordability. (Litman, Parking Management Strategies, Evaluation and Planning, 2006)

Bicycle Facilities

Walking and cycling supports parking management strategy in several ways like improvement in NMT options encourages transit use, since most transit trips involve walking or cycling links and also allow these modes to substitute for some automobile trips. Improvement in walkability increases “park once” trip that is vehicles are park in one location and walking rather that driving is prefer to each other destination. (Litman, Parking Management Strategies Evaluation and Planning, 2013).

Strategies that increase parking facility efficiency (Regulatory mechanism)

Shared parking

The parking facility in this serves multiple users or destinations. This parking management strategy is most successful if destinations have different peak periods, or if they share patrons so motorists park at one facility and walk to multiple destinations. (Litman, Parking Management Strategies Evaluation and Planning, 2013) (Litman, Parking Management Strategies, Evaluation and Planning, 2006).

Parking regulation

Regulations encourage more efficient use of parking facilities, it control who, when and how long vehicle may park at a particular location in order to prioritize facility use.

More accurate and flexible standards

In this parking standards are adjusted more accurately reflect demand in a particular situation.

Parking maximum

An upper limit is set on parking supply, either at individual sites or in an area, this is known as Parking Maximum. Area-wide limits are called *Parking Caps*.

Remote Parking

It refers to the use of offsite parking facilities. Usually this involves shared facilities such as office workers parking at a restaurant parking lot during the day, in exchange for restaurant employees using the office parking lot evenings and weekends.

Increase Capacity of Existing Parking Facilities

Utilizing existing parking space with its full capacity. There are various ways to increase parking facilities like using wasted areas, using mechanical garages, use of valet parking during busy periods (This can increase parking capacity by 20-40% compared with users parking their vehicles). (Litman, Parking Management Strategies Evaluation and Planning, 2013)

IV. Application of various strategies in combination in various cities

Combinations of strategies are adopted in cities to achieve various goals such as Emissions Reduction, Congestion Mitigation, Alternative Mode Promotion Optimal Curbside

Visitor Turnover, Prioritized Residential Parking etc. Thirteen different cities are examined, based on the variety of measures they use to decrease vehicle kilometers travelled and shift travel

from car trips to other modes of transport. Table 1 outlines which policy instruments have been applied in each city.

Table 1: various combination of strategy in various city to achieve various goals

	Amsterdam	Antwerp	Barcelona	Copenhagen	London	Munich	Paris	Stockholm	Strasbourg	Zurich	Seattle	Tokyo	Hong kong
Pricing Mechanisms													
Curbside Charges	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓
Progressive Fee Structure		✓								✓	✓		
Off-Street Price Harmonization		✓	✓						✓			✓	✓
Residential Permits	✓	✓	✓		✓	✓	✓	✓					
Workplace Levies											✓		
Ring Fencing			✓		✓							✓	
Regulatory Measures													
Supply Caps	✓												
Minimums	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
Maximums				✓						✓			✓
Transit Based Min/Max Reductions	✓	✓			✓		✓		✓	✓			
Access Bans			✓										
Emissions Reduction Goals	✓			✓			✓			✓			
Public-Private Partnership		✓	✓		✓	✓	✓	✓			✓		
Physical Designs													
Bollards	✓						✓						
Striped Lines				✓	✓			✓					
Repurposing Public Space	✓		✓	✓			✓		✓	✓			
Advanced Technologies													
Electronic Parking Guidance Systems			✓			✓	✓		✓	✓		✓	
Smart Meters							✓				✓		
Pay-by-Phone	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
Scan Cars	✓												

Source: (Hermann, 2011) (ITDP, 2012)

V. Travel Demand management modes

There are various strategies of travel demand management measures that has been defined between two management modes: one is parking supply management and other is parking demand management. The two basic function within travel demand are strong compulsion through restriction on parking space availability and other is the factor of cost. Parking supply management measures are discussed in detailed with its applications and case study. The six basic management strategies are explained further in Detail.

Stimulating priority of parking

Desirable parking spaces are set aside for desirable vehicles. Incentives are provided for desirable mode by allowing access to close in, covered, secure or otherwise attractive parking spaces. This can be applied both on and off-street, but most commonly applied off-street. It is can be applied in public or private parking facilities. It is especially appropriate in lower density where the transit options are minimal. (TDM Status Report, 1995).

Reducing minimal parking requirements applied to New constructions

There is Restriction on private non-residential parking i.e. to reduce the parking supply in certain areas. The control on parking supply is exerted through zoning code. Mixed uses are available or planned where parking supplies can be shared. Commercial and public parking is well utilized, thereby limiting opportunities for parkers to simply shift parking locations as supplies are tightened and denser urban areas. (Adolf Malic et.al, 2000)

Maximum parking needs applied to new constructions

In this huge parking supply is ensured using construction regulations. It is applied to areas of low build-up density, where public transport is poor or insufficient.

Control of overall parking supply

Limit total supply of parking in an area. The local authorities can control the whole available parking supply, by prohibiting the construction of detached garages and surface parking places, and stipulate the construction of new facilities without parking spaces, and revise the prices for buildings for public purposes. It is applied in residential as well as commercial areas in dense area.

Parking time restrictions

It regulates parking time on street. It is usually applied together with other strategies combined with an efficient penalty system. It is one of the efficient method to control on street parking and also increases turnover.

Park and ride system (peripheral parking, combined with public transport).

Parking on the periphery of downtown or activity centres served and shift in the modal split in favour of public transit. There should be sufficient capacities of parking lots and efficient public transport. The implementation of this strategy also depends highly on the careful parking service pricing that can be solved through a unique tariff system of the public transport. It can be applied to peripheral areas of the central city zone or a zone of high built-up density served by good public transport, whereas the zone itself is usually of low built-up density.

VI. Best Practices

Parking supply management measures examples are studied in details along with its issues and practice followed in the city as shown in table 2.

Table 2: Best Practices

City & its Problem	Practice in that City
<p>Amsterdam Air pollution Use of Private vehicles Congestion</p>	<ul style="list-style-type: none"> • Have Short term parking zones • The residents of any area can be allowed to park in a nearby parking facility in areas like 10-cent zones by paying appropriate fee (annual or one time) only between 7pm and 9am. • Incentives for Car sharing vehicles and fuel efficient/eco-friendly vehicles exist here also. • Pay-by-Phone system is available in Amsterdam. Public Transport passes for parking vehicle in Park & Ride facilities
<p>London Increase in vehicle ownership High cruising time Traffic congestion Air and noise pollution</p>	<ul style="list-style-type: none"> • Changing Laws to Enable Controlled Parking Zones (CPZs implemented parking maximums rather than minimums) • Parking fee is too. Other Asian nations like China are imposing parking rates that are 6-20 times of the Indian parking rates • In London, the boroughs are advised to set curbside rates to achieve an 85% saturations rate. • A number of boroughs use the money from parking fees to fund the Freedom Pass program, which allows elderly (60+) and disabled residents to use public transit for free.
<p>Zurich Air pollution Use of Private vehicles Congestion Huge space under car parking</p>	<ul style="list-style-type: none"> • Implementation of district-wide parking supply caps which required provision of fewer parking spaces in areas served by transit. • The city increased its transit supply, prioritizing transit access over parking availability, and also introduced progressive parking price to ensure a high turnover of the existing parking spaces. • With new off-street parking, the equal amount of on-street parking must be eliminated.
<p>Barcelona City center congestion Huge space under car parking Increasing vehicle ownership</p>	<ul style="list-style-type: none"> • Launched an integrated parking program called Area Verde (Green Zone). Its purpose was to regulate visitor parking supply by limiting parking time with a pricing mechanism and by giving priority to residents. • Residential and preferential parking permits are also available. Residential permits allow residents in the Green Zone to park at a lower rate while preferential permits allow non-residents to park in exchange for paying the city's highest hourly rates. • Parking spaces are converted into motorcycle parking and Bicycling stations.

<p>Seattle Traffic congestion Air pollution</p>	<ul style="list-style-type: none"> • Performance based parking pricing is the approach of determining the parking pricing based on the available demand. The real time data on parking occupancy and turnover is used determine the parking fee.
<p>Mumbai High parking demand congestion</p>	<ul style="list-style-type: none"> • The parking should be restricted wherever the demand exceeds the supply • Parking standards shall be viewed once every Ten years. Necessary modifications shall be incorporated in the Development Control Regulations. • It is necessary to develop park and ride facilities at all public transport interchanges in the city.

VII. Conclusion

Recognizing that increased parking leads to increased driving, many cities, have implemented parking supply management measures to ensure smooth traffic movements and to reduce private vehicle use. The outcome of Parking supply management strategy will be a more rational utilization of the existing parking capacity in an area, lower vehicle kilometers travelled, less traffic congestion in dense areas, more efficient use of on-street space, and safer streets for all users. All these parking supply management strategies should be applied in combination, so that the parking problem can be handled in efficient way. In most of Indian cities, parking policy is either non-existent, poorly coordinated, or used to make driving more convenient. The primary goal of our parking policy has always been in supplying more and more spaces to park these additional vehicles. But the requirements has never met the limitless demand. In every Indian city today, with the search of parking space, every type of plots are getting converted to parking lots. Even grounds and parks are at high risk. Indian cities regulate the supply of parking spaces by minimum parking requirements and parking prices. NUTP 2006 suggest that the parking charges should be calculated based on the real estate value of the land on which the cars are parked and brining restrictions in supply of parking. At present India follows a parking minimum approach. Thus these measures should be adopted at policy level to improve road condition and reduce pollution.

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