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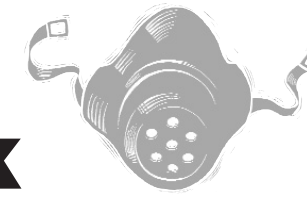
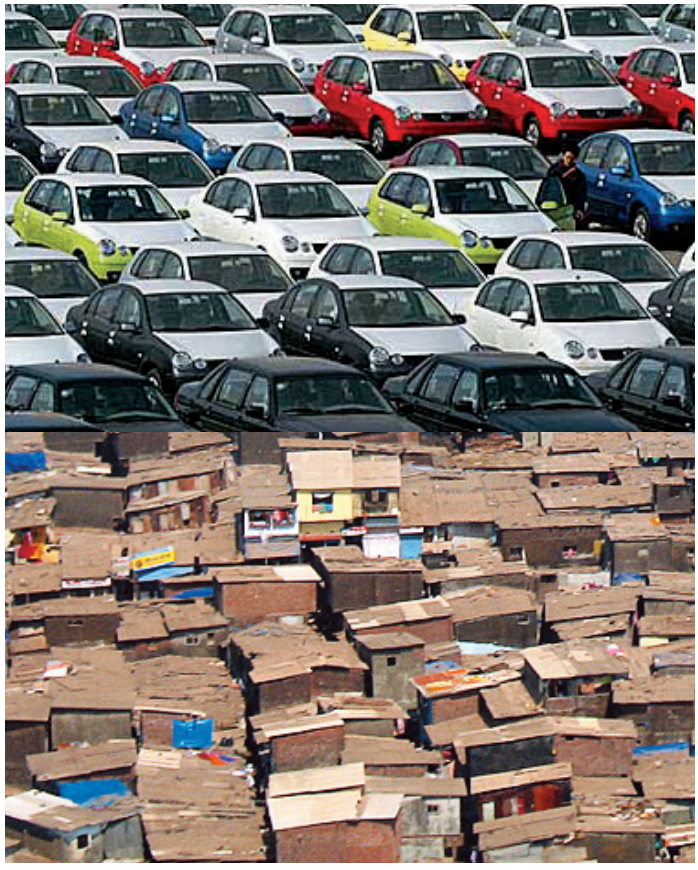


PARKING MEASURES TO ADDRESS MOBILITY CRISIS



RIGHT TO CLEAN AIR CAMPAIGN

2009

CENTRE FOR SCIENCE AND ENVIRONMENT, NEW DELHI

CONTENTS

WHY THIS STUDY?

Despite being one of the most polluted cities in the country, Delhi has succeeded in arresting the runaway air pollution. Early action to control air pollution in nearly all sectors has helped in this turn around. Delhi has relocated polluting industries, and introduced Euro II and Euro III emisssions standards for vehicles. All its buses, three-wheelers and some of its taxis and cars run on CNG; 15-year old commercial vehicles have been taken off the roads; transit freight traffic is restricted and controls on power plants are tighter. There is also a legal ban on open burning of leaves.

However, despite the cleaner air, Delhi is far away from the clean air goal. The air quality data still point towards the unhealthy levels presenting a serious public health challenge. Delhi, in fact, is on the verge of losing the gains of its first phase of action. Meeting clean air standards presents a very difficult challenge.

The air pollution challenge remains difficult in Delhi and many other Indian cities mainly because of the failure to address the explosive increase in vehicle numbers that threatens to undo the small incremental gains. Car numbers are exploding when more than half of our cities are reeling under pollution levels that are officially classified as critical. Direct exposure to traffic fumes is amongst the deadliest of the health threats.

The speed of this change is scary. It took as many as 30 years for India to reach the first million mark for personal vehicles in 1971. After that another 20 years to add two more million. Then in 10 years (1981-91) India added 14 million; another 10 years (1991-2001) 28 million. But in this decade just in four years (2001 to 2004) 16 million vehicles were added. Delhi today adds nearly 1100 vehicles a day. This means air quality will only get worse, energy use will go up, and cities will grind to a stop due to congestion. The cost of congestion in Indian cities is conservatively estimated at Rs 3000 to Rs 4000 crore annually.

More roads are not the answer. Delhi as the capital city of India is most privileged to have more than 21 per cent of its land area dedicated to roads; total road length has increased by about 20 per cent since 1996. And yet the city is gridlocked. Traffic speed and road availability per vehicle in Delhi has dropped over time, despite road widening and flyovers. Vehicles can soon exhaust physical and ecological space in cities. The story is repeated across the big and small cities of India.

We still have the time to act and prevent the future explosion. If we plan alternative mobility systems we can avoid car centric growth. Indian cities already have a huge strength in the usage of public transport and in its tradition of walking and cycling. If protected and improved India can take an alternative route and avoid huge emissions and oil guzzling. Buses that use less than 5 per cent of the road space, meet more than 60 per cent of the travel demand. Indian cities need mobility, not cars. Cars cannot meet the commuting needs of the urban majority.

Indian cities are at risk of losing their inherent strength due to wrong policies. The existing policies actually allow a hidden subsidy to personal vehicles as the costs of health damage, pollution, urban space for parking and roads, and other social impacts are not recovered through taxes and road pricing. Car owners do not pay adequately for the disproportionately high usage of road space or for parking. If parking charges are adjusted to reflect the costs of providing parking in cities, the rates could be 4 to 5 times higher than the current parking rates. Instead of correcting this distortion our government penalizes buses by taxing them higher than cars. In Delhi, a bus is charged roughly 43 times more road taxes than cars.

It is time to set a whole new terms of debate that can compel regulators to seek solutions not only to the pollution impact of transport, but also find a whole new way of organizing cities to improve the quality of urban life. Indian cities will have to reinvent the framework of mobility.

Globally, the governments are using a wide variety of policy measures to not only leapfrog to clean vehicle technologies, but also reduce the numbers and usage of personal vehicles. Congestion and road pricing, parking levers, tax measures to promote public transport and create disincentive for the use of personal vehicles. These approaches work on the simple principle — make these vehicles pay for the full costs of the ecological and social damages. Slow down the traffic growth to save energy, prevent pollution, and free cities from congestion.

Such action is already underway in other cities of the world. Asia's own legend, Singapore, has shown how beginning early with traffic restraint measures, even before the mass transit systems are in place, can effectively cap the car boom. These measures have shown results. Traffic volumes have reduced.

India cannot afford to delay these decisions any more. We need to re-design public policies to promote mobility for all — scale up efficient public transport and implement effective tax policies to restrain car use. Car restraint measures therefore, will have to be the key focus of the next phase of measures that are needed in Delhi as also in other Indian cities to address the pollution and congestion challenges.

Parking levers

Global experience bears out that parking management is one of the most powerful instruments to reduce travel by personal vehicles that also influence commuting choices in favour of public transport. Parking management when combined with appropriately priced parking, limit on parking space and improved access through other modes of transport, it is most effective in stimulating the switch from private cars to alternative modes of transport. There is, therefore, considerable opportunity in Delhi and other cities of India to develop parking policy as an instrument to decongest, shift commuter to public transport, and discourage car use.

This however, is not expected to be easy when the dominant thrust is on increasing parking provision to meet the insatiable demand for parking spurred by untamed motorization. However, it is possible to deepen public understanding and influence public opinion on this matter to bring about change. Already parking has taken the proportion of full blown mobility and social crisis in Indian cities. Parking devours scarce urban land, aggravates congestion, and pollution. Regular neighbourhood brawls, fist fights, even enraged killings over scarce parking spaces have escalated to a serious law and order problem in our cities. Parking crisis is an ugly manifestation of automobile dependence.

This study is an effort to improve public understanding of the challenges that parking of vehicles present and the ways parking regulations can be leveraged to restrain traffic in Indian cities. Parking levers must be applied to influence transportation choices in cities, decongest, and discourage car use.Findings of this study are revealing.

Parking entails enormous cost: Car boom is aggressively encroaching upon the scarce urban commons. If on an average three car spaces are assumed per car per day – at the residence, office, and shopping areas, then the current fleet occupies nearly 10 per cent of Delhi's urbanised area. The daily registration of cars (as on 2005) generates demand for 2.5 million sq m – roughly equivalent to 310 international football fields. At the current real estate value the land cost of providing parking of this magnitude is thus enormous. Transport planners consider 23 sq m of land as appropriate to park an average car. This means in a prime business district of Connaught Place the rent of such an area can be as high as Rs 36,000 per month. But the municipal laws in Delhi make cars pay a miniscule as "misuse parking charge" of Rs 4000 once for lifetime – not even one rupee per hour. If cities continue to opt for more structured parking it will make parking more expensive. The true cost of providing parking is thus never factored into the car dependent infrastructure that has begun to dominate cityscapes.

Hidden subsidy to rich car owners: The existing policy perpetrates hidden subsidy to rich car owners as the cost of using up scarce and valuable urban space for parking are not recovered through proper pricing and taxes. As available surface areas are becoming increasingly clogged with cars, city governments are now planning to build extremely expensive multistoried car parks in prime areas. While this increases the cost of providing parking manifold, — nearly Rs 4 lakh to 6 lakh per car space as opposed to near free surface spaces, there is no plan to recover the full cost from the car park users. Instead, to keep the parking rates cheap nearly 30 per cent of the parking structures are being allowed for other commercial activities so that profit and rent from this can further cross subsidise parking fees. Parking fees can then remain at Rs 10 per hour instead of full cost rates of Rs 30-39 per hour. Even that minimal increase to Rs 10 per hour may hit roadblock as the willingness to pay for parking among car owners is very low as people have got used to paying paltry for using high cost services.

Flawed pricing fails to reduce congestion: Without a pricing and a management strategy the capital intensive parking structures can remain grossly underutilised and the basic objective of reducing parking congestion can not be met. Our survey shows that the existing structured parking facilities in Delhi and Mumbai remain nearly empty due to disparity in parking rates for surface and structured parking. Despite the high demand for parking in busy commercial places these structures remain nearly empty. This issue must be addressed in the early stages of planning to prevent wasteful investments. Nor is there any management model to use these structures to curtail surface parking to reduce congestion in the vicinity. Yet taking steps to correct pricing is not an impossible task as is evident from Kolkata that has one of the highest surface parking rates – Rs 7 per hour – among the metros, and also shows better utilization of its multilevel parking structure. Worldwide experience shows that appropriately priced parking can influence demand for parking and commuter choice for alternatives.

Need parking policy as car restraint measure: The world over it is recognised that demand for parking is infinite and any amount of supply cannot meet this demand. Additional measures are needed to control car growth and usage and parking levers can be effective in dampening the demand. From that perspective it is important to

rethink the strategy on multilevel parking in India. These should be integrated as far as possible with the interchange points of the public transport networks to encourage park and ride and thus remove congestion from the commercial hub. Civic agencies must plan to improve access to the commercial sites through improvement in public transport, and at the same time cap parking supply through actual physical restriction on further expansion of parking and also by pricing parking high. This is most effective in stimulating the switch from private cars to alternative modes of transport.

Other governments have begun to act: Global experience bears out that parking management is one of the most powerful instruments to reduce travel by personal vehicles that also influence commuting choices in favour of public transport. The big cities including Portland, Seattle, Bremen, San Francisco, New York, Tokyo, Bogota among others have hiked parking fees and limited parking supply to dampen parking demand and reduce car usage. Hong Kong, Bogota, Singapore etc have also gone much further ahead to improve public transportation.

Though many cities of the world have experimented with different types of parking strategies, it is still very difficult to find a perfect and `one size fits all' strategy. An appropriate combination of measures will have to be customised to meet the local requirements and imperatives. These strategies that largely hinge on pricing of parking provision and innovative management of the available parking spaces must be designed in an integrated way. At the same time supplementary measures are needed to improve access and connectivity through improved public transport so that overall parking demand can be further reduced.

THE WAY AHEAD

Parking demand is gregarious, aggressive, and insatiable. No amount of parking provision can help to satisfy the growing demand. Therefore, parking provision should work on the principle of parking restraint to put brakes on car growth and usage. Provide parking not to incite more demand but manage and restrain its provision to discourage people from using personal vehicles. The future roadmap should hinge on this principle.

The detailed assessment of the parking problem in Delhi underscores that a combination of strategies are needed to develop parking policy as a decongestion measure and to reduce the overall demand for parking. Parking policy has the potential to be an effective first generation car restraint measures in Indian cities as they already have some system of providing and organising parking.

The recent announcement from the Union ministry of Urban Development in January 2009 on the funding scheme for purchase of buses and urban transport systems under the Jawaharlal Nehru Urban Renewable Mission (JNURM) has created a mandate for cities to develop parking policies as a car restraint measure. To be able to access this fund the city governments will have to give commitments to initiate institutional reforms for public transport management and implementation, create dedicated funds from revenues from variety of sources including higher taxes on personal vehicles and diesel cars, among other measures. The key conditions include parking policy wherein parking fees represent the true value of the land occupied; which is used to make the public transport more attractive; bans parking on arterial routes; and multi-level parking centres are used more as park and ride facilities etc.

This is an opportunity for the cities to prepare the blue print for the parking

DELHI TAKES THE LEAD

The New Delhi based Centre for Science and Environment (CSE) presented a statement of concern to the Supreme Court in 2004 in the ongoing public interest litigation on air pollution in the national capital region of Delhi. The statement noted that the implementation of the first generation policy measures implemented between 1998 and 2002 that included one of the largest ever CNG programmes, advance enforcement of Euro II emissions standards for all vehicles, lowering of sulphur content in fuels to 500 ppm, and phasing out of 15 year old commercial vehicles, — have helped to lower pollution levels. But the city's air remains highly polluted. Therefore, the 'breathing space' that Delhi gained can be lost if the future roadmap for pollution control in the city is not set immediately. There is need for consistent, sustained, and aggressive strategy to lower emissions from the fast burgeoning vehicle fleet in the city.

CSE, therefore made a strong demand for an action plan to control vehicle numbers and usage and augmentation of public transport to supplement the technology improvement process. The Chief Justice bench admitted this statement of concern as an interlucotary application and served a notice to the Delhi government directing it to formalize a strategy to control the number of vehicles and congestion. This gave an opportunity to focus attention on travel demand management measures. The Supreme Court appointed Environment Pollution (Prevention and Control) Authority (EPCA), recommended to the Supreme Court in November 2004 that a parking policy be framed as one of the priority car restraint measures in Delhi.

The Supreme Court on April 8 2005 directed the Chief Secretary of the Delhi government to discuss the matter with all concerned so that a proper parking policy could be placed before the court by July 15, 2005. The government of Delhi submitted a draft report on parking policy to the Supreme Court in July 2005. The review of this draft policy revealed that the policy had not recognised the merit of integrating car restraint and congestion reduction principles and it was predominantly focussed on unlimited increase in supply of parking space in both public and residential areas. The only proposal that came close to limiting car use was, linking of vehicle registration with availability of owner parking facility in residential areas. Clearly, the policy proposals needed reassessment to provide a stronger policy and enforcement framework for it to be an effective traffic restraint measure.

Taking note of these criticisms the EPCA report of November 2005 recommended integration of traffic restraint principles. Therefore, while finalising the draft policy in March 2006 the Delhi government took on board the recommendation — "Focus on demand management through parking control and pricing rather than increasing supply". Though there is now a broad agreement among the key civic development agencies in the city that parking policy should also act as a demand management instrument, initiatives are not strong enough to develop specific management and pricing strategy for application of this principle.

policies. It is therefore important the parking policies in cities reflect the following principles:

Utilise parking facilities to improve usage of public transport and non-motorised public transport: The new parking structures should be used innovatively to improve usage and integration of public transport. Locate parking structures close to the interchange points of the public transport nodes like metro and bus stations, and, use them for park and ride system to reduce pressure in the commercial centres. Link them with the targeted commercial areas with feeder services that include three-wheelers, cycle rickshaws, small buses or easy pedestrian ways.

Improving access and connectivity of places through improved public transport

that can reduce overall parking demand. Ticketing system of public transport should incorporate park and ride component. Parking rates should favour intermediate transport including three-wheelers and taxis and also non motorised vehicles. Review the proposed sites for the multi level parking structures to see to what extent these can be located at or close to the public transport interchange nodes with a good feeder system that links the key commercial destinations. This can help to decongest the busy commercial areas. Free shuttle buses and free transit service connect destination with remote parking facilities. These facilities can also be developed as an overflow parking plan and other special event transportation management. Taxis and three-wheelers can play an important role in the feeder system for park and ride system.

Free parking should be minimised or eliminated: It is important to eliminate or minimise free parking. Pricing of parking should be based on user pay principle and aim to go for full cost pricing. Use pricing in a manner that it reduces peak demand, and congestion in convenient places. Experts point out that parking charges gradually make urban road users aware that driving within city cannot be free.

Use variable rates more widely to reduce peak demand: Parking fees should be designed to target the peak hours and peak demand to influence commuter choice and open up options. All municipal agencies must develop variable parking fees according to commercial importance of areas; according to duration of stay to reduce peak demand; according to weekdays when demand is high, and weekends when low.

New Delhi Municipal Council (NDMC) has started enforcing graded fee structure. There is no reason why other agencies cannot develop similar systems. This strategy should be developed on a city-wide scale. Civic agencies in other cities should begin to evolve similar pricing strategies.

Also discourage payment of parking rates as a fixed annual amount to replace graded fee structure to be paid on usage. Annual payments will defeat the purpose of using parking rates as a demand management tool. This will grossly underprice parking of personal vehicles and act as a subsidy for the car owners.

Parking rates should be lower at park and ride sites to influence commuting choices: With park and ride system the long term parkers who are largely the office goers will not crowd at the commercial centres but utilise long distance parking facilities. The proportion of the short-term and long term users vary from site to site though the short-term users dominate in most sites. The longer term parkers (employees and employers) should be encouraged to use parking that are located at some distance from the work place, but connected with a good feeder service. These can be priced lower than the convenient places located close to the work place. This will also encourage long-term parkers to shift to public transport. Short-term users who are largely shoppers and visitors prefer convenient spaces close to the work place and these spaces are priced higher. Limiting parking duration for short-term users can also ensure higher customer turnover rates for local businesses and also reduce local congestion. Ticketing system of public transport should incorporate park and ride component. Parking rates should favour intermediate transport including three-wheelers and taxis and also non-motorised vehicles.

Need parity in rates of surface parking and structured parking. For the first time Indian cities are making a transition from lowly priced or free surface parking to cost intensive structured parking. If the cost of the investment in the structured

parking is recovered through higher parking fees, it will have significant impact on parking rates in the city. This upward revision is important to recover the cost of investment and also to reduce parking demand. Investment in these structures cannot continue unless there are clear plans on pricing. Moreover, this will require some revision of the surface parking rates for optimal utilisation of both. Higher parking rates in the structured parking lots will widen the gap with the current surface parking rates manifold. In this regard the following will have to be addressed:

- Rate of parking on surface and multilevel structured parking be brought to equivalent, or near parity rates. Civic agencies should develop a management model to ensure that parity works. In Delhi it is estimated that parking charges based on full cost pricing can increase parking charges in the multilevel parking lots to Rs 30 to Rs 40 per hour. In the initial stages NDMC has proposed to fix the rates at Rs 10 per hour. If this becomes the minimum floor price in the structured parking lots then the civic agencies must work out parity with the rates in surface parking lots and also develop a roadmap in advance for progressive increase in parking rates over time to reach full cost pricing and to allow the market some time to adjust. A phase-in plan will also enable the commuters to adjust.
- Use regulatory measures such as restrictions on total numbers for parking on surface and congested on-street parking so that structured parking is optimally utilised. Pricing distortions can lead to under utilisation of the capital intensive parking structures as has been noticed in some sites in Indian cities.
- Parking pricing should influence commuter behaviour in favour of public transportation and lower parking demand. Graded rates should also be introduced according to the commercial importance of the site.

Surface parking, especially on street parking should be progressively curtailed in areas where structured parking is being constructed.

Develop metropolitan wide parking fee system. Incorporate a metropolitan-wide view for regulating parking that must cover both commercial business districts (CBD) and non-CBD area. Though the rates in the CBD areas are expected to be higher than the non-CBD areas, maintain parity within zones. Or it may end up shifting parking demand and affect business in the regulated areas. The rates will have to be fixed according to the commercial attractiveness of the area as classified by the civic bodies. Also tightening of parking measures without improved access will be politically difficult to implemen.

Enforcement of norms: At this stage even the minimum provision of parking in buildings as per the norm of the Delhi Development Authority under the Master Plan 2021 are not adhered to. Spaces to be allotted for parking in buildings are diverted for other uses or are not built. As a result, there is a huge spill over on the roads. After ensuring that norms are implemented, use regulations effectively to ensure that they are utilised and spill overs are prevented.

Reassess parking standards for future application: Delhi and most other cities normally set a minimum parking standards. But as improved parking pricing policy comes into full effect and parking management begins to work in tandem with public transport augmentation plans, the city governments should begin to consider need based flexible parking standards for different locations and also capping of the provision of parking. This will help to prevent oversupply and wastefulness. Develop parking inventory, current parking utilisation pattern to identify area of deficit and then develop an integrated parking policy to identify

specific measures, tasks, responsibilities, budgets and schedule. These detailed systems are needed to develop a plan to limit parking supply.

While developing these policies a higher level of restraint can be applied to areas with good public transport accessibility whereas a lower level of restraint can be applied to areas with poor connectivity. This process can be dynamic. Examples from other countries show that with improvement in connectivity of sites with parking deficit actually turn into surplus. Mobility management programmes often reduce parking demand, and many parking management strategies help reduce vehicle traffic or support other mobility management objectives. Even as the parking provision is made to meet the basic requirement simultaneous effort should be made to limit the parking supply to restrain car use.

Promote efficient utilisation of existing spaces: Surface parking will continue to remain the cost effective model of parking in Indian cities. Field assessment shows that the present parking contractors are utilising the available spaces very effectively and maximising earnings from it. But there is still further scope of qualitative improvements and there is considerable international guidance on this matter that can provide the basis for such improvements. However, surface parking, especially on street parking should be progressively curtailed in areas where structured parking is being constructed. Promote shared parking for maximum utilisation of existing spaces. As far as possible parking spaces should be managed as common areas. For instance, Victoria Transport Policy Institute (VTPI) in Canada gives practical suggestions — use currently wasted areas (corners, edges, undeveloped land etc). This can be particularly appropriate for small car spaces, two-wheelers and bicycles.

Reviews also point out that where there is adequate street width, shift from parallel to angled street parking helps. Maximise the number of on-street parking spaces by using a curb lane for parking during off-peak period and keeping small spaces for two-wheelers. Encourage two-wheelers to share parking spaces. Use valet parking, particularly during peak time. This can increase parking capacity by 20 to 40 per cent compared to users parking their vehicles. Identify sites where on-street parking will either have to be restricted during peak hours or all day parking. On-street parking on key arteries will have to be curtailed to reduce congestion.

Siting of commercial complexes and shopping malls need careful review to prevent spillovers and congestion: Cities are witnessing massive boom in the construction of mega commercial complexes that induce huge traffic, increase parking demand and congestion in the neighbourhood. It is very important to review the siting of these structures to prevent such fallouts. Often these complexes lead to massive spill over in the surrounding roads that lead to more congestion. This aspect should be thoroughly reviewed in the environmental impact assessment that are carried out for complexes spanning over 20,000 sq meters. Such complexes should not come up in high density traffic corridors and along main arteries. Special measures are needed to review appropriateness of siting of large commercial complexes that generate enormous traffic and parking needs well beyond the capacity of the site.

Develop parking strategies for residential areas: Parking provision in most residential areas are very ad hoc and in most cases the building bylaws that define the parking norms are not met. This often goes awry due to multiple ownership of cars and densification of the residential units. Often car numbers exceed the available parking spaces. In some areas of Delhi residential areas have opted for self regulation. There is considerable scope for application of wide ranging parking

strategies that can meet parking demand and at the same time reduce cars. Develop innovative strategies for residential parking that while meeting the basic demand puts brake on multiple ownership of cars by families. Discourage as much as possible captive use of parking spaces by individual owners. Common and shared parking lots should be encouraged.

Globally, one of the most effective strategies for restraining car usage has been linking of registration of personal vehicles with the availability of space to park personal vehicles. This can be combined with appropriate pricing. Indian cities can begin to look at a special parking pricing stategies for controlling multiple car ownership.

Special challenge of mixed land-use areas: This is the most daunting challenge in Indian cities. Most Indian cities have dense mixed land-use areas that makes Indian cities compact and amneable to public transit oriented growth. In countries like Singapore mixed land-use areas are well planned. But in Indian cities these have grown in unplanned manner. But parking pressure is one of the most important cause of congestion in these areas. A variety of strategies are possible. If space is available then common structured parking structures can be created in the neighbourhood. But this should not happen at the cost of sacrifising green areas that are essential in residential neighbourhoods. To maximise usage of the available parking spaces the thrust should be on treating the parking areas as common area and are shared instead of holding the parking spaces captive for individual usage. Also consider promoting pedestrian walkways linked with distant parking to restrict entry of non-resident cars in congested stretches. Non-motorised vehicles can play an important role here.

Improve management coordination and enforcement

Create institutional interface to address parking pricing, management and parking regulations and enforcement across jurisdictions in a composite manner. Ultimately, the traffic management authority should be able to effectively enforce a restrictive parking policy, to collect parking fee, and to fine offenders. Any institutional weakness can undermine the entire initiative.

Reinvent mobility: The ultimate solution

Cars are overwhelming the urban space and road infrastructure. They have eroded public spaces and urban commons to meet the insatiable need for roads and parking. Cars are locking up enormous resources to provide mobility to a minority – bringing in their wake unacceptable social inequity and pollution. Public transport, pedestrians, and cyclists are the immediate victims of this car mania. This car dependency can be reversed with right policies. City governments can discourage car usage while improving access to more sustainable forms of transport. Cities need to build and expand public transport: The only way out of the congestion mayhem is to massively augment public transport so that the road space can be used more efficiently to carry more people and at greater speed. Integrate all modes of transport to maximize access to public transport systems and its usage. Cities need tax and road pricing measures that will actively discourage car usage. Within this larger framework parking controls can discourage use of personal vehicles and provide incentives for shift to more sustainable forms of transport.

Sign post

It is becoming increasingly clear that the challenges of parking are still not well understood in India. It is therefore important to deepen and broaden the policy understanding of these issues as considerable pressure is building up to invest and

expand parking capacity in the city to meet the phenomenal increase in parking demand.

This has spurred *Right to Clean Air Campaign team* in CSE to assess the magnitude and the nature of the problem to identify the challenges and principles for developing parking policy and regulations as a decongestion measure.

— Right to Clean Air Team

1. THE CRISIS

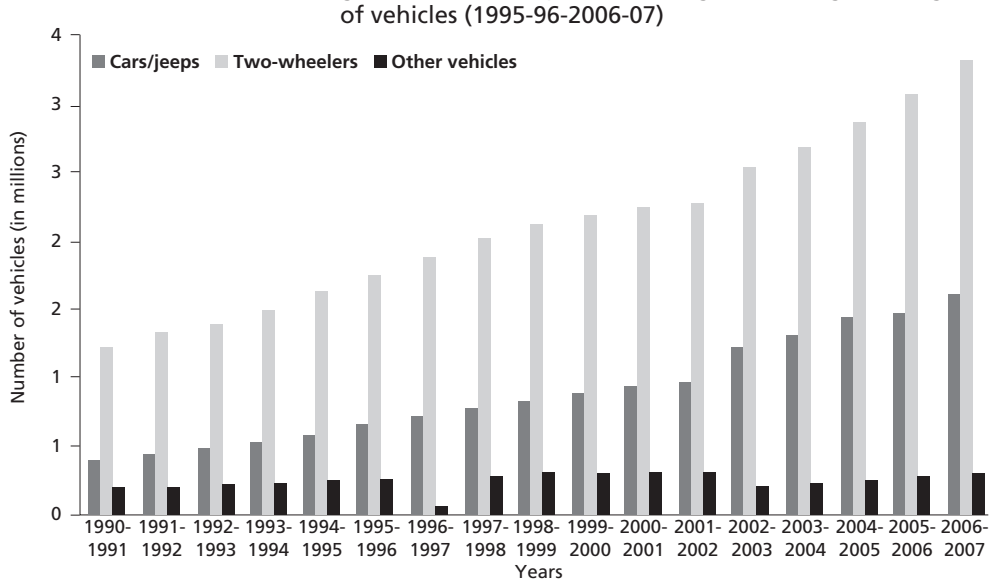
Vehicle numbers are growing rapidly in Delhi and other Indian cities adding to the insatiable demand for parking. With this the clamour for land to park cars and two-wheelers in their multiple destinations has become more intense.

Delhi has more than 5.2 million registered vehicles. It is now adding nearly 1100 vehicles each day. The bulk of these vehicles are personal – about 963. This is almost doubling of what was added in the city in 2000-2001. The growth rate has been substantially higher for personal vehicles (see Graph 1 A and 1B: *Increase in personal vehicles in Delhi, Rising personal vehicle ownership*).

The impact of this growth is already visible in choking congestion on roads. Delhi is most privilaged to have the maximum share of its land area – about 21 per cent, under road network. Nearly 2,103 km of road length per 100 sq km area, which is much higher than the national average of 74.73 km per 100 sq km area. In one decade – 1995-2006, while the road length in the city has increased by about 20 per cent, cars have increased by 131 per cent (see Graph 2: *Availability of road length in Delhi*).

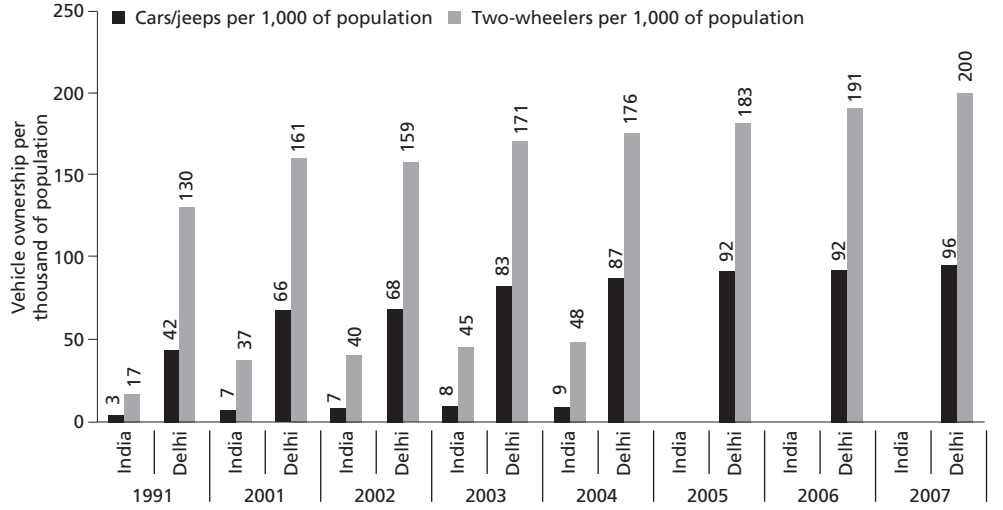
Graph 1A: Increase in personal vehicles in Delhi

Cars have recorded decennial growth rate of 92 per cent — highest among all categories of vehicles (1995-96-2006-07)



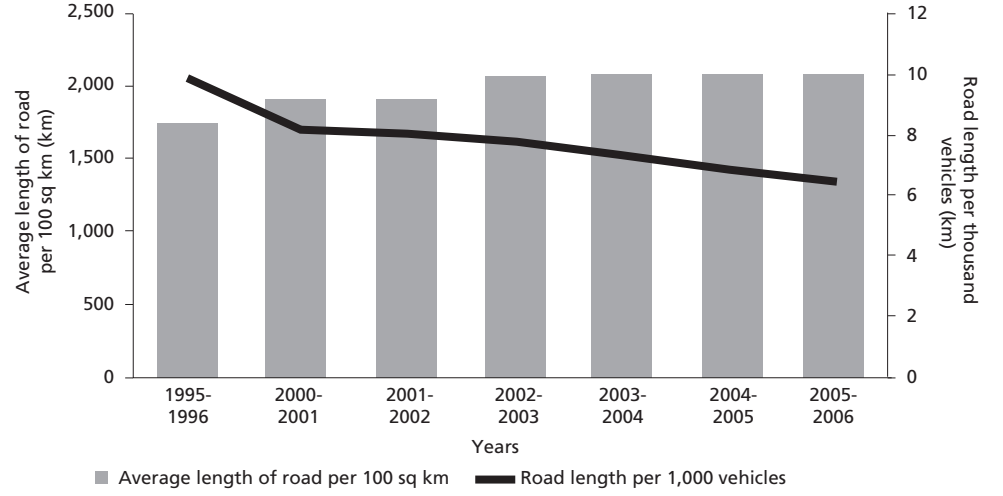
Note: Estimated from vehicle registration data of transport department, NCT of Delhi
Source: Anon 2000, Economic Survey of Delhi: 1999-2000, Planning Department, Government of National Capital Territory of Delhi; Anon 2004, Delhi Statistical Handbook 2004, Directorate of Economics & Statistics, Government of National Capital Territory of Delhi; Anon 2006, Delhi Statistical Handbook 2006, Directorate of Economics & Statistics, Government of National Capital Territory of Delhi, Anon 2007, Delhi Statistical Handbook 2007, Directorate of Economics & Statistics, Government of National Capital Territory of Delhi

Graph 1B: Rising personal vehicle ownership



Note: Vehicle registration data for India not available for 2005, 2006 and 2007.
Source: Estimated on the basis of the vehicle registration data and population data.

Graph 2: Availability of road length in Delhi



Note: Vehicle registration data of transport department, NCT of Delhi
Source: Anon 2000, Economic Survey of Delhi: 1999-2000, Planning Department, Government of National Capital Territory of Delhi; Anon 2004, Delhi Statistical Handbook 2004, Directorate of Economics & Statistics, Government of National Capital Territory of Delhi; Anon 2006, Delhi Statistical Handbook 2006, Directorate of Economics & Statistics, Government of National Capital Territory of Delhi, Economic Survey of Delhi: 2005-06, Planning Department, Government of National Capital Territory of Delhi

Open spaces in residential, commercial, and recreational sites are under severe pressure to create space for parking.

The immediate sign of the growing congestion is the plummeting traffic speed. In Delhi, the average vehicular speed has fallen from 20-27 km/hr in 1997 to only 15 km/hr in 2002. Even other metro cities are reporting falling roadway speed of vehicles and increasing congestion. In Mumbai, the average roadway speed has fallen by half from 38 km/hr in 1962 to only 15-20 km/hr in 1993 . While the average speed is 13 km/hr in Chennai, in Kolkata, traffic speed range from 10-15 km/hr but falls to 7 km/hr in the city centre.

Peak hour traffic volume in Delhi has begun to exceed the designed capacity of many arteries. The Ring Road, that circles the entire city, was designed for peak hour traffic volume of 75,000 passenger car unit (PCU) and six carriage ways. But it is now projected that by 2012 the traffic volume may increase to 4 lakh that may

need 18 to 24 carriage ways. Where is the space for this kind of expansion? (see Graph 3: *Congestion on Delhi's roads*).

While roads are getting clogged, open surface areas in residential, commercial and recreational sites are also coming under severe pressure to create space for parking for rapidly rising numbers of vehicles.

Parking – most wasteful uses of cars: A typical vehicle stays parked 95 per cent of the time, and uses several parking spaces at several destinations. The New Delhi based Central Road Research Institute (CRRI) estimates that out of 8760 hours in a year, an average car's total steering time is only 400 hours. This is considered one of the most wasteful uses of cars that entail enormous cost on the society but is rarely accounted for.

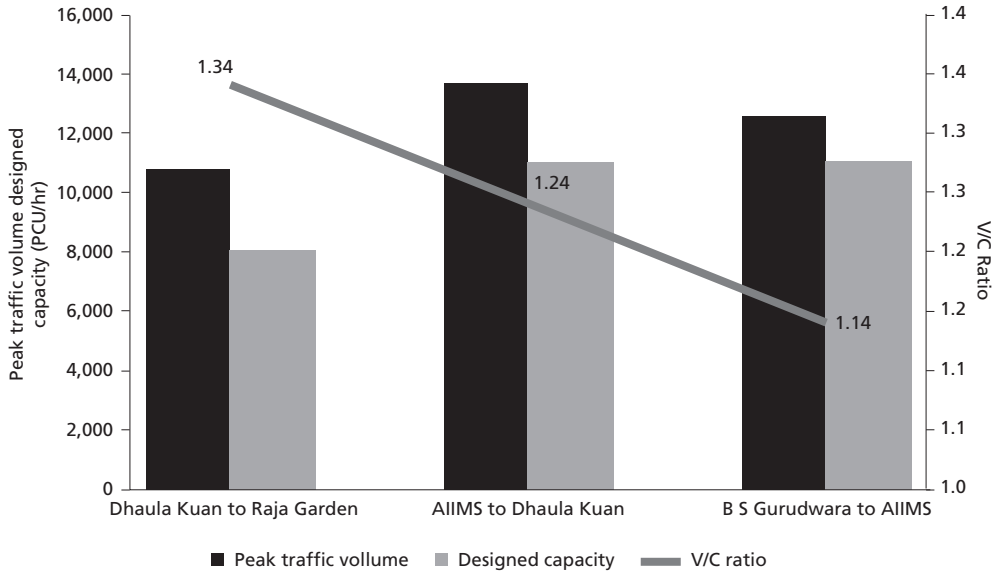
A typical vehicle stays parked 95 per cent of the time, and uses several parking spaces at several destinations. This is considered one of the most wasteful uses of cars.

Insatiable demand for land: How much land do cars take up in Delhi? Cars use up disproportionately huge space not only when on road but also when parked at home or at the work place. A preliminary estimate shows that the total amount of land that is currently required to keep the entire fleet of personal vehicles parked on the surface is already enormous. Transport regulators in Delhi normally consider a land space of 23 sq m as appropriate to park a car in the open surface which includes the space for the car and also the minimum circulation space needed for it to be parked. This termed as the equivalent car space (ECS), is used as a reference for allotting space to other categories of vehicles as well. Accordingly, a two-wheeler requires 0.16 sq m of ECS.

If demand for land for an average car is computed on the basis of three parking space per car — the total cars already occupy more than 10 per cent city's urbanised area. The forest cover in Delhi is 11.5 per cent of the geographical area of the NCT Delhi. Continuous increase in car numbers puts an enormous pressure on the scarce urban land.

Given the total number of registered personal vehicles in the city more than 48.71 sq km of land (2.12 million ECS) is needed for parking. And the demand is growing each

Graph 3: Congestion on Delhi's roads



Source: PWD 1990 and IL&FS 2004 as quoted in CDP Delhi

Cars take disproportionately huge space not only when on road but when parked at home or at the work place and shopping malls. This puts enormous pressure on the scarce urban land.

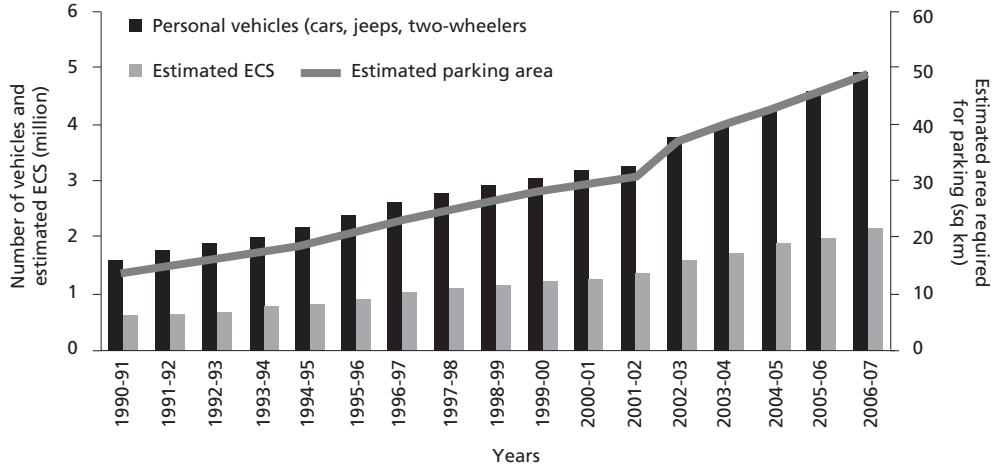
day — demand has increased four times — from 0.59 million ECS (13.66 sq km of land) in 1990-91 to 2.12 million ECS in 2006-07 (see Graph 4: *Uncontrolled increase in parking demand*). At an estimated car and jeep registration of 338 per day means that on a yearly basis, the additional land required for parking each year is 2.84 sq km of land – roughly equivalent to 310 international football fields. The future growth in parking needs will only erode open green spaces and capture free pedestrian ways in the city.

In the US where car ownership is several times higher, the total area needed by a car to park at home, office and at other places is estimated at 372 sq m, which is 3 times that of the average home. The US based experts Michael Manville and Donald Shoup who have studied parking issues extensively state, "Cars take up more space when they are being driven than they are parked because of the distance needed between vehicles when they are moving in traffic. But a car in motion also occupies a given amount of space for a short time while a car that is parked takes up slightly less room for a much longer period. As a result, the cumulative space and time consumed by an average vehicle trip is much smaller than the space and time consumed by most parking durations."

Inequitous use of land: The pressure on urban space for parking has also raised concerns regarding equity issues related to urban land-use. Parking represents one of the most inequitous uses of urban land. While a car is allotted 23 sq m of public land for its parking and circulation space, a very poor family gets a plot of about 18 sq m under the Delhi government's very low cost housing scheme *Jhuggi Jhompri* (small hutments) housing. The governments' low cost housing scheme offers 32 sq m. The amount of land used for parking of private vehicles registered daily in 2005-06 could have accomodated 600 low cost houses each day. Implicitly, Delhi allots more public land for parking cars than it does to house its poor. And all this for only 30 per cent of the city's population (as estimated by the National Council for Applied Research), which have a family car. Disproportionately high share of urban land is devoted to cater to the parking needs of handful of people.

Personal vehicles dominate parking demand: The various surveys carried out in the key commercial spaces in Delhi show that the personal vehicles occupy the

Graph 4: Uncontrolled increase in parking demand



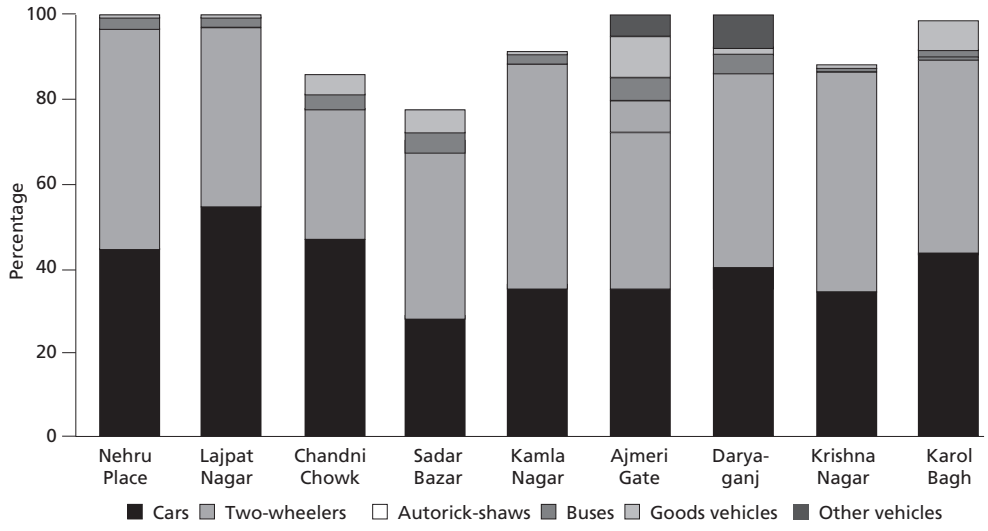
Note: Estimated from vehicle registration data of transport department, NCT of Delhi
Source: Anon 2000, Economic Survey of Delhi: 1999-2000, Planning Department, Government of National Capital Territory of Delhi; Anon 2004, Delhi Statistical Handbook 2004, Directorate of Economics & Statistics, Government of National Capital Territory of Delhi; Anon 2006, Delhi Statistical Handbook 2006; and 2007; Directorate of Economics & Statistics, Government of National Capital Territory of Delhi

maximum space available for parking – more than 85 to 95 per cent (Graph 5: *Cars and two-wheelers dominate the peak parking demand in major market areas*). The public transport buses occupy just about 3 per cent of the road space but meet more than 60 per cent of the travel demand in the city, occupy barely 4 to 5 per cent of the total ECS of the parking spaces. But cars and two wheelers that occupy more than 90 per cent of the road space meet only 20 per cent of the travel demand, occupy disproportionately high share of parking spaces. In most commercial sites parking is encroaching upon open and pedestrian spaces especially along the roads endangering pedestrians. Parking sites under municipal agencies mainly cater to the parking needs of the personal vehicles especially cars and two-wheelers. Few sites exist where other modes of transport (buses and goods vehicles) are also allowed to be parked but at a higher cost.

Urban common encroached: As authorised parking spaces are not adequate to meet the demand, surrounding areas are coming under pressure. Surveys have found massive parking spill over on the surrounding road networks and any open available spaces due to inadequate capacity of the existing authorised parking spaces. Surveys conducted by the Delhi Metro Rail Corporation (DMRC) in the vicinity of the metro stations bear this out. At the Bhikaji Cama, the district center of southwest Delhi, surveyed by Engineering and Planning Consultants (EPC) and DMRC found high parking spillover on the carriageways as a common situation because of the absence of adequate parking facilities (see Table 1: *Poor site management*). In Saket Community Center DMRC study found spillover parking from the commercial center. In absence of adequate off-street facilities in the community center the access streets are used for on-street parking.

International studies point out that cruising for parking i.e searching for curb parking space also add to congestion. This wastes time and fuel. According to surveys carried out in the US, 8-74 percent of the urban traffic congestion is caused by vehicles cruising for parking. Motorists were found to spend about 3.5 to 14 minutes to find curb parking space. This way each curb parking space can generate additional miles tavelled. Donald Shoup of the University of California, Los Angeles, who has studied the problem of parking extensively has estimated that one curb

Graph 5: Cars and two-wheelers dominate the peak parking demand in major commercial areas



Source: Estimated from Anon 2006, Congestion and parking problems of selected locations in Delhi, Central Road Research Institute, New Delhi, p 160.

Delhi allots more public land for parking cars than it does to house its poor.

Table 1: Poor site management

While some parking lots are filled to the brim others are underutilised due to poor management practices in Bhikaji Cama Place in Delhi

	Designated parking area	Designated parking capacity	Actual peak parking volume	Ratio of actual peak parking volume and designated parking capacity
Some plots under severe pressure				
Parking lot P1	2349 sq m	102 ECS (95 cars)	257 ECS (247 cars, 40 two wheelers)	2.5
On street parking – P13	650 sq m	69 ECS (69 cars)	112 ECS (95 cars, 65 two wheelers)	1.6
On street parking – P11	60 sq m	6 ECS (6 cars)	18 ECS (15 cars, 10 two wheelers)	3.0
Some plots under-utilized				
Parking lot – PL6	588 sq m	26 ECS (98 TW)	10 ECS (10 cars)	0.4
Parking lot – PL5	1012 sq m	44 ECS (16 cars)	3 ECS (2 cars, 4TW)	0.06
Parking lot – PL4	949 sq m	41 ECS (60 cars)	16 ECS (15 cars, 2 TW)	0.4

Source: Based on Bhikaji Cama Place - Traffic management plan for selected sites in Delhi, Delhi Metro Rail Corporation and Engineering & Planning Consultants.

space can generate about 1825 additional vehicles miles traveled in a year.

Due to poor management, some sites remain underutilised while others in the vicinity are filled to the capacity. In many locations the 'actual peak parking volume' is higher than the 'designated parking capacity' while in others the opposite is noticed.

It has also been noticed that the common parking spaces that have been provided in public buildings are most inefficiently used. In many cases these parking lots are held captive for private use and not shared with other users in the building. Sometimes other factors come in play. For instance, in Baba Kharak Singh Marg in Connaught place, poor connectivity of the site and availability of free parking facility in the nearby temples lead to underutilisation of authorised NDMC off street parking facility.

It has been noticed that the common parking spaces in public buildings are inefficiently used. In many cases parking lots are held captive for private use.

Misuse of parking spaces: Misuse of parking premises in buildings is common in Delhi. Parking spaces in public buildings are being used for uses other than parking. This is largely undocumented problem and no numbers are available, and also the resultant spillover of vehicles outside the premises is also not being assessed in commercial and office areas. Vehicles spill over outside the premises and cause heavy congestion on narrow streets. This free and unauthorized parking on surrounding roads further reduces pedestrian walk-ways.

As the demand for office space is increasing it is becoming increasingly more difficult to prevent illegal conversion of basement parking space for other commercial activities. A Committee constituted by the Union ministry of urban development under the chairmanship of Delhi's Lt Governor Tejender Khanna to look into various aspects of unauthorized constructions and misuse of premises in Delhi in 2006. The committee has noted the ground reality and suggested, "In so far as misuse of basements is concerned, it has been suggested to the Committee that though basements are at present meant to be used only for parking or for servicing the building, in many cases they are being used as professional working space.....The Committee's view is that subject to the proper ventilation and indoor lighting, as also observance of fire-safety precautions, such flexible use of basements may be permitted. However, in such a situation, the floor area of the

basement would have to be counted towards floor area ratio. In case of existing basements, the owner would have to pay prescribed compounding charges." It is however not clear how just paying the charges of violations will help to address the problem of parking and congestion, unless these charges are used to create alternative parking sites to accommodate the demand. But that will further externalise the problem and put pressure in public spaces.

Utilisation of parking spaces: The parking contractors in most places are utilising the available parking spaces most efficiently to accommodate the demand. The analysis of the available data shows that at the current level of utilisation of the ECS per vehicle works out to be much lower than the space allowed under the norms. For instance, the gap in demand and supply is normally estimated based on the designated ECS for comfortable circulation space for vehicles and easy retrieval. Accordingly, in Nehru Place, a prime commercial site, the available parking space is about 3785 ECS, with a total area of 87,026 sq m (If ECS is counted as 23 sq m) that accommodates the peak demand of 5,861 ECS. This means under real world conditions the actual area of one ECS is equal to 18.1 sq m, much less than the norm of 23 sq m. This indicates 54 per cent more efficient utilisation of the current spaces compared to the legal requirement of the parking space standards (see Table 2: *Parking lots in commercial centers under pressure*).

This, therefore, indicates that the parking contractors are already utilising the available parking spaces to maximum capacity to accommodate the demand, and also maximising their revenue gains.

Efficient utilisation of the available parking lots remains an important strategy. However, parking lots remain overcrowded and inconvenient. Users expect comfortable parking so that long vehicle retrieval time and queues can be avoided, congestion at entry and exit points can be prevented, and there is enough

The parking contractors are already utilising the available parking spaces to maximum capacity to accomodate the demand and maximise revenue gains. Even this does not help.

Table 2: Parking lots in commercial centers under pressure

Area available for parking increases 1.5 times of what is available under parking in Nehru Place. This shows very efficient use of available space

Commercial built up area	Current available Parking area (on & off street parking in sq m) and no. of ECS available for parking	Current Peak demand	If peak demand were to be parked according to the surface space standard (23 sqm/ECS), the total area for parking will be:
Nehru Place 2,64,595 sq m	87,026 (33%) 3785 ECS	5,861 ECS (Cars: 4,949, 2w: 5,587)	1,34,803 (51%)
KG Marg 1,54,579 sq m	19,113 public only (12.4%) 831 ECS	987 ECS (Cars: 866, 2w: 729)	22,701 (15%)
Sarojini Nagar 31,645 sq m	15,916 (50%) 692 ECS	1,171 ECS (Cars: 1119, 2w: 317)	26,933 (85%)
Shastri Park 65,800 sq m	38,640 (59%) 1,680 ECS	2,288 ECS (Cars: 2,159, 2w: 807)	52,624 (80%)
South Ex Market 53,000 sq m	24,702 (47%) 1,074 ECS	1,576 ECS (Cars: 1,493, 2w: 518)	36,248 (68%)

Note: Estimated on the basis of various feasibility reports submitted to EPCA.
Source: Draft Techno commercial study for DDA Multievel parking at Nehru Place by IDFC; Draft Techno Commercial Studies for NDMC's multilevel parkings at K G Marg, Sarojini Nagar by IDFC; Techno Commercial Reports for development of MCD's automated multilevel parking cum commercial complexes at Shastri Park and South Extension by IDFC.

Even as the crisis looms large in our cities, there is very little public understanding of environmental, social, and economic impact of the insatiable need for parking

circulation space among others. On these terms the current scenario is therefore severely constrained. The users' surveys conducted in key commercial sites show that 25 to 76 per cent of the users have expressed dissatisfaction and indicated long vehicle retrieval time, congestion at entry and exit points, inadequate circulation space as the key parking problems (see Table 3: *How parking users pecieve the problem of parking?*).

The surface parking lots require qualitative improvements. Currently, the agreement between the parking contractors and the civic bodies require the contractors to physically demarcate parking lots and prevent spill over; put up display boards indicating availability of parking space; use of devices to monitor time of parking etc. If the numbers of parked vehicles are found to be more than the ECS allowed then contractors can be penalised and contract can be revoked. According to MCD guidelines a penalty of Rs 500 per day can be enforced. These provisions should be reviewed to improve overall management of the parking lots and also ensure efficient utilization.

Even though the enormity of the crisis looms large in our cities, there is very little public understanding of the environmental, social and economic impact of the insatiable demand for parking that must be addressed in the early stages of motorization.

2. HOW IS PARKING MANAGED?

Public parking includes off-street and on-street parking in commercial, public and recreational sites. Parking provision is made in the commercial buildings and offices in line with the building development norms. Public parking facilities serve multiple destinations. Currently, almost the entire parking demand is being met by

Table 3: How parking users percieve the problem of parking?

Most parking lots are overcrowded and not user friendly

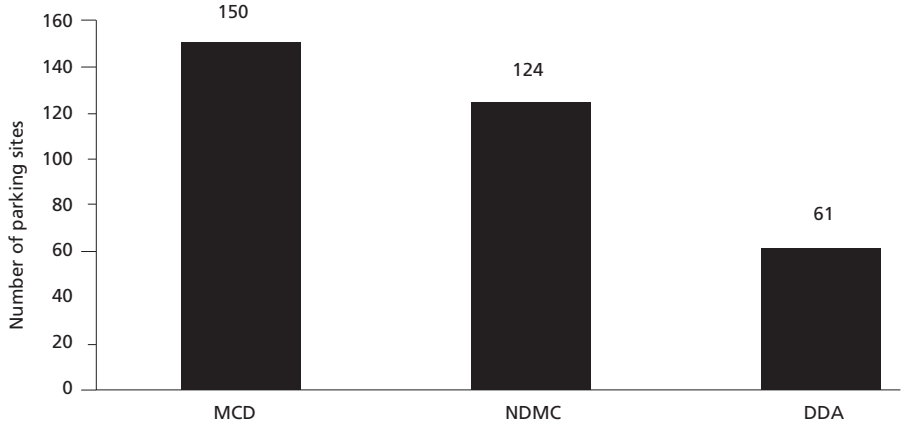
	Problems at the existing lots (% of respondents)						
Perception of the problems in the existing parking lots	**Nehru Place**	**Mangalam Place**	**Baba Kharak Singh Marg**	**KG Marg**	**Sarojini Nagar**	**Shastri Park**	**South Extension**
Over crowded parking lots/lack of space	67	73	25	29	38	68 (shop owners) 76 (users)	81(shop owners) 66 (users)
Long vehicle retrieval time	42						
Scarcity of parking lot s	31	14					
Congestion at entry/exit	21	6	30	36	29	15 (shop owners) 10 (users)	5 (shop owners) 12 (users)
Inadequate circulation space	17						
Safety		8	26	19	20	13 (shop owners) 6 (users)	13 (shop owners) 6 (users)
Poor maintenance			10	10	9	1 (shop owners) 2 (users)	3 (users)
Water logging			9	5	4	3 (shop owners) 5 (users)	2 (users)
Others							10

Source: Draft Techno Commercial Studies for DDA multilevel parkings at Nehru Place and Mangalam Place conducted by IDFC in 2005; Draft Techno Commercial Studies for NDMC's multilevel parkings at Baba Kharak Singh Marg, Hindustan Times Building and Sarojini Nagar by IDFC in 2005; Techno Commercial Reports for development of MCD's automated multilevel parking cum commercial complexes at Shastri Park and South Extension by IDFC.

on-street and off-street surface parking. Only Nehru Place, one of the prime business districts in south Delhi, has one seven-storied multilevel structured parking. Both Nehru Place and Connaught Place, another prime commercial area in the heart of the city, have basement parking areas for public parking.

The management of parking is fragmented among different agencies — the Municipal Corporation of Delhi (MCD) that provides municipal services to nearly 94 per cent of the land area of Delhi, New Delhi Municipal Council (NDMC) that caters to 3 per cent and the Delhi Development Agency (DDA) which is the building norm setting body in the city and also oversees some fraction of land (see Graph 6:

Graph 6: Parking sites in Delhi



LEGAL POWERS TO PROVIDE PARKING IN DELHI

Powers of the Municipal Corporation of Delhi (MCD)

- **Under section 304 of the Delhi Municipal Corporation Act, 1957, MCD has power to acquire lands and buildings for public streets and public parking places. It states 'subject to the provisions contained in chapter X, the commissioner may acquire any land for the purpose of laying out or making a public parking place.'**

Powers of New Delhi Municipal Council (NDMC)

- **The section 208 of the New Delhi Municipal Council Act, 1994 mandates NDMC to acquire lands and building for public streets and for public parking places. It says "Subject to the provisions contained in Chapter X, the Chairperson may — acquire any land required for the purpose of opening, widening, extending or otherwise improving any public street or of making any new public street, and any building standing upon such land; acquire in relation to any such land or building, all such land with buildings, if any, thereon as the Council may think expedient to acquire outside of the regular line, or of the intended regular line, of such street; and acquire any land for the purpose of laying out or making a public parking place."**

Powers of Delhi Development Authority (DDA)

- **The Delhi Development Act, 1957, mandates DDA to prepare Master Plan and zonal plan that lays down parking norms.**

Powers of the Delhi Traffic Police

- **Delhi Traffic Police is the enforcement agency. Under section 28 of Delhi Police Act, 1978, Delhi Police has been granted power to make regulations for regulating traffic and for preservation of order in public places. The Act states that the Commissioner of Police may, by notification in the Official Gazette, make regulations to provide for all or any of the following matters, namely —- regulating traffic of all kinds in streets and other public places, and the use of streets and other public places by persons riding, driving, cycling, walking or leading or accompanying cattle, so as to prevent danger, obstruction or inconvenience to the public; regulating the conditions under which vehicles may remain standing in streets and other public places, and the use of streets as halting places for vehicles or cattle.**
- **Under Section 122/177 of the Motor Vehicle Act, 1988 the Delhi traffic police can impose fine for improper and obstructive parking.**

Conventional urban planning tends to focus primarily on increasing parking facilities. It is assumed that more is always better. But do not recognise that there can never be enough.

Parking sites in Delhi). The Delhi traffic police is responsible for enforcing parking laws on roads and maintain some key traffic corridors as "no parking" zones (see Box: *Legal powers to provide parking in Delhi*). The Delhi transport department does not have any direct role in the management and regulation of parking but are expected to address the issue through an overall transport policy for the city.

In addition to the sites managed by the municipal agencies, the Northern Railways and Delhi Metro Rail Corporation (DMRC) also own and manage the parking lots. Here, the parking lots are linked to public transport modes — trains or metro. Northern Railways provide parking at all its major Railway stations. The DMRC has provided parking facilities in all its 18 stations in line 1 and at Vishwavidyalaya underground station in line 2. Parking sites under DMRC are not far from criticism. According to an NGO working on sustainable transportation issue, parking sites of the metro are not catering to the needs of the metro users but to shoppers and other commuters who visit the nearby places and utilise the space for parking their vehicles in the meantime. This clearly shows how the purpose of creating these sites is being defeated.

Since MCD by virtue of its command over a very large jurisdiction manages maximum area under parking. But unfortunately, there is no clear record of the total land area under parking managed by MCD. At the time of drawing up contracts with the parking contractors the MCD hands over a rudimentary site map of the location without firm measurements.

The total surface area available for authorized parking varies across the jurisdictions of the various civic agencies. In the NDMC area there is about 0.16 sq km of authorized parking area. The Delhi Development Agency (DDA) which is also responsible for setting building development norms has about 0.13 sq km of surface parking. Unfortunately, this information for the MCD, which controls largest land area in Delhi, is not available. Almost all the parking lots are widely scattered in off-street plots and on road stretches in different localities. Relative share of off-street and on-street parking varies across the sites. On-street parking aggravates the congestion problem more (see Graph 7: *Share of on and off-street parking in the total parking*).

Only NDMC that governs the prominent central part of the city has a system of classifying commercial areas within its own jurisdiction according to the importance of the area – as categories marked as A, B and C and develop site specific strategies. Other agencies do not have this system. There are now discussions that MCD will also do similar classfication.

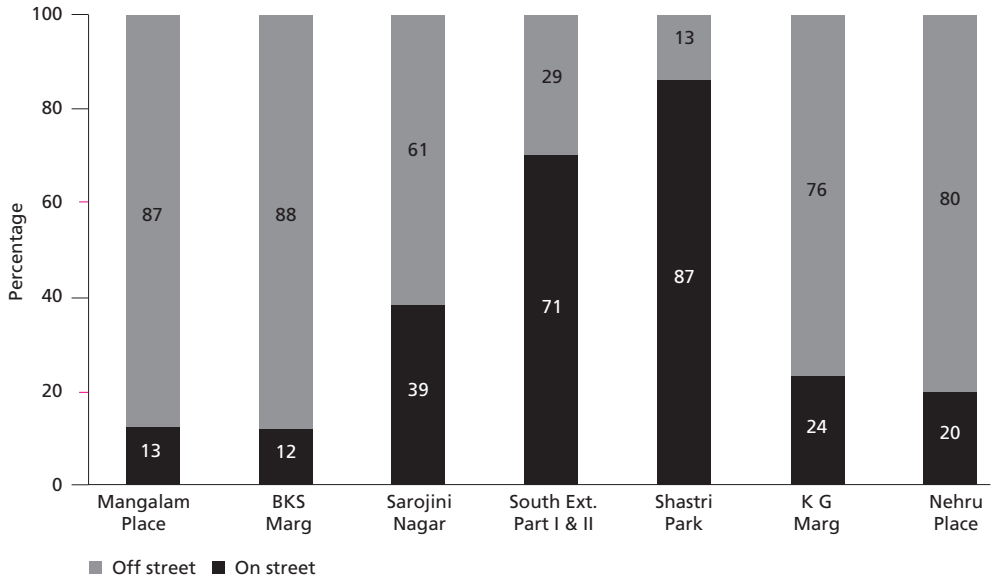
The current approach towards creating surface parking spaces is *adhoc* and not planned according to any well established criteria. Often depending on the commercial attractiveness of the sites the additional open spaces are brought within the ambit of legal contracts. Sometimes parking spaces expand in an *adhoc* manner and illegally by the parking contractors that are subsequently legalized. The MCD recently announced legalizing 100 illegal parking lots.

According to the building development norms all individual commercial buildings are required to provide for dedicated parking spaces. This is flouted in most of the cases. In many of the cases, the basements are used for other purposes than parking.

Almost all the civic agencies hold that the current parking spaces are not adequate to meet the burgeoning demand for parking in the city. As there is not enough space

Graph 7: Share of on-street and off-street parking

In most sites the share of off-street parking is higher except South extension and Shastri park. More on-street parking causes congestion



Source: Estimated on the basis of feasibility and parking survey reports provided by various agencies

for expanding the surface area for public and commercial parking all the agencies plan to create structured parking lots to meet the future demand. All agencies have proposed construction of multilevel parking lots. NDMC has proposed to construct 3, MCD – 19, and DDA – 5.

Further impetus to create more multilevel parking lots has also come from the public interest litigation in the Delhi High Court (C.W.P. No. 5239/2002). The Delhi High Court on December 17, 2004, has directed that, '*until and unless 100 parking sites are identified in Delhi that too of larger dimensions the problem of parking is going to be acute which will not only affect haphazard parking of vehicle on roads but traffic in terms of congestion would create other problems. We direct that the MCD, DDA and NDMC to identify minimum 100 sites to built multilevel parking in Delhi…..*"

Additionally, under a separate initiative the MCD has taken steps to regularise 100 more surface parking lots. It has also issued tender for 3,000 parking lots that will come up on 2,500 commercial and mixed land use roads. In some places they will use stack technology. The city is therefore poised for massive expansion of parking supply. But it is not known how parking provisions will be made in these congested commercial streets where there is barely any space available.

This assessment becomes even more difficult as proper surveys have not been carried out to assess the area under parking lots in the city. The Comptroller and Auditor General's report — CAG *Report on Government of NCT of Delhi of 2004* also took note of the fact that MCD does not specify area of the parking lots. The Report states, "In most cases, the Corporation did not prepare site maps of the paid parking lots to be allotted to the contractor as of July 2002. It had not specifically mentioned the area of the parking lots which were to be handed over to the contractors while awarding contracts for the lots." Since then things have not changed much.

The MCD officials still prepare maps but in most cases they do not specify the exact area allotted. The MCD officials explain that most parking sites are mapped with the

help of key landmarks around the site like a building or a shop etc. These are plotted on the map to broadly indicate the area and the contractors follow that to identify and manage the area. Some officials do not find these maps reliable. Also the shortage of enforcement staff further weakens the system. Almost all the parking lots are widely scattered in off-street plots and on-road stretches in different localities.

In commercial, recreational and public places civic agencies auction the designated parking lots for a period of 2-3 years and get huge amount of money in the form of monthly license fee. The monthly license fee varies from site to site depending on the utilization potential of a parking lot. There is no doubt that parking for these agencies mean revenue generation. This further stokes interest in expanding the parking spaces to increase the revenue.

A review of terms and condition and agreement documents for auction of parking

TERMS OF CONTRACT

Civic agencies have nearly the same terms and conditions for the parking managers in Delhi

NDMC

Contract duration and monthly license fee

- **A parking lot is awarded for a period of 2 years and is to be operated for 24 hours on all days of the year.**
- **A contractor has to pay the monthly license fee in advance by 7th of every month. In case of failure, interest has to be paid on the due amount at the rate of 24 per cent per annum (that is 2 per cent per month). Further delay of payment for one month will lead to cancellation of the license.**

Rates

- **The rates will be charged as per the applicable rate of NDMC.**
- **A point of scale machine or hand held device or any other instrument as directed by the NDMC has to be installed for issuance of parking tickets in all the parkings lots at their own cost.**
- **Monthly parking charges facility shall be allowed only to the shop owners and office employees. NDMC will decide the monthly rate of parking charges for the shop owners.**
- **Parking rate of the approved taxi booths shall be at the rates mutually agreed between the contractor and the concerned taxi booth allottees.**

Management

- **Parking sites will have to be used for parking private cars, scooters and motorcycles only.**
- **Parking pattern including entry/exit of vehicles is supplied by NDMC, which has to be adhered to.**
- **Display boards, displaying the site number, name of the parking site, name of the contractor, area allotted for parking, no of cars/scooters allowed to be parked and the rate of parking fee is provided by NDMC and maintained by the contractor. In case of failure, one month license fee is forfeited /recovered as cost.**
- **A yellow line has to be drawn earmarking the area as given in the tender from. In case of it is found that number of cars parked in the area is more than the number allowed, a contractor can be penalized and on repeating, the contract can be revoked and security money can be forfeited.**
- **The contractor has to maintain the cleanliness of the parking lot. He has to manage the parking of vehicles himself or through his employees. He is not allowed to allow any other person to run the parking on his behalf failing which the contract will be cancelled along with forfeitation of the security deposit. He is not allowed to transfer his rights to any other person.**
- **No vendor is allowed at the parking site. The contractor is not allowed to construct any temporary or permanent structure movable or immovable at the allotted parking sites and is liable for prosecution as well as demolition.**
- **The contractor shall be responsible for all the damages or losses to the vehicle during their parking at the site and not the NDMC**
- **A complaint book is to be kept at the site, which the NDMC can check as and when required.**
- **In case of overcharging or violation of any kind, Director enforcement will investigate the matter and on finding it true will impose a penalty of Rs. 5000 for first complaint, Rs. 10,000 for second complaint and cancel the contract if the complaints continue.**
- **The NDMC can terminate the agreement without any notice and reason if there is any breach in any of the conditions, parking land is encroached, parking creating obstruction of the passage of the parked vehicles, if parking is used for vehicles other than the ones specified, vehicle parked, non conformity with parking**

rtes, refusing to parking despite availability of parking space, refusing to produce the compliant book etc.

DDA

- Contract duration and monthly license fee
- A parking lot is awarded for a period of 3 years subject to increase of 10 per cent of monthly parking fee every year.
- A security deposit equivalent to 2 months bid amount will be returned only after completion of the license period without any interest.
- Advance three months license fee is to be paid after allotment of the site which is adjusted only against last three months license fee of the compact period that is in the 34th, 35th, end 36th months.
- A contractor has to pay the monthly license fee in advance by 10th of every month. In case of failure, interest has to be paid on the due amount at the rate of 15 per cent per annum. Further delay of payment after one month will lead to cancellation of the license.

Rates

- Monthly parking charges facility shall be allowed only to the shop owners and office employees.

Management

- Parking sites will have to be used for parking cars, scooters, cycles and trucks and for which authorization has been issue.
- No parking pattern is specified by the DDA.
- A contractor has to display a notice board at a conspicuous place at the site with the applicable rates, his address and validity of license period.
- The contractor shall be responsible for all the damages or losses to the vehicle during their parking at the site and not the NDMC
- A contractor has to make arrangements at his own costs for maintaining the parking site in a state of repair and lightning of the parking sites.
- A contractor will have to maintain the site in a clean and hygienic condition.
- The contractor shall manage the parking of vehicles himself or through his employees. He is not allowed to allow any other person to run the parking on his behalf failing which the contract will be cancelled along with forfeitation of the security deposit. He is not allowed to transfer his rights to any other person.
- No vendor is allowed at the parking site.
- The contractor is not allowed to construct any temporary or permanent structure movable or immovable at the allotted parking sites and is liable for prosecution as well as demolition.
- The contractor is not allowed to display or exhibit any advertisements or place or put up any hoarding on any part of the interior or exteriors other than those permitted in writing by the DDA.

MCD

Contract duration and monthly license fee

- The contract is for a duration of five years. After the expiry each year, the contract will be renewed with an enhancement in the monthly license fee by 5 per cent. The contract can further be extended for one year by the Commissioner at his discretion. However if the allottee continues to operate the site after the expiry of the contract period, he will be treated as unauthorized occupant and shall be liable to pay misuse/damage charges that is double the monthly license fee for such period of unauthorized occupation.
- The monthly license fee shall in no case be less than Rs. 20,000.
- A security deposit equivalent to three months license fee (that is 25 per cent of the total bid amount) and license fee for the entire year is to be paid to the MCD. This can be done either by depositing 3 months quoted and approved license fee as security deposit and one month of advance license fee besides 11 cheques as license fee for remaining 11 months starting from 2nd to 12th month of the contract or depositing 3 months approved license fee as security deposit along with one month's advance license fee and the remaining amount equivalent to 11 months license fee in lump-sum on which a rebate of 4.5 per cent is allowed. After renewal of the contract every year and from second to fifth year, the licensee has to deposit 12 post-dated cheques of enhanced license fee for 12 months of the relevant years. As mentioned earlier, a rebate of 4.5 per cent is allowed for lump-sum payment.
- In case the cheque is dishonoured, the contract will be deemed to be automatically terminated and the license shall be liable to pay the corporation damage charges equivalent to double the monthly license fee for the unauthorized occupation.

Rates

- The contractor has to get the parking slips printed at his own cost. The rates are to be charged as prescribed by the MCD. The contractor has to maintain proper accounts and produce the same whenever asked. For this, the licensee shall procure hand held computers to ensure proper and undisputed monitoring of the duration of the time of the parked vehicle for charging the parking fee. The MCD exempts this facility in very small parking sites keeping in view the cost of computerization and the monthly license fee of the parking site.

- Concessional rates have to be charged for vehicles of traders having shops/offices in the area in front of the parking (Rs. 150 per month for cars and Rs. 75 per month for two-wheelers).
- In case of residents of the area in front of which parking has been allotted, free parking will be allowed with a clear stipulation that the vehicle should be registered at the address of the same area and this will be allowed to only one vehicle per house/office/shop.
- The contractor has to display an illuminated sign board at the entrance and exit points of the parking sites with information about the name of the contractor, his registration number, address, telephone number, number of employed workers, license number and date, period of contract, area police telephone number and the parking charges.
- The contractor is responsible for making provisions of adequate lighting, general upkeep, cleanliness and hygiene at the site.
- Incase of unauthorized encroachment (vendor etc) in the site, the contactor will have to pay Rs. 5000.

Management

- MCD supplies a map of the space allowed for parking of vehicles, which has to be strictly adhered to. The space allotted as per map will be allowed on roadside parking sites from the road berm.
- The sites will be open round the clock and allow parking of vehicles at all time except due to an extraneous reasons or non-availability of parking space.
- Parking of vehicles on more than the specified permissible space is not allowed failing which a fine of Rs. 500 per day violation will be imposed upon the licenses and the contract may be liable for termination.
- The parking zone of vehicles per unit has to be clearly demarcated for the convenience of the public. Parking slots have to be provided either by putting white lines on the ground or by fixing bricks/pipe.
- The licensee has to make arrangements for illuminations and sinnages on the sites as per the approved design to be supplied by the MCD.
- The contractor has to manage parking of vehicles, security of the site, cleanliness, lighting and computerization wherever done either himself or through his employees. He is not allowed to sublet or allow any other person to run the parking sites on his behalf. The directions given by the local police authorities are to be complied with from time to time.
- The contractor is liable and responsible for any theft of vehicle/accessories and the damages/losses caused to the vehicle during its parking at the site.
- The contractor can construct a wooden khokha for use. However, MCD reserves the right to allow advertisement boards and kiosks within the boundary or within the parking site itself.
- The site has to be managed in such a way that it does not obstruct the very passage of the vehicles parked there.
- In the event of violation of any condition, apart from cancellation of license, a penalty of Rs. 500 per violation per day has to be paid. When the imposed penalty accumulates upto Rs. 10,000 and the contractor fails to deposit it within 15 days of the date when the amount exceeded Rs. 10,000, action can be initiated as per provisions mentioned for breach of contract and blacklisting and cancellation of registration.

Recently, MCD announced revision in its terms and conditions for allotment of parking lots. Most of them remain the same except the following:

- Earlier only registered contractors with the MCD could apply for a tender. But from now on, the tender process is open to all.
- All contracts will be awarded through e-tendering.
- The contract duration has been reduced from 5 years to 2 years. The contract will be renewed after the expiry of the first year with 10 per cent enhancement of monthly fee.
- Monthly license fee shall not be less than Rs. 10,000 in any case.
- The proposed charges are to be charged at all the sites.
- A new tax has been imposed on the contractors. As per the provision of section 206 C (IC) inserted by the Finance (No. 2) Act, 2004 with effect from October 1, 2004 of Income Tax 1961, every successful tenderer shall be required to deposit TCS at the rate of 2 per cent along with surcharge and education cess (2.244 per cent in total) on license fee or applicable from time to time.
- The contractors at the multilevel parking will have to perform the following duties and responsibilities and make arrangement for the following at their own cost.
  - Complete illumination of entry and exit points of site with glow signs
  - Functional toilets
  - General keep up of cleanliness within the parking site
  - Functional fire fighting systems
  - Functional public address system
  - Functional power backup through generators
  - Functional system for removal of water from the water logged portions if any due to rain, seepage etc
  - Adequate lighting/illumination
  - Insurance of the site

HIGH COURT PROPOSES TO BAN ON-STREET PARKING

In a suo motto case (WP © 16565 of 2006) – Court on its won motion vs Union of India and others, the Delhi High Court ordered the following on March 26, 2007.

"The Municipal Corporation of Delhi/New Delhi Municipal Corporation shall not issue any license, contrary to the above direction. They shall also ensure that all the roads in Delhi shall be cleared from the unauthorized occupation of shopkeepers, raidees, water-trolleys and no other object, which obstructs the traffic and no part of the main road shall be used for parking of vehicles/rickshaws/scooters. The authorities shall also take effective steps to ensure compliance of directions contained in the order dated 16th March, 2007. The Assistant Commissioner of Police shall ensure that the authorities concerned are fully implementing this condition. There should be no violation of these conditions in the area under their control.

It is further directed that unless and otherwise exempted for a particular occasion or function by the competent authority i.e. Additional Commissioner of Traffic Police, on the entire Lutyens Zone, no vehicles would be parked on the metalled roads and wherever large number of persons have to go to that zone, they shall park their cars at the earmarked parking areas at India Gate. The authorities are directed to ply special buses within the Lutyens Zones beginning and terminating at India Gate. The main roads falling in the Lutyens Zones shall be treated as no parking zone and the vehicles parked on the main road shall be towed away by the traffic police, in accordance with law. The boards of `Tow Away Zone' shall be displayed on the roads in Lutyens Zone.

There is no doubt that the principal interest of the municipal agencies is revenue generation. This stokes interest in expanding parking spaces

lots shows that there is major emphasis on monthly license fee payment. All agencies have rules and regulations regarding payment of license fee —- periodicity of payment, the interest rate at which the delayed license fee is to be paid and penalty for not paying the fee or if there is delay. These guidelines are weak on the guidelines for qualitative improvements (see Box:*Terms of Contract*).

Delhi government will have to work out a new approach to parking planning as there is also a High Court order proposing to ban on-street parking along the main arterial roads. This order was issued in n August 2007 (see Box: *The High Court proposes to ban on-street parking*).

3. HOW MUCH PARKING DO WE PLAN FOR?

Difficulty in estimating parking demand and supply: Biggest challenge to parking planning is limted and uncertain data. The key sources of information on parking demand and related issues include the data and reports of the consultancy organizations that have been commissioned by the civic agencies to undertake feasibility studies for multilevel structured parking lots in some commercial sites and one diagnostic report by the New Delhi based Central Road Research Institute (CRRI).

The key reports for Delhi include– i) Congestion and parking problems of selected locations in Delhi in 2006 by CRRI. This is a diagnostic study that has covered nine representative sites in Delhi including Nehru Place, Lajpat Nagar, Chandni Chowk, Sadar Bazaar, Kamla Nagar, Ajmeri Gate, Daryaganj, Krishna Nagar, Karol Bagh; ii) Infrastructure Development Finance Corporation (IDFC) Techno Commercial Studies for multilevel parking in Nehru Place, Mangalam Place, Baba Kharak Singh Marg, Hindustan Times Building, Sarojini Nagar, Shastri Park and South Extension. iii) Simpark Infrastructure Private Limited of 2005 for Kamla Nagar, Ramlila Ground and Parade Ground. All these studies have been conducted within the time frame of 2004-06.

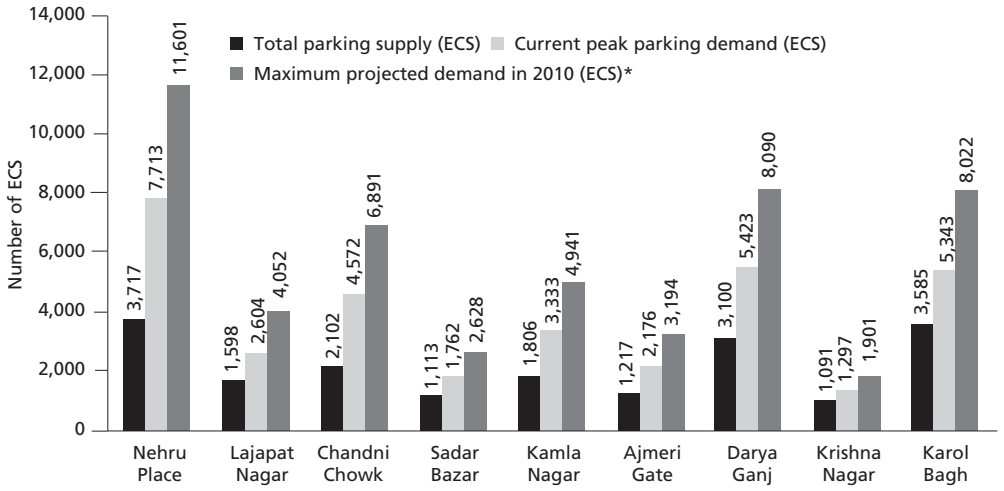
These reports are beset with data gaps and data discrepancy making direct comparisons and quantification difficult. There are differences in approach and methodology as well. The CRRI has carried out a diagnostic study to assess congestion and parking problem in selected locations of Delhi. They have reviewed parking standards, study area characteristics, conducted parking surveys, site inventory, and traffic volume surveys. It is important to note that they have estimated the future parking demand on the basis of overall growth in vehicle numbers in the city and also the GDP growth. On the other hand, IDFC has conducted various techno commercial studies to examine the feasibility of constructing multilevel parking lots. They have conducted reconnaissance survey to assess the influence area, site characteristics, parking surveys on variety of indicators, including parking duration, accumulation, arrival rate, user characteristics, parking lot characteristics, willingness to pay and so on.

The differences in methodology lead to wide variations in estimations. For example, in Nehru Place both IDFC and CRRI have conducted actual surveys to estimate the current parking demand. But IDFC estimates actual current parking demand as nearly 5861 ECS while CRRI estimates 7,713 ECS – a difference of 32 percent. While CRRI has projected increase in parking demand in Nehru Place to be 11601 ECS by 2010, IDFC has projected 9521 ECS by 2020. IDFC survey shows 45 per cent people coming for work in Nehru Place. CRRI study shows 60 per cent as employer and employees. These differences stem from the differences in the methodology and study design.

All these studies conclude that there is wide gap in demand and supply of parking in the key commercial areas of the city and the current parking usage has already eroded a large share of common spaces in commercial areas.

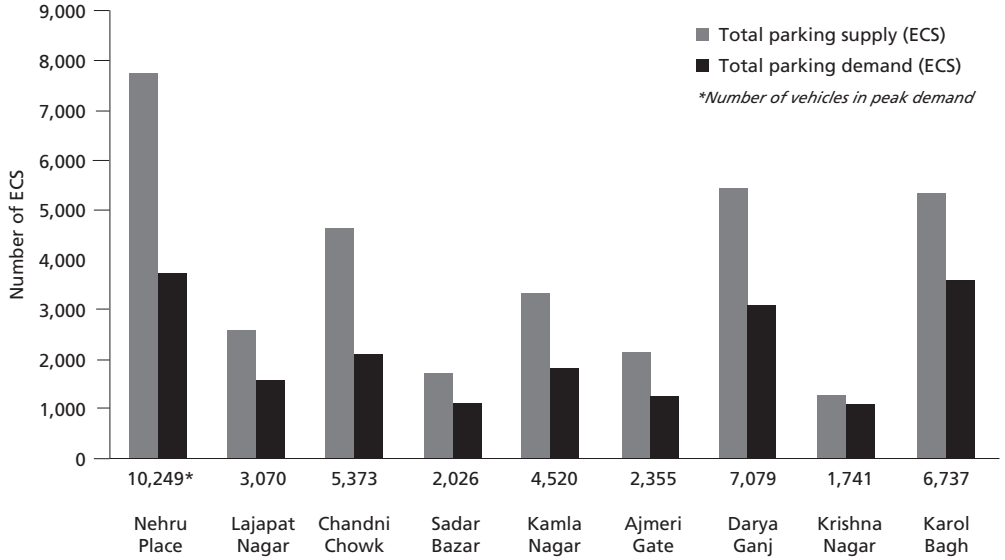
The widening gap between demand and supply in key commercial sites is only expected to get worse as demand for parking is projected to increase significantly by 2010. In some cases the demand may increase by nearly 50 per cent (see Graph 8: *Projected parking demand in key commercial areas*). In almost all key commercial sites surveyed parking demand is overtaking supply. The shortfall is in the region of nearly half of the total current demand. In Nehru Place, Chandni Chowk, Ajmeri Gate the short fall is as high as 52 per cent, 54 per cent, 55 per cent respectively (see Graph 9: *Parking demand and supply gap*). This means even after getting chock a

Graph 8: Projected parking demand in key commercial areas



Note: *Compound annual growth rate of car (10 per cent) and two-wheeler (6 per cent)
Source: Based on data provided in Anon 2006, Congestion and parking problems of selected locations in Delhi, Central Road Research Institute, New Delhi.

Graph 9: Parking demand and supply gap

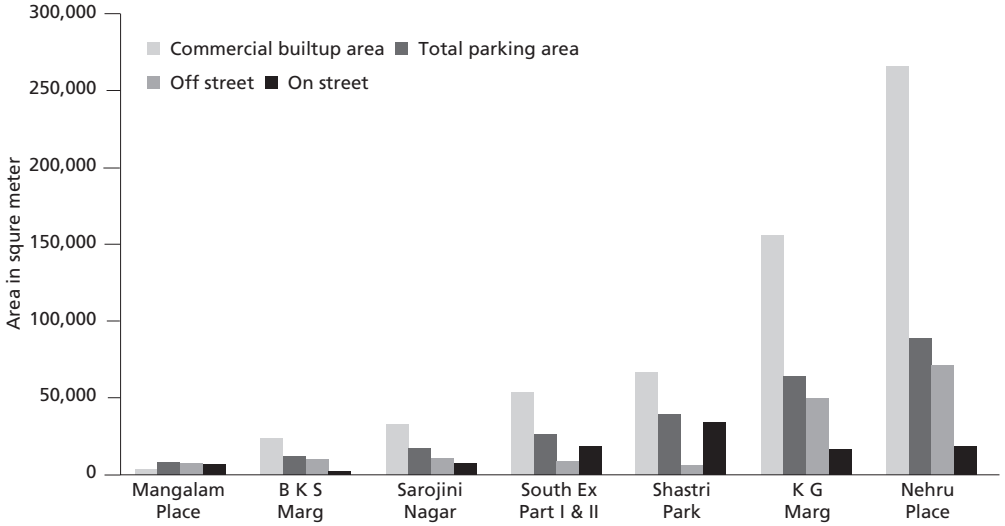


Source: Based on CRRI 2006, Congestion and parking problems of selected locations in Delhi, Final report, New Delhi

block with cars, these sites can meet half the gargantuan appetite for parking. This is unsustainable if additional steps are not taken to reduce parking demand and retrain car usage.

In some key commercial areas – Sarojini Nagar, Shastri Park, South Extension, Nehru Place, Baba Kharak Singh Marg, Mangalam Place — the space needed to park the current fleet of vehicles is already nearly half of the commercial built up area of the site. In Nehru Place the space needed to park the current fleet of personal vehicles is already half of the commercial built up area. According to the IDFC study, the maximum peak demand is about 10,536 vehicles generating parking demand of 5861 ECS. All these vehicles would require 1,34,387 sq m area for parking which would be 50.78 per cent of the total commercial built up area of Nehru Place (see Graph 10: *Commercial built up area and estimated area under parking*). This shows that the

Graph 10: Commercial built up area and estimated area under parking



Source: Estimated on the basis of the data provided in various feasibility reports submitted to EPCA

surface parking area in key commercial places of Delhi have reached a near saturation point and there is little scope of further expansion of the parking provision on the surface.

Legal norms for parking: In Delhi DDA is responsible for setting parking norms according to broad land-use classes. These include residential, commercial, manufacturing, government (see Table 4: *Parking norms in Delhi*). During the revision of Delhi's Master Plan for 2021 the parking norms came under severe pressure.

There was a considerable pressure to revise and increase the ECS provisions in MPD 2021. In fact the Delhi Parking policy even stated that the current parking norms appear to be considerably on the lower side in view of actual vehicle use. The government notified the Master Plan 2021 in February 2007. This increased the ECS provision.

The MPD 2021 also mentions that parking adequacy statement/study for large projects like stadia, shopping malls, multiplexes will be desirable. It also states that parking area in basements if misused can be taken over by the local municipal body/authority.

As the surface land area is getting increasingly exhausted the civic agencies have begun to plan vertically high rise multi-level structured parking lots to cater to the growing parking demand. Separate development norms have been created for these structures (see box: *Development control norms for multilevel structured parking lots*)

Globally, the governments either set: i) Minimal standards that put the responsibility of providing parking on the developer to satisfy the parking demand, or, ii) Maximum allowable standards to cap the parking supply, or, iii) Flexible parking standards based on the actual site specific demand surveys.

There can never be a standard yardstick for setting parking standards. Global experience has shown that uniform minimum standards have risk of over or under supply. There are apprehensions that these standards may lead to oversupply in those areas that are more accessible, have priced parking, and other travel demand management options are available or parking facilities costs are high. Therefore, careful assessment and planning are crucial. We can see that in many market places either there is oversupply or undersupply if the current norms are strictly followed. The comparison of the projected parking demand for some sites show that the demand will either equal the norm, in some cases it could even be higher, or even lower. This also means that the norms can even lead to oversupply of parking spaces (see Table 5: *Need flexible standards*).

There is no standard yardstick for setting parking standards. Uniform minimum standards have risk of over or under supply.

Experts caution that uniform application of parking norms derived from different surveys by the transport planners can at times lead to oversupply and poor utilisation at an enormous cost. Adjust parking standards to more accurately reflect the demand in sites. A preliminary estimate shows that if the new norm of 3 ECS per 100 sq m is applied to all new commercial developments in Nehru Place it would require increase in parking supply by 35 per cent over the projected demand, which may not be needed.

Are we planning for overcapacity? Traditionally, the city governments have been regulating parking supply by setting development norms that requires provision of parking spaces in every development site or land use. Through this instrument the regulatory authorities keep control over the parking provisions in residential and commercial buildings. The basic premise of these norms is to put the responsibility

Table 4: Parking norms in Delhi

Land use category	Parking standards ECS/100 sq m of floor area
COMMERCIAL	
i. Commercial centres	
a. Convenience shopping centre/local shopping centre/local level commercial areas	2
b. Service market	2
c. Organised informal bazar	-
d. Community centre/non-hierarchical commercial centre	3
e. District centre/sub central business district/sub city level commercial areas	3
ii. Metropolitan city centre/central business district	
a. Commercial plot: Retail and commerce metropolitan city centre that is Connaught Place and its extension	3
b. Commercial complex at Fire brigade land and Janpath lane	3
iii. Hotel	3
iv. Service apartments	3
v. Any other commercial centre	3
a. Including commercial component along with Railway/ MRTS stations/ISBT	
b. Asaf Ali Road (the area shown as commercial strip in Delhi Gate – Ajmeri Gate Scheme)	3
vi. Wholesale trade	
Integrated freight complex/wholesale market	3
RESIDENTIAL	
i. Residential plot –plotted housing	
Plot size 250-300 sq m	2
In plots exceeding 300 sq m	1 ECS for every 100 sq m built up area provided that if the permissible coverage and FAR is not achieved with the above-mentioned parking norms in a plot, the parking norms of the preceding category shall be allowed
ii. Residential plot group housing	2
iii. Cluster court housing	As per group housing norms
iv. Foreign mission	Basement for parking and service not to be counted in FAR
v. Hostel/guest house/lodging and boarding house/dharamshala	2 ECS per 100 sq m of built up area These norms will not be applicable for guest house under mixed land use
vi. Night shelter	-
vii. Farm house	-
MANUFACTURING/INDUSTRIAL	
Industrial plots	
50 sq m and below	2
51 sq m to 401 sq m	2
401 sqm and above	2 (In case of plots up to 60 sq m, common parking shall be provided)
Flatted group industry (minimum plot size 400 sq m)	2

Continued…

Table 4: Parking norms in Delhi

Land use category	Parking standards ECS/100 sq m of floor area
GOVERNMENT	
Government offices	
i. Integrated office complex (premises used for the office of central government, local government and local bodies)	1.8
ii. District court (premises used by offices of the judiciary)	1.8
PUBLIC AND SEMI PUBLIC FACILITIES	
i. Hospitals	
a. Hospital A (501 beds and above)	2
b. Hospital B (201 beds to 500)	
c. Hospital C (101 beds to 200)	
d. Hospital D (upto 100 beds)	
OTHER HEALTH FACILITIES	
a. Maternity Home	2
b. Nursing Home/ Polyclinic/Dispensary	
c. Family welfare centre	
d. Pediatric centre	
e. Geriatric centre	
f. Diagnostic centre.	
Veterinary Hospital for pet animals and birds	1.33
Dispensary for pet animals and birds	1.33
Medical College	As per norms of Medical council of India/Regulatory Body
Nursing and Paramedic Institute	2
Veterinary Institute	As pr veterinary council of India/Ministry norms
ii. Education	
Education facilities	
Play School, Coaching Centre, Computer-Training Institute, physical	
Education Centre etc.	1.33
Nursery School	
Primary school	1.33
Sr. Secondary School	2
School for Mentally challenged	
School for Physically challenged	
Education facilities (higher education)	
Vocational Training Centre (ITI/Polytechnic / Vocational/ Training Institute/ Management Institute/ Teacher Training accommodation.	
Institutes etc.) / Research	
Development centre	1.33
General College	1.33
Professional College (Technical)	1.33
University Campus including International Education Centre (IEC) - Large campus (10 ha and above) will be divided into four parts —— academic including administration, residential, sports and cultural activities and parks and landscape	1.33

Continued…

Table 4: Parking norms in Delhi

Land use category	Parking standards ECS/100 sq m of floor area
iiii. Sports facilities	
Various sports facilities (divisional sports centre/golf course; district sports centre; community sports centre; neighbourhood play area and housing area play ground)	2
iv. Communication facilities	
Head post office with administrative office and with/without delivery office)	1.33
v. Security police facilities	
Police post; police station, district office and battalion, police line, district jail, police training institute/college, police firing range etc)	2
vi. Safety/fire facilities	
Fire post, fire station, disaster management centre and fire training institute/college)	1.33
vii. Socio-cultural facilities	
a. Multipurpose community hall and banquet hall	3
b. Community recreational club and recreational club	2
c. Socio cultural activities such as auditorium, music, dance and drama centre/meditation and spiritual centre etc	2 (A proper scheme for visitors parking and parking adequacy statement shall be prepared taking into consideration large number of visitors)
d. Exhibition cum fair ground	Subject to statutory clearance
e. Science centre	2
f. International convention centre	2
Other community facilities	
Old Age Home/ Care Centre for Physically/Mentally challenged/ Working women/ men hostel/Adult education Centre/Orphanage/Children's Centre/ Night Shelter	1.8
Religious places	1.8
Anganwari	1.8
Cremation ground, burial ground and cemetery	New structures to be planned with proper parking

Use premises	Permissible ECS per 100 sq m of floor area
Commercial	3
Residential	2
Manufacturing	2
Government	1.8
Public and semi public facilities	2

Note: 1. In existing buildings having plot area of more than 2000 sq m, an extra ground coverage of 5 per cent shall be permissible for construction of automated multilevel parking to provide dedicated parking structures for additional needs

2. For the provision of car parking spaces, the space standards shall be given as follows:
   i. Open parking 23 sq m per ECS; ii. Ground floor covered 28 sq m per ECS; iii. Basement 32 sq m per ECS
   iv. Multilevel with ramps 30 sq m per ECS; v. Automated multilevel with lifts 16 sq m per ECS
3. In the use of premises, parking on the above standards shall be provided within the plot

DEVELOPMENT NORMS FOR MULTILEVEL STRUCTURED PARKING LOTS

As per MPD 2021, multilevel parking facility should preferably be developed in the designated parking spaces or in the residential, public-semi-public facilities, commercial, transport node, DTC depot, etc. with the following development controls:

- **The minimum plot size should be 1,000 sq m.**
- **A maximum of 25 per cent of gross floor area may be utilized as commercial/office space to compensate the cost of multilevel parking and also to fulfill the growing need of parking spaces within urban area**
- **In addition to the permissible parking spaces on max. FAR, 3 times additional space for parking component shall be provided.**
- **Maximum FAR permissible shall be 100 (excluding parking area) or as per the comprehensive scheme. However, no FAR shall be permissible in plots/existing buildings where 5 per cent additional ground coverage is permissible (para 8 (4) i) Parking Standards of Chapter 17.0 Development Code refereed as — In existing buildings having plot area of more than 2000 sq m, an extra ground coverage of 5 per cent shall be permissible for construction of automated multilevel parking to provide dedicated parking structures for additional needs.**
- **Maximum ground coverage shall be 66.6 per cent. The maximum height shall be restricted to permissible height of the land use in which the plot falls. There will be no restriction on the number of levels of basement subject to structural safety.**
- **In case of comprehensive schemes, development controls including height shall be as per approved scheme.**
- **No limit on number of basements but subject to adequate safety measures.**
- **For development of multilevel parking, models should be worked out to encourage the private sector initiative with restricted commercial component, not exceeding 10 per cent limited to FAR 40 on the plot.**
- **Specific proposals requiring relaxation in above-mentioned norms would be referred to the Authority.**

Table 5: Need flexible standards

The current norms can either lead to over supply or under supply

Area	Current Attractiveness Factor Or Parking demand in ECS per 100 sq m of commercial built up area	Projected attractiveness factor for the area	Draft MPD 2021 Norm	
			Norms for retail business, commerce (in ECS per 100 sq m)	Norms for wholesale trade warehouses and oil depots (in ECS per 100 sq m)
Mangalam Place	2.17	> 2.17 (to increase slightly)	2-2.4	3
Sarojini Nagar	3.7	3.7 (to remain same till 2020)	2-2.4	3
Shastri Park	3.2	3.2 (to remain same till 2020)	2-2.4	3
South Extension Part I & II	3	3.3 (to increase in next 15 years)	2-2.4	3
Nehru Place	2.21	2.21 (to remain same till 2020)	2-2.4	3
K G Marg	2.13	2.5 (to increase)	2-2.4	3
BKS Marg	1.7	2.0 (to increase in next 15 years)	2-2.4	3

Source: Compiled from various feasibility reports submitted to the EPCA

of providing parking on the developer to satisfy the parking demand generated from the development, and, prevent crowding and spill over on roads and open spaces. Common parking spaces are also created in open surface – both on street and off-street – to satisfy the spill over demand that the commercial places attract.

Parking plans do not account for reduction in parking demand: The demand projection made by the consultants and the civic agencies do not account for the

influence of improved public transport and access to sites on reducing parking demand in the future. They consider only a linear growth in demand with the increase in vehicle numbers. This inherent bias in demand projection is expected in studies that are being carried out to increase parking provisions in the city. This can lead to over capacity that will further fuel motorisation. This is a serious flaw in the current planning.

In fact, even rudimentary evidences prove that the impact of improved access on the parking demand can be significant. Studies conducted by the Delhi Metro Corporation (DMRC) show that in Vikas Marg the advent of metro rail can reduce the trips of different modes that will indirectly impact upon the parking demand. Cars, jeeps and two-wheelers are expected to reduce by as much as 10 per cent. Similarly, in Connaught Place demand for parking has already reduced by 10 per cent after the introduction of metro rail. Similar impacts have been noticed in the areas adjacent to Delhi University that is now connected with metro service.

Experts also emphasise on contingency based planning. As Todd Litman, transportation expert from the Canada based Victoria Transport Policy Institute (VTPI) points out that the planners may identify solutions that can be deployed in future if needed. Conditions are monitored and various strategies are identified to manage the spill over. This allows planners to use lower parking standards with the confidence that any resulting problems can be solved. This principle can help to avoid considerable wastage.

Parking demand may also reduce in the future if travel demand management options become available and effective. In other countries, excessive parking supply is discouraged by reducing public parking supplies, imposing a special parking tax, and by enforcing regulations that limit temporary parking facilities. Some cities set the parking maximum or the upper limit on parking supply. Efficient estimation of parking demand is critical for planning parking provision or it may lead to wasteful use of resources and also go against the congestion reduction objectives.

So even as the city government is planning expansion in parking facilities it will have to work simultaneously to restrain personal vehicle usage.

Special challenges

Parking in residential areas: Parking problem is much worse in residential areas. Numerous disputes over parking in residential neighbourhoods with serious law and order consequences have become common in Delhi. Violent fights are reported regularly in newspapers. The shooting incident of one resident of the upmarket Panchsheel Park had hit the headlines in March 2007.

Parking in residential areas is not managed well, norms are not enforced. Most of the time it is left to the vagaries and negotiating skills of individual car owners. In many residential areas, one is free to park as many vehicles as one wishes on the road and that too at no cost. With growing densification of the residential areas car ownership per unit of area is escalating. The number of cars has exceeded the capacity of the legal parking lots. Personal vehicles – cars and two-wheelers – are therefore taking over the road sides, and any vacant area in the vicinity. Parked vehicles reduce carriageway width and aggravate congestion.

In Delhi there are mainly three types of residential land uses. These include plotted housing (premise for one or more than one dwelling unit and may have one main

building block and one accessory block for garages and service personnel), residential plot group housing (premise of size not less than 3,000 sq m comprising of residential flats with basic amenities like parking, park, convenience shops, public utility etc) and residential flats (residential accommodation for one family/household as part of group housing). In addition, a large number of government residential flats exist. DDA has also set separate norms for the residential areas.

The official regulations exist in the form of the building development norms as prescribed by the DDA. The norms have been set according to the area of the residential unit, and according to residential plot group housing (see Table 4: *Parking norms in Delhi*). Even these are violated most of the time as there is no clear mechanism to ensure that legal provisions are made in the buildings. Most of the time the garage spaces in the buildings is diverted for other uses.

Way back in 2001 it was reported in Indian Journal of Transport Management that surveys carried out in different types of residential colonies (cooperative group housing societies, houses built on private plots and flats built by DDA) showed a linear trend between car ownership and income level. This means that per household car ownership increased with rise in income. The study estimated that nearly 56 per cent of the people in these colonies parked their vehicles on the road. However, 25 per cent and 19 per cent of the people parked their vehicles inside the residential premises and in the garage respectively.

However, a cursory survey in some areas in the outskirts of Delhi shows that in many residential areas, mainly in the apartment bocks with common parking lots, the private builders have developed their own system and pricing package for providing parking. Also community initiatives have begun to draw up the rules for parking for the residents.

In the apartment blocks built by cooperative group housing societies or private builders, separate parking lots are created. A resident opting for a garage has to pay a lump sump amount at the time of allotment of flat. This can be roughly 1 to 3 per cent or even less than that of the cost of the apartment (See table 6: *Cost of parking spaces in some residential colonies*). Others who do not buy garage space use the vacant space around the apartments for parking. However, in apartments for medium and high income groups built by DDA, the state urban development agency, a small scooter garage is provided which does not seem to serve the purpose. Bigger vehicles are seen parked along the streets or in open area near the flats. In apartments built for low income classes garage space is not provided.

Development norms for multilevel parking structures allow 25 per cent of the gross floor area to be used as commercial space. This induces more parking demand

Of late resident welfare associations (RWAs) have begun to play a role in managing the parking chaos in some neighbourhoods. Some RWAs have begun to charge for the second or third car owned by a family. The residents are being made aware of the fact that they are using land for parking absolutely free and this land can be utilized for other useful purposes. There is an opportunity cost of the land so they need to pay for using that space for parking their vehicles. These charges can be unbundled with the monthly charges that a resident pays to the association. This makes each resident who owns a car to realize that land is not free. Residents having two or more cars should be charged more. The revenue that will be collected can be utilized for betterment of the colonies. A part of it can be utilized for ensuring safety of the parked vehicles.

Parking in mixed land-use locations: Addressing the need of parking in mixed land use areas is most daunting. The Master Plan Delhi (MPD 2021) has permitted mixed

land use in residential areas. Mixed use essentially means allowing non-residential (commercial) activity in residential premises. Under the new Master Plan, several roads have been converted to commercial and mixed land use. Mixed land-use is considered advantageous for more dense growth that prevents urban sprawls and allows more transit oriented growth. But this needs to be managed well. Adhoc mixed landuse policies in Delhi have become the cause of severe congestion and angst. A series of notifications have been issued during 2006 and 2007 by the Delhi government to regulate and manage these areas more efficiently (See box: *Administering mixed land use*). Mixed land use needs to be properly regulated in order to manage and mitigate the associated adverse impacts related to congestion, increased traffic and increased pressure on civic amenities.

Future projections do not account for the possible reduction in parking demand due to improvement in public transport and improved access to sites. This may create oversupply of parking spaces

Mixed use is however not permitted in the Lutyen's Bungalow zone, Civil Lines bungalow zone, government housing, institutional/staff housing of public and private agencies and buildings/precincts listed by the Heritage Conservation Committee. However, enforcement of norms in other residential and mixed land use areas remains a difficult challenge.

In most mixed land-use areas adequate space is not available for parking. Parking spaces orginally provided for only residential usage have come under severe pressure from increased commercial activities in the area. To address this problem the government has come up with a policy to ask the owners of the commercial establishments in the mixed land-use areas to either provide for parking or pay for providing parking at off-site locations. The owners/residents in mixed landuse areas are required to pay one time cost for development of parking for the year 2006-2007. The applicable rate for 1 ECS per 50 sq m has been fixed according to the class of the residential colonies. To cater to the demand for parking to be generated MCD has floated tenders for 3,000 parking lots that will come up on 2,500 commercial and mixed land use roads. The contractors have been asked to visit the sites and to decide the kind of parking that will be made.

This policy approach requires proper assessment. While legitimate requirement of parking will have to be provided for, this rule must not create policy loophole in which the commercial units can escape the duty of providing for parking by making a onetime payment to the MCD and the MCD also fails to provide for the need. The payment then becomes an eyewash and the demand for parking remains unmet, and parking demand continues to increase to unsustainable levels.

MCD has already collected huge amount of money on this count but has not been as

MASTER PLAN FOR DELHI 2021 ON PARKING MEASURES FOR RESIDENTIAL AREAS

The Master Plan for Delhi 2021 (MPD 2021) has stipulated parking norms for residential areas. Green spaces in residential areas can at risk. Some of the measures suggested in the MPD are as follows:

- **All encroachments on residential streets in the form of kitchen gardens/roadside private greens, large projections/ramps, etc. need to be removed.**
- **Accommodate planned car parking along the residential streets, road cross sections may be redesigned wherever possible, and more surface movement space should be created.**
- **Other options such as creation of underground parking below parks and open spaces will also have to be considered in selected areas.**
- **Resident Welfare Associations will have to be called upon to participate in this process by raising contributions from the residents on the basis of objective criteria such as number of cars owned, etc.**
- **Problem of congestion arising on account of the traffic generated by schools have to be specifically addressed. The main responsibility for putting up the required additional facilities has to be borne by the schools themselves for which policy guidelines have to be evolved.**

Table 6: Cost of parking space in some residential complexes

	Cost of apartment	Type of parking	Applicable rate
Scottish Gardens Indrapuram (Ghaziabad)[1]		• Open parking • Covered parking	Rs. 25,000 Rs. 30,000
Vaishali (Ghaziabad)[2]		• On-floor/open parking • Underground parking	Rs. 25,000 Rs. 80,000
Aura Chimera, NH-58, Near DPs, Ghaziabad Free hold flats[3]	Approximately Rs. 16 lakh to 23 lakh	• Individual car parking open • Still car parking • Two-wheeler parking	Rs. 35,000 Rs. 60,000 Rs. 10,000
Green Valley Faridabad, Omaxe Construction Limited[4]	Rs. 29 to Rs 31 lakh for 2 bedroom apartment and Rs. 40-42 lakh for 3 bedroom apartment	• Open parking • Covered parking	Rs. 50,000 Rs. 80,000
Triveni Heights Ghaziabad[5]	Rs. 25 to Rs. 36 lakh	• Open parking • Covered parking	Rs. 75,000 Rs. 1,50,00
The Nile Gurgaon, Omaxe Construction Limited[6]	Approximate available areas of flats (1900 sq ft, 2342 sq ft and 3750 sq ft)	• Open parking • Covered parking • Compulsory 1 covered parking for ground floor apartments and penthouses)	Rs. 75,000 Rs. 2,00,000
Parsvanath Exotica Gurgaon[7]	At the rate of Rs. 6500 per sq ft for available areas of 2645 sq ft to 6260 sq ft	• Open parking • Covered parking • Mandatory 1 covered parking for 3 bedroom apartment • Mandatory 2 covered parkings for 4 to 5 bedroom apartment	Rs. 1,00,000 Rs. 2,00,000
Tulips at Ashiana Upvan/ Ashiana Upvan Indirapuram[8]	Rs. 68.4 lakh to Rs. 75 lakh	• Reserved car parking i. Open ii. Stilt floor iii. Basement • One car-parking bay at stilt floor/basement floor is mandatory/compulsory with parking bay each unit • Open (reserved) parking bay is optional and shall be allotted subject to availability	 Rs. 50,000 per parking bay Rs. 1,25,000 per parking bay Rs. 1,25,000 per
DLF Park Place on Golf Course Road, near DLF Summit, Gurgaon[9]		• Parking per slot • Mandatory 2 car parkings for apartments in DLF Park Heights • Mandatory 3 car parkings for Apartments in DLF Park Tower	Rs. 3,00,000

Personal communication
Personal communication, Vaishali
http://www.99acres.com/customised/newprojects/aura-infrastructure/
http://www.indiaspaces.com/real_estate_india.aspx?Project_Detail=26
http://www.indiaspaces.com/real_estate_india.aspx?Project_Detail=85
http://www.indiaspaces.com/real_estate_india.aspx?Project_Detail=25
http://parsvnath.com/exotica/Pricelist.asp
http://tulip.ashianahomes.com/pricelist.htm
http://www.prithviestates.com/dlf-park-place.html

succeccful in finding offsite areas where parking facilities can be created with this monely. A thorough asessment is needed of these streets. In fact, following a directive from EPCA the MCD had tried to identify areas for parking but in most of the streets where commercial activites have been allowed were found too clogged to have any space left for parking. Where parking facilities are inadequate either commercial activities should be curtailed or the civic agencies should look at the possibilties of creating remote parking facilities, pedestrianise these streets and restrict the entry of non-resident cars. Innovative solutions are needed instead of providing a loophole that fails to resolve the situation.

Special concern over shopping malls: Yet another big concern in the city today is

ADMINISTERING MIXED LAND-USE

The Gazette notification dated March 28, 2006 suggested, "Non-residential activity on residential premises should be permitted selectively and carefully taking into consideration community needs, environmental impact and provision for safe and easy traffic circulation and adequate parking. In case of new developments, planned mixed residential and non-residential activity should be introduced right at the time of preparation of the layout plans along with planning of commercial centers for which appropriate parking provisions, circulation and services be kept in view. Notified provisions made in the earlier plan may be continued within the overall framework of the approved plan.

"Four activities were approved for mixed land use. These included retail shops (except building materials, firewood, coal or any fire hazardous material; automobile repair and workshops, cycle rickshaw repairs, tyre resorting and retreading, battery charging; storage, godown and warehousing, junk shop, liquour shop, printing, dyeing and varnishing) professional activities (including non-hazardous and non-nuisance kind of activity based on professional skills such as doctor, lawyer, architect, engineer, chartered accountant, designer etc), other activities (either pre-primary school or nursing home or guest house or bank or fitness centre) and banquet halls.

a. RETAIL SHOPS: In this case, mixed use shops are allowed only on ground floor upto the maximum permissible ground floor coverage. These are meant to provide parking at the rate of 2 ECS per 100 sq within the premises. In cases, where parking facilities are not provided, the cost of development of parking shall be playable to the concerned local authority. On-street encroachment is not permitted.
b. PROFESSIONAL ACTIVITIES: In this case, the professional activity is allowed on any floor subject to a maximum of 25 per cent of the floor area of the dwelling unit or not exceeding one floor in case of plotted development.
c. OTHER ACTIVITIES: The residential premise on a plot of a minimum of size of 200 sq m (160 sq m in special area, villages and rehabilitation colonies) facing a minimum width of 18 metres wide roads (9 m in special areas and 13 5 m in rehabilitation colonies).
   BANQUET HALL: These have to in residential plots of 330 sq m facing minimum 18 metres wide roads. The ground coverage, FAR, height and basement etc. shall be applicable as per the Master Plan norms, subject to the conditions in respect of parking and other facilities.

The notification however made it clear that the mixed use on residential plots be located on 18 metres wide roads with earmarked common parking areas and mandatory parking to be provided within the premises. Conversion fee will also be charged for conversion of use/activity.

The September 7, 2006 notification stated the parking norms for the residential plots. For plots of 250-300 sq m size, parking has to be provided at the rate of 2 ECS. In plots exceeding 300 sq m, it would be 1 ECS for every 100 sq m, built up area. It also mentions that if the permissible coverage is not achieved with the above-mentioned parking norms in a plot, the parking norms of the preceding category be allowed. If the building is constructed with stilt area of non-habitable height (less than 2.4 m) used for parking, such stilt area shall not be included in FAR but would be counted towards the height of the building.

"Delhi Development Authority (Fixation of charges for mixed use and commercial use of premises) Regulations 2006: The was issued on November 20, 2006. DDA came up with a notification applicable to residential premises being used for non-residential activities as mandated by the Master Plan of Delhi as amended vide the September 7, 2006 notification. Under this notification, charges were fixed for registration, annual charges, special conversion charges and one time cost of developing parking in case of mixed-use areas.

On parking, the notification mentioned that the owner/allotee/resident/user of the plot/dwelling unit under mixed land use in all area categories shall be liable to pay one time cost for development of parking for the year 2006-2007. The applicable rate for 1 ECS per 50 sq m was fixed at Rs. 2,10,500 (A and B colonies), Rs. 1,49,750 (C and D colonies) and Rs. 66,500 (E, F and G colonies). at the rate of 1 ECS per 50 sq m of the plot area. The payment has to be made by June 30 every year. Unless revised and notified with the approval of the central government, these rates will remain in force for subsequent years. Streets notified as pedestrian shopping streets were exempted from paying the one time parking charge. The notification made it clear that the collected amount for all charges including the parking charge will be deposited in an ESCROW account (a dedicated savings account held by the concerned local body not being operative unless the conditions for which it has been opened are fulfilled) by the concerned local body for incurring expenditure for developing parking sites, augmentation of amenities/infrastructure and environmental improvement programmes for the areas in which mixed use/commercial use streets fall after consultation with all stakeholders including traders in the area.

The owners/residents in mixed landuse areas are required to pay the conversion charges and one time cost of developing parking.

the proliferation of the mega malls and commercial complexes in congested business districts or residential areas in total disregard of the congestion impact. These malls are expected to generate enormous parking demand. For example, DDA has sanctioned three shopping malls in over stretched areas of Vasant Kunj, Saket and Jasola. MCD has sanctioned shopping malls and commercial complexes – community centre cum commercial complex at sector V, plot 1 and 2, Pushp Vihar, convenience shopping centre ONCS/OCF, Pocket Block 1, Sector 16, Rohini and commercial building at local shopping centre Gujranwalan town.

A large spill over of traffic is noticed from these malls. If this problem is not addressed now the city will hurtle towards a congestion nightmare.

There is urgent need to ensure that parking impacts of all new commercial complexes are carried out as part of the environment impact assessment to prevent any spill over of traffic in the surrounding areas. All construction projects including commercial complexes with area greater than or equal to 20,000 sq m of built up area are required to get environmental clearance at the state level from the State Environment Impact Assessment Authority (SEIAA) or in their absence from the ministry of environment and forests (MoEF). The projects have to take consent (establish/operate) separately from the state pollution control board (SPCB) if the projects fall under the purview of Air and Water Act. Environmental clearance is needed to obtain consent to establish from the state pollution control board.

One of the criteria for impact assessment is parking provisions in the building under land environment and air environment. It has to assess if the project will create shortage of parking space for vehicles. They have to furnish details of the present level of transport infrastructure and measures proposed for improvement including the traffic management at the entry and exit to the project site.

Surveys in residential colonies have shown that there is a linear trend between car ownership and income levels. Car ownership increase with rising income. This escalates demand for parking space in residential colonies.

The system and environmental clearance and consent to establish from the state pollution control board is not working that well. There are 76 shopping malls/commercial complexes in the city. According to the list provided by the DPCC, only 1 mall is operating with consent. Others are at various stages (see Table 7: *Status of shopping malls in Delhi*). According to the latest status provided by the Delhi Pollution Control Committee (DPCC), there are 74 shopping malls out of which 1 has obtained NOC from the DPCC, 19 have obtained environmental clearance from the MoEF and 40 have applied for NOC to DPCC.

However, in January 2009, Union Ministry of Environment and Forests has yet again made attempts to dilue the EIA requirement for the buildings. A draft amendment has been issued to waive off the EIA requirement for the buildings. If this comes through it will seriously jeopradise the move to make environmental regulations binding on these buildings. This can lead to serious environmental and congestion impacts in cities.

Both DDA and MCD inform that the projects within their jurisdictions follow the given norms for parking (see table: *Parking provisions in the shopping malls and commercial complexes A and B*). But adherence to parking norms and a parking management plan to prevent spill over must be drawn up by all commercial projects irrespective of the area criteria as the areas of even smaller size can have significant parking and congestion impacts.

There is need for strict directive for the owners of the shopping malls and commercial complexes that the parking demand will have to be met within the premises of the complex through adequate provisions and good management

Table 7: Status of environmental clearance of shopping malls in Delhi

Classification of malls/commercial complexes	Number
Applied for consent to establish	23
Consent issued and functioning	1
Not applied for consent to establish and are functioning	16
Not applied for consent to establish and are under construction	2
Not applied for consent to establish and reply is awaited	1
Not applied for consent to establish and are newly built	1
Not applied for consent	32
	76

(A) Parking provisions in the shopping malls and commercial complexes

Shopping malls/ commercial complexes	Total built up area (in sq m)	Parking requirement as per MPD	Parking achieved
Vasant Kunj	190,162 sq m	@ 2 ECS/100 sq m = 3803 ECS	6000 ECS @ 3.15 ECS/100 sq m
Saket district centre	249,692 sq m	@ 2 ECS/100 sq m = 4993 ECS	8035 ECS @ 3.2 ECS/100 sq m
Jasola commercial centre	212,220 sq m	@ 2 ECS/100 sq m = 4244 ECS	6366 ECS @ 3 ECS/100 sq m

(B)

Name of site	Parking provisions	
	Required ECS @ 2 ECS/100 sq m	Proposed/sanctioned ECS @ 2 ECS/100 sq m
Community centre cum commercial complex at sector V, plot 1 and 2, Pushp Vihar	485.61	514.66
Convenience shopping centre ONCS/OCF, Pocket Block 1, sector 16, Rohini	345	390.60
Commercial building at local shopping centre Gujranwalan town	232	290

practices. No spill over outside the premises will be tolerated. Any spill over should be banned. Additionally the entire area surrounding the mall needs to be declared a no parking zone and need to be strictly enforced.

It is also important to increase the awareness levels of the shopping mall owners. They need to understand that free and low cost parking has a negative impact on businesses. The total sales are not increased rather shoppers tend to shop more frequently with smaller purchases on each trip. This in turn encourages people to park for longer than needed (long-term parkers are the least efficient user of a parking space). Few cars parking for long periods of time take up more space than many cars parking for less time. Free parking also tends towards more shopping trips made by solo driving.

4. COST OF PARKING

Free parking is actually not free — we all pay a price for it in some way or the other. Donald Shoup of the University of California, Los Angeles, who has studied parking as a travel demand management issue mentions, 'We unknowingly support our cars with almost every commercial transaction we make because a small share of the money changing hands pays for parking. Residents pay for parking through higher prices for housing, businesses pay for parking through higher rents for their premises, shoppers pay for parking through higher prices for everything they buy.

We don't pay for parking in our role as motorists but in all our other roles as consumers, investors, workers, residents and taxpayers —– we pay a high price. Even people who don't own a car have to pay for free parking.'

It is the parking charge that we pay as a motorist directly is crucial in influencing the demand for parking and usage of personal vehicles. But clearly, the complexity of the cost of parking is not well understood and therefore not adequately reflected in the way parking is priced in our cities. In fact, public understanding of the basic cost of providing parking itself lacks clarity let alone other externalities associated with it.

Cost of structured parking

For the first time in Indian cities, the civic bodies have begun to plan for hi-tech structured parking facilities. They argue that there is very little margin available in the existing surface parking lots to accommodate future demand and to decongest existing areas. The construction and integration of the structured multilevel parking with the overall management strategy for parking has raised many concerns in Delhi and also other cities.

Among all civic and development agencies around 27 multilevel parking structures have been planned for Delhi. In addition to this there is a blanket directive from the Delhi High court to set up 100 multilevel parking structures in Delhi. The structured parking lots are being constructed on a build-operate-transfer (BOT) basis in a public-private partnership. Land is leased out by the civic agencies for this purpose.

This thrust on structured parking has generated a lot of skepticism. Structured parking is very expensive to build while surface parking is cheapest to provide. Therefore, provision of structured parking would require steep escalation in parking rates even for the minimal recovery of the capital costs. This may not work at all as the cheaply priced surface parking in the vicinity may totally undercut its economic viability unless ways are found to bring some parity. Matching the pricing of structured parking with surface parking presents an enormous challenge especially in the price sensitive market of India. But massive investments have been planned without any clarity with regard to the management and business model for overall parking management plan for a given area where structured and surface parking will coexist.

What it costs to provide structured parking?

There is very little public understanding of what it costs to provide parking space as the full cost of providing parking is never recovered from the users. Parking services are provided with an enormous hidden subsidy. It would take a staggering proportion if environmental and congestions costs are also added.

However, typical cost of structured parking includes construction costs, operation and maintenance costs, and transaction costs. Land is given on lease by the civic bodies and therefore land costs are not included. There are two types of structured parking – manual or ramp based and automated systems. Automated systems that require more sophisticated equipment are comparatively more expensive. Unfortunately, detailed costs of most of the planned structures are not available in Delhi.

The civic bodies do not expect these structures to be profitable at the current level of the parking fees or at the minimum escalation planned after these structures become operational. Therefore, in order to make these projects commercially

attractive they are allowing the bidders to use at least 25 to 30 per cent of the built up areas for other commercial activities to cross subsidise the cost of providing parking and also recover investment costs. This has been done on the premise that parking fees in itself cannot ensure return on investments.

NDMC has shared the detailed costs for the structures that are being planned for Baba Kharak Singh Marg and Hindustan Times Building in Connaught Place. In their bid parameters NDMC has not specified any technology but have stated the minimum ECS requirement which the bidders are expected to satisfy in a cost effective manner. NDMC has shared estimates for both the options – i) If at least 25 per cent of the parking structure is set aside for other commercial activities and ii) If the entire structure is devoted to provide parking. In the former case it has been assumed that the entire cost of creating the parking facility will not be passed on to the user and the revenue from the commercial activities will cross subsidise the cost of providing parking and also ensure the internal rate of return to the provider. In this case higher ECS has been estimated as the commercial activity is also expected to generate additional parking demand.

In the second option the structure is expected to provide only parking facilities and parking rates are fixed for full cost recovery including the internal rate of return. In this case the parking charges are expected to be substantially higher compared to the former option (see Table 8: *Summary highlights of costs of constructing a multilevel parking as estimated by NDMC*). More detailed cost break up is given in Annexure 2).

The cost data provided by the NDMC for their structured parking bear out the following:

- The capital cost of providing multilevel parking amounts to Rs 0.4 million per ECS. (According to MCD this can increase to Rs 0.9 million per ECS if more advanced technologies are used for automatic operations).
- The business model adopted by the NDMC is based on the combination of parking and commercial activities. About 25-30 per cent of the space in the structure will be used for other commercial activities to keep the venture profitable. This model aims at recovering only 22 per cent of the total capital costs through parking charges.
- As a result, the minimum hike in parking rates that has been planned in these parking lots is an average parking fee of Rs 10 per hour (this will be the basis of

Table 8: Summary highlights of costs of constructing a multilevel parking as estimated by NDMC

	Baba Kharak Singh Marg multilevel parking		**Hindustan Times Building multilevel parking**	
	Parking and commercial	**Parking only**	**Parking and commercial**	**Parking only**
Number of ECS planned	941	780	1209	1025
Capital cost Rs in million per ECS	0.4 approximately	0.4 approximately	0.4 approximately	0.4 approximately
Total cost Rs. in million (including cap, working, taxes etc) (Net Present Value)	529.00 approximately (Rs. 18,577.78 per sq meter)	384.90 approximately	752.30 approximately	531 approximately
Revenue - Rs. In million (NPV)	672.40 approximately	416.8 approximately	935.2 approximately	557.4 approximately
IRR in per cent	12.68	12.67	12.68	12.69
Parking charges	Rs 10/h	Rs 30.25/h	Rs 10/h	Rs 39/h

Source: Based on data provided by NDMC to EPCA

developing graded structure) that will allow 22 per cent recovery of the capital costs.
- Full cost recovery only through parking charges can push up the parking rates to as much as Rs 30 to Rs 39 per hour.
- Both the rates are several times higher than the current surface parking rates in the city which is on an average Rs 10 for 12 hours.

Challenge of pricing parking in structured facilities:
The greatest weakness of the current approach is that there is no clarity how the higher parking rates in the high cost structured parking will be balanced with the low rates in surface parking which is crucial for the optimal utilisation of the former. Nor is there any management model to suggest that with the augmentation of the structured parking the surface parking especially the on-street parking that contributes maximum to the congestion will be curtailed. Without a pricing and a management strategy the structured parking will remain grossly underutilised and the basic objective of meeting the parking demand and reducing pressure of on-street parking will not be met. Unless this is addressed in the early planning stage any further plans to build structured parking should be put on hold.

These challenges are clearly evident from the status of use of the existing structured parking in both Delhi and Mumbai. The existing structured parking facilities in these cities are grossly underutilised due to distortion in parking fees. This has emerged from the review of the Eros multilevel parking structure at Nehru Place in Delhi and INOX multilevel car park at Nariman Point in Mumbai (see Box: *Poor model)*. Availability of abundant, cheap or free, and unauthorised surface parking in close proximity undermines the utilisation of the structured parking lots. For instance, when the field survey for this study was carried out at the Eros in Nehru Place the parking rates were Rs. 20 for two hours, Rs 40 for 4 hours, and Rs 100 for 6-10 hours. But the rate at the surrounding surface parking continued to remain at Rs 10 for 10-12 hours. This wide differential had resulted in gross underutilization of the structured parking. After that the rates at the multilevel parking was revised and lowered.

It is difficult to justify such high investments in structured parking if despite the high demand for parking, these structures remain nearly empty in a busy commercial place because of cheaper surface parking charges in the vicinity. Moreover, the civic agencies have not made any integrated plan to leverage the structured parking to curtail the surface parking (especially the on-street parking that causes maximum congestion). This indicates a serious policy failure.

None of the feasibility reports for structured parking has considered setting parking fee for full recovery of the costs. As mentioned earlier, the maximum that has been considered is the average rate of Rs10 per hour that is also the basis of developing time variable rates as has already been done in Eros structured parking lot in Nehru Place. The market has not accepted this rate. Any hope of passing on the full costs at the rate which can raise the rates to Rs 30 to Rs 40 per hour seems still quite distant (see Table 9: *Parking charges proposed by different agencies for mutilevel structured parking lots*).

As the future expansion of parking capacity hinges on capital intensive structured parking lots, the parking rates in these structures will begin to set the floor limit of the parking rates in the city. Unless parity is achieved between multilevel and surface parking lots the investments in multilevel parking will be at serious risk. If the multilevel parking remains underutilised over time commercial activities may begin to expand in these structures and parking will play a secondary role, defeating

the basic purpose of creating these structures. Civic bodies however, argue that the current practice of leasing out of the land for 30 years is expected to prevent misuse of these structures for other purposes.

The civic bodies will have to develop a business and management model for given commercial districts in an integrated manner that will include a pricing strategy for both structured and surface parking and a plan to eliminate free and unauthorized surface parking and curtailment of on-street parking wherever needed to reduce congestion.

There is very little public understanding of what it costs to provide structured parking as the full cost of proving parking is never recovered from the users.

Parking charges in surface parking lots

In most prime areas of the city, parking is priced but the rates are very nominal. Many of these areas also have the huge problem of free illegal parking. There is a big difference among the civic bodies with regard to the parking pricing. NDMC that manages the central district in Delhi charges the highest parking rates. NDMC has adopted a graded parking fee structure based on areas classified according to importance. Group A, is the prime business districts (Connaught Place, Dilli Haat, INA market etc), Group B, the next rung (Bengali Market, Pandara Road, Sarojini Nagar etc) and Group C (places in front of government offices, other private offices, Supreme Court, High Court etc). Parking rates are highest in group A areas, followed by Group B and Group C areas. Group A area parking rates are further divided into peak hour and lean hour period rates.

In contrast the other two agencies —- MCD and DDA charge nominal rates (see Table 10: *Parking rates in Delhi*). These agencies charge flat rates irrespective of the commercial importance of areas. The MCD rates though very low are second highest in the city followed by the lowest parking rate charged by the DDA. The immediate step should be to bring the MCD and DDA rates at par with the NDMC rates and set the roadmap for the future increase.

Under the aegis of the Supreme Court the MCD has been directed by the EPCA to design a scheme for graded parking rates for different areas classified according to the commercial attractiveness. But MCD is simultaneously working on a parallel proposal to introduce one time payment of parking charges for cars and two-wheelers. MCD has proposed annual payment of a lumpsum amount and thereafter cars and two-wheelers can park free throughout the year for any length of time. Accordingly two-wheelers are proposed to pay a minimum amount of Rs. 500 per year; small and medium, big cars and sports utility vehicles will pay the following amount respectively every year —- Rs. 1,000, Rs. 1,500- 2,000 and Rs. 2,000-2,500.

Such a move will grossly subsidise the parking cost of cars and two-wheelers in the city. A basic calculation of the proposed yearly charges show that owners of personal vehicles will have to pay far less than even the current parking charges of the MCD. The proposed annual charges translate into paying a mere Rs. 1.4 for two-wheelers and Rs. 2.7 – 6.8 for cars per day — a lot less than what they would normally pay currently. A car now pays Rs. 10 for 10 hours and Rs. 20 beyond 10 hours in surface parking. Even on the basis of the current monthly charges a two-wheeler and a car owner pays Rs. 250 and Rs. 500 per month. This works out to be Rs. 3,000 and Rs. 6,000 per annum respectively. This is much higher than the proposed annual charges.

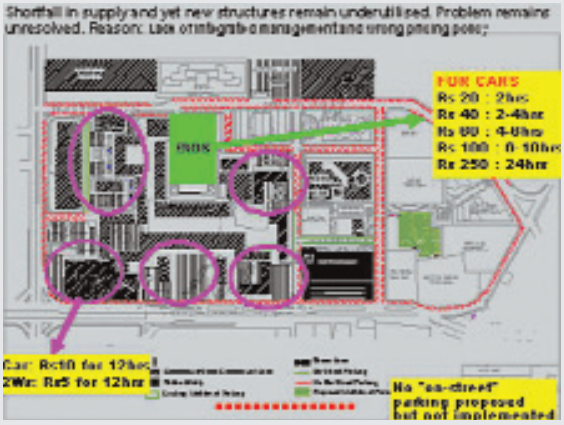
In contrast NDMC has already introduced graded parking prices for different classes of areas based on their commercial importance. But given the fact that MCD administers more than 94 per cent of Delhi's area, such a proposal implies giving away parking spaces for nearly free. This will also obstruct efforts to bring parity

POOR MODEL

Poor pricing and management model result in poor utilisation.

i. Eros multilevel car park in Nehru Place

A seven-storied multilevel parking complex exists at Nehru Place in Delhi. It is a ramp based multilevel parking with a capacity to accommodate around 1,000 ECS. The total built up area (including basement) is 60,550 sq m. Of the total built up area, 18,165 sq m (nearly 30 per cent) is allowed to be used for other commercial activities and the remaining 42,385 sq m is expected to provide parking services. At present, only two floors are operational – the first and the fourth floor. At the time of field visit CSE representatives were informed that first floor has a capacity to accommodate 120 ECS the fourth floor can take 108 ECS on a daily basis. But during the field visit only nine cars were found parked on the first floor.



As this is an expensive facility, the parking rates are also comparatively higher. In the initial stages the parking rates for a car were Rs. 30 for 1 hour, Rs. 50 for 2 hours, Rs. 80 for 4 hours and Rs. 120 for 8 hours. If a car was parked till 12 am at midnight, a parking fee of Rs. 300 was charged. There was hue and cry over those rates that drew a lot of political criticism. These rates were subsequently revised downward: Rs. 20 for 2 hours, Rs. 40 for 2 to 4 hours, Rs. 60 for 4 to 6 hours and Rs. 100 for 6 to 10 hours and Rs. 250 for 24 hours.

The surrounding surface parking and unauthorised parking lots have not been curtailed after the creation of this structure and the surface parking rates have continued to remain very low. The multilevel Eros parking facility has remained underutilised and has not made any impact on the congestion in the area. This issue will have to be urgently sorted out as even without a strategy for proper utilisation of the existing structure DDA has planned two more structured parking in the same area.[1]

Need policy clarity on the parity between parking rates in structured parking lots and the adjacent surface parking lots.

between parking charges in surface parking lots and in the multilevel structured parking lots when they become operational. This will also grossly undermine the efforts to use parking pricing as a traffic restraint measure.

Misuse charges – advantage cars

In addition to on-site parking charges the MCD has introduced a system of levying parking charges on all vehicles registered in Delhi since September 2004. This charge, ironically termed as 'misuse' charges, is levied on all vehicles for using municipal land for parking. But even this charge is disproportionately lower for personal vehicles compared to commercial vehicles. Personal vehicle especially the cars which need several parking spaces in a day are asked to pay a life-time parking charge. Two-wheelers are exempted from payment. Cars costing Rs. 4 lakh and above are required to pay one time parking charge of Rs. 2,000 and Rs. 4,000 respectively at the time of purchase.

Commercial vehicles have to pay these charges on a yearly basis. The annual rates for commercial vehicles are — Rs. 1,000 for autorickshaws and taxis, Rs. 2,500 for

ii. INOX multilevel car park, Nariman point, Mumbai

Mumbai based civil society group Mumbai Environmental Social Network has assessed the INOX multiplex parking lot in Nariman point to expose a similar predicament. Their assessment shows that before the construction of the multilevel parking, the open surface space had 140 parking spaces and it was 100 per cent utilised. But after the construction of the multilevel parking structure on the same plot the parking space has increased to 540 ECS but its utilisation has dropped to only 10 per cent. This anomaly is the result of the relatively cheaper on street parking in the vicinity. The structured parking rates are Rs 5 per 30 minutes or Rs 10 per hour. In the vicinity the rates for surface parking are Rs 5 per hour and Rs 3 for every additional hour.

iii. Rawdon Street multilevel parking, Kolkata

Kolkata has one multilevel parking at Rawdon Street, which has 3 floors that can park 200 cars. The current rates are Rs. 15 per hour and a concessional rate of Rs. 75 for 8 hours. According to Simpark Infrastructure, the parking operator, about 110 slots are always occupied mostly by office goers who pay monthly. On an average there are about 160-180 cars using the lot on an hourly basis. In this case, greater occupancy can be attributed to relatively high rates of surface parking (Rs. 7 per hour). The surface parking charges in Kolkata are considered to be among the highest in the country. The city area is categorized into A, B and C with differentiated parking rates. Category A areas have the highest parking rates.

Source: Anon 2006, Report of the Workshop on Transport Demand Management Measures for Mumbai, Mumbai Environmental Social Network, Mumbai, May 2006.

Table 9: Parking charges proposed by different agencies for multilevel structured parking lots

Agencies	Locations of multilevel parkings	Parking rates proposed
DDA	Nehru Place	Rs 5 per hour considered in feasibility report
	Mangalam Place	Rs 5 per hour considered in feasibility report
	Eros, Nehru Place (under operation)	Has fixed variable rates but on an average it works out to be Rs 10 /hr
NDMC	S N Market	Not available
	H T Building	Most likely Rs 10/hr
	B K S Marg	Most likely Rs 10/hr
MCD	Kamla Nagar, Ramlila Ground, Parade Ground, Shastri Park, South Extension	Rates NA

Source: Based on information received from DDA, NDMC and MCD.

Table 10: Parking rates in Delhi

Vehicles		New Delhi Municipal Council (NDMC)			Municipal Corporation of Delhi (MCD)	Delhi Development Authority (DDA)
		Group A	**Group B**	**Group C**		
Cars	Surface parking	Rs. 10 for first 2 hours and Rs. 10 for every subsequent hour and part thereof	Rs.10 for 4 hours Rs. 30 for 4-8 hours Rs. 50 beyond 8 hours	Rs. 10 for 4 hours Rs. 30 beyond 4 hours	Rs. 10 upto 10 hours Rs. 20 beyond 10 hours upto 24 hours	Rs. 10 upto 12 hours Rs. 15 upto 24 hours
		Rs. 1000 per month	Rs. 600 per month	Rs. 500 per month	Rs. 500 per month for all except Gandhi Maidan and Church Road parking (Rs. 600 per month) and Asaf Ali Road parking (Rs. 700 per month) Premium tourist parkings in front of Appu Ghar, Lotus Temple and opposite Delite Cinema (Rs. 25 per entry)	Rs. 500 per month
	Underground parking: Palika parking and Baba Kharak Singh Marg	Rs. 10 for 4 hours and Rs. 5 for every subsequent hour or part thereof Rs. 500 per month				
	Multilevel parkings	Mayur Bhawan: Proposed parkings: NDMC submits that the parking rates will be kept fair and just so as to avoid competition from surface parking. The revenues from development of commercial area in these complexes and the revenues generated from the surface parking will help finance the multilevel parking in the long run The agency proposed the rate at Rs. 10 per hour				There is no mechanism to regulate parking fee of multilevel parkings auctioned by DDA, as the developer of such parkings is free to fix parking fee on his own In case of Nehru Place and Mangalam Place proposed multilevel parkings, Rs 5 per hour considered in feasibility report
Scooter/ motorcycle	Surface parkings	Rs. 5 for first 2 hours Rs. 5 for every subsequent hour and part thereof	Rs. 5 for 4 hours Rs. 10 for 4-8 hours Rs. 25 beyond 8 hours	Rs. 5 for 4 hours Rs. 10 beyond 4 hours	Rs. 7 upto 10 hours Rs. 15 beyond 10 hours upto 24 hours	Rs. 5 upto 12 hours Rs. 10 upto 24 hours
		Rs. 400 per month	Rs. 350 per month	Rs. 300 per month	Rs. 200 per month (day passes) Rs. 250 per month (for day and night passes) Premium tourist parkings in front of Appu Ghar, Loyus Temple and opposite Delite Cinema (Rs. 15 per entry)	Rs. 250 per month

Continued…

Contd: Parking rates in Delhi

Vehicles		New Delhi Municipal Council (NDMC)			Municipal Corporation of Delhi (MCD)	Delhi Development Authority (DDA)
		Group A	Group B	Group C		
	Under-ground parking: Palika parking and Baba Kharak Singh Marg	Rs. 5 upto 4 hours Rs. 15 for 4-8 hours Rs. 25 beyond 8 hours Monthly charges Rs. 300				

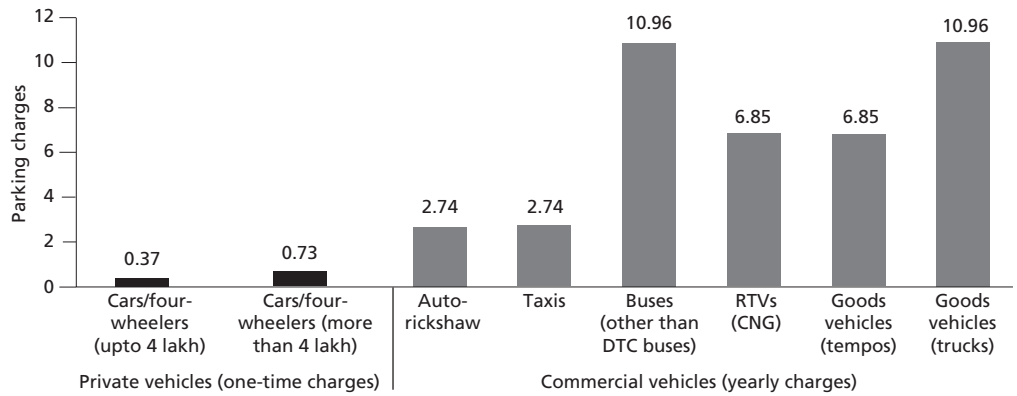
the small CNG buses/vans and goods vehicles, light motor vehicles like tempo etc, and Rs. 4,000 for standard buses, heavy commercial vehicles like trucks etc. A comparison of these charges on a daily basis shows that personal vehicles pay a miniscule amount while commercial vehicles pay 15 to 30 times higher (see Graph 11*: Estimated per day parking charges).*

The transport department collects the parking charge and retains 5 per cent of the total charges collected. About 95 per cent of the collected charges is transferred to the MCD. The collected money will be used for constructing multilevel parking lots. This literally amounts to double subsidy for car owners as the structured parking largely caters to the parking needs of the personal vehicles. The commercial vehicles will continue to use open public spaces and road side.

No will to pay:
High parking rates present a serious political dilemma in a city where users are not made aware of the hidden costs of providing parking and use of cars, have got used to paying paltry for using high cost services, and do not see this as their responsibility to pay the full cost for the services. In fact, all the feasibility studies conducted for the proposed projects shows very low willingness to pay among car users in the city with the highest per capita income in the country.

One feasibility study available for MCD's automated multilevel parking sites at Parade Ground shows that 50 per cent of the car users interviewed, are willing to

Graph 11: Estimated per day parking charges



Note: Estimated on the basis on the misuse charges charged. In case of private vehicles, lifetime period is taken as 15 years.

Table 11: Parking rates in other cities

Vehicles	Kolkata			Chennai
	Group A	**Group B**	**Group C**	
	Day parking charge (7 am to 10 pm)	**Day parking charge (7 am to 10 pm)**	**Day parking charge (7 am to 10 pm)**	
Cars	Rs. 7 per hour or part thereof for first hour.[1]	Rs. 6 per hour or part thereof for first hour.[1]	Rs. 5 per hour or part thereof for first hour.[1]	Rs. 5 for 6 hours[2]
	Additional charge of half the rate for every additional 30 minutes after the first hour[1]	Additional charge of half the rate for every additional 30 minutes after the first hour [1]	Additional charge of half the rate for every additional 30 minutes after the first hour[1]	Rs. 20 for entire day[2]
	Night parking (10 pm to 8 am) Rs. 25 per night Rs. 300 per month			
Two-wheelers	Rs. 3 per hour or part thereof for first hour.	Rs. 2.50 per hour or part thereof for first hour	Rs. 2.25 per hour or part thereof for first hour	Free parking
	Additional charge of half the rate for every additional 30 minutes after the first hour	Additional charge of half the rate for every additional 30 minutes after the first hour	Additional charge of half the rate for every additional 30 minutes after the first hour	
	Night parking (10 pm to 8 am) Rs. 8 per night Rs. 125 per month			
Lorry/bus	Rs.14 per hour or part thereof for first hour[3]	Rs. 12 per hour or part thereof for first hour.[3]	Rs. 10 per hour or part thereof for first hour[3]	Rs. 25 for 12 hours[4]
	Additional charge of half the rate for every additional 30 minutes after the first hour[3]	Additional charge of half the rate for every additional 30 minutes after the first hour[3]	Additional charge of half the rate for every additional 30 minutes after the first hour[3]	Rs. 50 for entire day[4]
	Night parking (10 pm to 8 am) Rs. 50 per night Rs. 700 per month			
Autorickshaws				Free parking
Tempos				Rs. 15 for 12 hours Rs. 30 for entire day

Note:
1. In Kolkata, parking rates for car/van/minibus
2. In Chennai, parking rates for cars and jeeps
3. In Kolkata, parking rates for lorry/bus
4. In Chennai, parking rates for lorry

Source: Kolkata Municipal Corporation and Corporation of Chennai

pay only Rs. 10 – the same amount that is usually charged at most ordinary parking lots in the city and 30 per cent are willing to pay Rs. 15 for unlimited time. When it comes to payment on an hourly basis, most opt for the rate of Rs 5. Only 28 per cent of all the respondents are willing to pay equal to or more than Rs. 10 for the proposed parking structures. For the proposed fully automated multilevel parking lot at Ramlila Ground, 93 per cent of the car users are willing to use the parking lot but when asked about the parking fee, 61 per cent are willing to pay Rs. 5, about 26 per cent Rs. 10, 3 per cent Rs. 15 and only 10 per cent said that they can pay Rs. 20.

Willingness to pay does not reflect the ability to pay. Some user surveys conducted in South Extension shows that customers coming to the market have very high spending power. Exclusive branded lifestyle showrooms, restaurants in the market, upmarket localities in the surrounding areas reflect a high spending power. But this is not considered while fixing the parking rates in prime areas. At the same time unpriced parking in large number of places and very low parking rates create more

barriers to accepting rationalisation and upward revision of the parking rates in the city. A city wide plan is needed to develop pricing zones depending on the commercial importance of the areas. Elimination of unpriced parking and its strict enforcement can make significant impact on parking demand and commuter's modal choice in the city.

Parking pricing can influence parking demand:
Worldwide experience has shown that appropriately priced parking can make significant impacts. This can influence demand for parking and commuter choice for alternatives. As we have seen most parking is inefficiently priced, provided free, significantly subsidised or bundled (automatically included) with building purchases and rents thus forcing consumers to pay for the parking facilities regardless of whether they want it or not.

"Providing anything for free or at highly subsidised rates encourages overuse and means that more parking spaces have to be provided. Therefore, charging users for parking is a market based approach that passes the true cost of parking to users and encourages use of other transportation modes," states Donald Shoup.

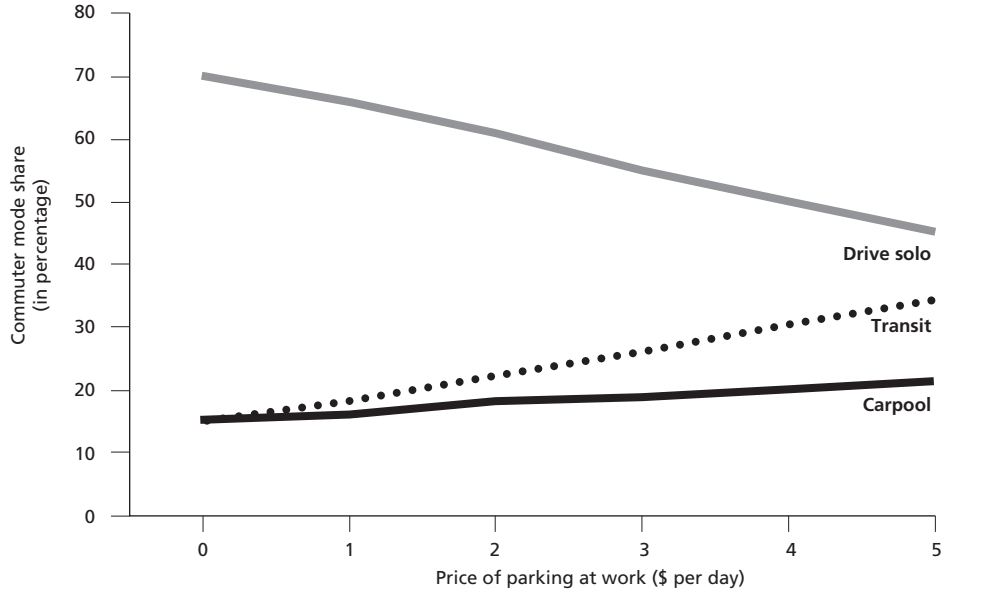
It is estimated that even a modest parking fee can affect vehicle travel patterns. The estimates available from Todd Litman of VTPI shows that only a 10 per cent increase in parking charges can reduce vehicle trip by 1-3 per cent. Shifting from free to cost recovery parking rates can reduce automobile commuting by 10-30 per cent especially if linked with transportation choices and complementary travel demand management measures. International surveys shows that nearly 35 per cent would consider shifting to another mode if they were required to pay for parking with fees of $1-3 per day in suburban locations and $3-8 per day in urban locations. More studies show that parking pricing for work trips can reduce regional vehicles miles travelled by upto 4 per cent and for non –work trips by another 4.2 per cent. This translates into very significant reduction in congestion delays.

International surveys shows that nearly 35 per cent would consider shifting to another mode if they were required to pay for parking with fees of $1-3 per day in suburban locations and $3-8 per day in urban locations. More studies show that parking pricing for work trips can reduce vehicles miles travelled by upto 4 per cent and for non-work trips by another 4.2 per cent. This translates into very significant reduction in congestion delays. Parking charges have been found to reduce employee vehicle trips and thus daily parking demand by between 7 per cent and 30 per cent or more depending on factors such as the level of charges and the availability of alternatives to driving alone. According to an estimate, each 1 per cent rise in parking fee is accompanied by a 0.3 per cent decrease in demand.

Pricing parking in just one area has such impact that it can shift vehicle trips to other locations thereby reducing overall vehicle travel. About 35 per cent of the drive alone commuters would likely switch modes in response to $20 per month parking fees even if is offset by a transportation voucher (see Graph 12: *Parking pricing affect mode choice*).

Upward revision of parking rates which is an important element of travel demand management measure will have to be addressed in Delhi. Considerable effort is needed to develop a phase-in plan for upward revision of rates, its announcement in advance and enlisting public support through awareness creation. Civic bodies will have to initiate a buy-in strategy to make people aware of the benefits of such measure in reducing congestion. It may also be possible to create dedicated funds from the parking revenue to invest in public transportation systems or other

Graph 12: Parking pricing affect mode choice



Source: Estimated from Willson (1991)

sustainable transportation measures to get public support.

Limiting parking supply:
Parking restraint measures have been in use internationally for over 30 years and is a widely used traffic management tool to reduce traffic congestion. These measures have made impacts on parking and travel demand and also on congestion in cities where these have been implemented. Success of many of these schemes presents a model for designing a package of measures in Delhi and other Indian cities as well. Experience around the world shows that parking measures require a great amount of detailing depending on the objectives and site-specific features.

Broadly, the measures cover appropriate pricing of both off-street and on-street parking to influence parking demand; controlled parking zones, removal of on-street parking during peak periods; pedestrian only streets; new developments are regulated by the maximum parking that can be allowed; commuted payment schemes or the amount of money that the developers pay in lieu of providing car parks; setting of parking ceiling which is the total spaces that can be used for parking; and reducing parking provision according to the level of public transport etc. In existing spaces differential rates for long term and short-term parking are implemented, and park and ride facilities are created at the periphery of the centre with dedicated bus service.

Unfortunately, in Indian cities, the parking issue remained on the agenda of policy makers and government panels without any tangible impact. These initiatives will have to be revisited and reformed as car restraint measure. It is clear from the experience of the experience of all the countries that when parking management combines a high price for parking, puts limit on parking provision and improves access to locations through other modes of transport, it helps to stimulate switch from cars to alternative modes of transport. This can reduce parking demand and also traffic volume.

5. POLICY ACTION

National policy framework: As a nascent beginning the national urban transport framework policy has taken issue of parking on board. The National Urban Transport Policy (NUTP) of the Union ministry of urban development makes note of the fact that parking places occupy large portion of the valuable land in urban areas. It states that this should be recognized in determining the principles for allocation of parking space.

According to the NUTP high parking fee should be charged in order to make the use of public transport attractive. The parking fee should reflect the value of the land that is occupied. Public transport vehicles and non-motorised modes of transport should be given preference in the parking space allocation. This along with easier access of work places to and from such parking spaces can encourage the use of sustainable transport systems (see Box: *Policy genesis*).

On March 28, 2007, Union ministry of urban development (MoUD) has written a to the Chief Secretaries of all states and union territories stating the following:

- *"Various cities are sending proposals related to urban transport for sanctioning under Jawaharlal Nehru Urban Renewal Mission. While considering such projects the Central Sanctioning and Monitoring Committee (CSMC) chaired by the Secretary, MoUD observed that none of the proposals is incorporating the parking improvements and leveraging land as a resource along the transport corridor. Roads are prime urban space and parking on major arterial roads unnecessarily eats up considerable space, which should be available for mobility. Most of the*

POLICY GENESIS

What National Urban Transport Policy says on parking?

The National Urban Transport Policy (NUTP) of the Union ministry of urban development mentions

- **High parking fee should be charged in order to make the use of public transport attractive.**
- **The parking fee should reflect the value of the land that is occupied.**
- **Public transport vehicles and non-motorised modes of transport should be given preference in the parking space allocation. This along with easier access of work places to and from such parking spaces can encourage the use of sustainable transport systems.**
- **Park and ride facilities for bicycle users with convenient interchange are a useful measure.**
- **Adopt graded scale of parking fee that recovers the economic cost of the land used in such parking with the objective of persuading people to use public transport to reach city centers.**
- **The policy suggests that multilevel parking complexes should be made a mandatory requirement in city centers that have several high-rise commercial complexes and these can come up through public-private partnerships. These would be encouraged to go in for electronic metering so that is there is better realization of parking fees to make the investments viable and also a better recovery of the cost of using valuable urban space in the parking of personal motor vehicles. Such complexes could even be constructed underground, including areas declared as green belts in the master plan in a public-private partnership to limit the impact on the public budget.**
- **Proposals of such complexes would be given priority under the National Urban Renewal Mission.**
- **In residential areas also, the policy suggests changes in byelaws to free the public carriageway from parked vehicles impeding the smooth flow of traffic. It suggests making provisions in the appropriate legislation to prevent the use of right of way on road systems for parking purposes.**
- **It states that state governments would be required to amend building byelaws in all million plus cities for adequate parking space availability for all residents/users of such building. This can be achieved by making more liberal (floor area ratio) FAR norms.**

Parking restraint measures are widely used as traffic management tools and to reduce car usage.

MANAGEMENT IMPACTS IN DELHI: PALIKA PARKING

The underground Palika parking remained under-utilised for many years till an advanced parking management system (APMS) was installed. According to NDMC's June 2006 estimate, 3000 ECS was the designated parking in Connaught Place. Of this, 1200 ECS was the capacity of the Palika underground parking. The remaining 1800 ECS included the surface parkings in the outer circle, radial roads, main circle and the inner circle. As against the designated capacity of 1800 ECS in the surface, nearly 4600 ECS were parked on surface unauthorised. But Palika underground parking with a capacity of 1200 ECS was not fully utilised to its capacity and there was a vacant space for nearly 500 ECS at any given time. This was despite the peak hour parking demand in Connaught Place to be 5434 ECS. The underground Palika parking that was created to minimise surface parking and lower congestion was not being utilized effectively. This parking area was made concessional – with cheaper rates, than on-road parking. Yet people did not use this underground parking. This points to the problem in other parkings as well. Availability of abundant free/cheap surface parking is undermining the utilisation of the underground parking that has been created to decongest the surface area.

Things have changed after the installation of APMS by the NDMC in August 2006. The system developed by the CRRI facilitates parking for motorists by disseminating information about identified parking lots within the premises. Motorists come to know about the availability of parking within the area at the entry of Connaught Place itself.

How does it work: Sensors have been installed at the entry and exit of the Palika parking. The central computer system reports the parking occupancy to the personnel deployed there as well as to the central control room. The processed information on the available parking spaces gets automatically transmitted from the central computer room to the variable sign boards which have been installed at the roads in front of Palika underground parking, Jantar Mantar-Sansad Marg T-point, near Kasturba Gandhi Marg-Connaught Place T-point, Janpath-Connaught Place T-point and State Entry Plaza T-point. As a result, motorists come to know how much parking is available within Palika parking. The system also helps in managing the ticketing and payment system.

It has been estimated that APMS installation has led to 20 per cent increase in number of vehicles that are parked in the Palika parking.

cities do not have a well laid out parking policy. As a result, free parking is permitted even on major arterial roads as a rule rather than as exception. Land utilized for parking is a premium urban space and needs to be charged accordingly. As such, there is a need to have a proper parking policy for each city/town, regulation of parking requirement through proper parking fee, ban on parking on the major arterial roads and encouraging paid parking complexes on PPP basis...."

The Working Group Report on Road Transport for the Eleventh Five Year Plan also suggests price-based instruments to discourage use of personalised vehicles including higher parking fees, higher excise and increased taxes on personalised vehicles. The Report of the Steering Committee on Urban Development suggests developing a parking policy in all cities that are in grip of motorisation (see Box: *Early policy murmurs in Delhi*).

The world over it is recognised that demand for parking is infinite and any amount of supply cannot meet this demand if additional measures are not implemented to control car growth and usage and also use parking lever itself to control the demand. Therefore, planning for the commercial sites should plan for improving access to the sites through improvement in public transport, and capping parking supply. Capping can be done through actual physical restriction on further expansion of parking and also by pricing the parking high.

SUBSIDY FOR PARKING IN OTHER COUNTRIES

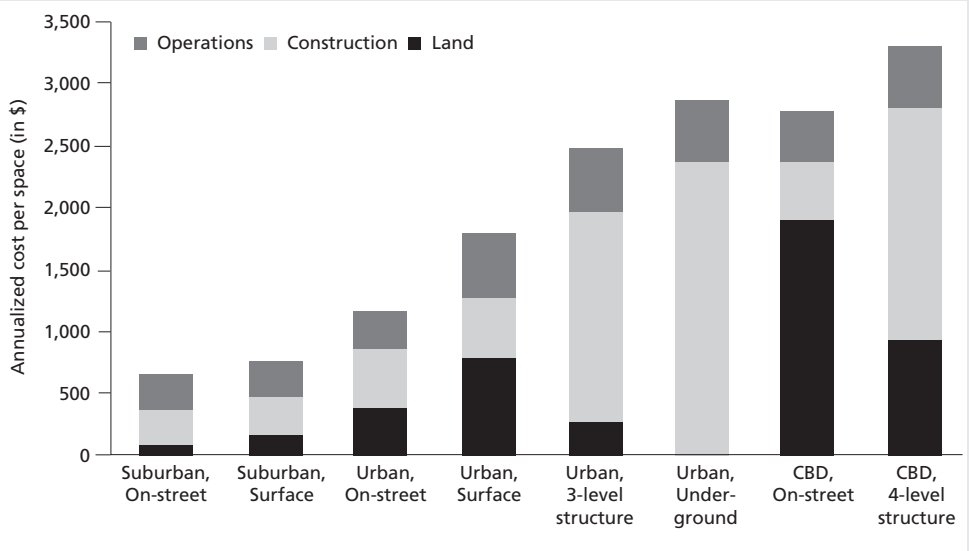
Despite the attempts to make parking users pay the full cost of parking directly, many people still underpay across the world. They are still heavily subsidised by their employers, government and the tax payers.

Even though some US cities like New York, Boston, San Francisco, and Portland, Oregon etc have begun to harden the parking rates, on a nationwide scale majority of the US commuters are heavily subsidised or not charged at all for parking. It is estimated that in the US, about 95 per cent of the US commuters only 5 per cent pay full parking costs, 9 per cent pay subsidized rates while unpriced parking is provided for more than 99 per cent of the non-commuter trips. The cost of unpriced parking is borne by businesses and governments and ultimately by customers and taxpayers.

As per the estimates made by the US based expert Mark Delucchi in 1997, priced parking in the US was then estimated to be only 4 per cent of the total parking. The parking subsidy was in the range of $76 to $223. However, the parking cost ranged between 81 per cent to 128 per cent of the road cost that time. In 2002, the annual subsidy for off-street parking ($135 billion and $386 billion) was nearly equivalent to the national defence budget ($349 billion) of the US. Parking subsidies substantially increase vehicle travel.

According to a Victoria Transport Policy Institute (VTPI) estimate, for each dollar a motorist spends directly on a vehicle, somebody devotes/bears more than 50 cents in parking costs. As consumers pay for this parking indirectly they tend to use it inefficiently, resulting in more parking demand, more vehicle ownership and more vehicle mileage than is economically efficient. Other estimates

Graph 1: Annualised cost in parking facilities



Source: Todd Litman 2007, Transportation Cost and Benefit Analysis — Parking Costs, Victoria Transport Policy Institute, August, p 5.4-8.

show that while a motorist spends an average of about $4,000 per vehicle each year on direct expenses, the annualized cost of an urban space used for parking would be around $3,000 and higher (estimating 5 parking spaces a minimum annualized cost of $600).

There is little acknowledgement of the fact that land which is devoted for parking has other opportunity costs. Parking facilities also involve other costs such as construction and maintenance and operating costs. The costs vary for different kinds of parking (see Graph 1: *Annualised cost in parking facilities*).

Implementation of parking management measures in underground Palika parking lot in Connaught Place has improved utilisation by 20 per cent.

EARLY POLICY MURMURS IN DELHI

THE DELHI URBAN ENVIRONMENT AND INFRASTRUCTURE IMPROVEMENT PROJECT

While formulating vision for 2021 the Delhi Urban Environment and Infrastructure Improvement Project (DUEIIP) recommended some stern actions to be taken on the parking front. The Report took note of the fact that increasing parking demand together with limited parking supply and absence of a parking policy is an impediment to the smooth flow of traffic especially in and around major commercial areas/activity centres.

Suggested various short-term, medium-term and long-term strategies for parking pertaining to both personalised vehicles and parking and terminals.

- **It considered parking pricing as a major tool for environmental improvement**
- **For personalised vehicles, the DUEIIP suggested strict parking regulation and pricing and employer's role in providing transport.**
- **Suggested establishment of differential parking norms and guidelines based on public transport service; Appropriate pricing with respect to real cost to discourage usage of personalised vehicles**
- **On-street parking in critical areas should be banned and on-street parking in residential areas to be priced. New developments and regularisation of illegal activities to be approved through traffic impact assessment; encourage private parking facilities and terminals in specified areas on a BOT basis**
- **Provision of parking facilities in critically deficient areas with introduction of 'park and ride' systems.**
- **Actions to continue to reduce parking demand and discouraging FAR/ground coverage in area level computations.**

TACKLING URBAN TRANSPORT – OPERATING PLAN FOR DELHI

In 2002, the Delhi government came up with a policy document: Tackling urban transport – Operating Plan for Delhi to provide safe, eco-friendly, cost-effective and efficient modes of public transportation through a well integrated multi-modal transport system. Under inter-agency coordination, the plan has assigned certain tasks related to parking. These are:

- **Parking facilities to be created by the municipal agencies;**
- **Parking facilities for buses, autos, taxis and slow modes by municipal and development agencies;**
- **Planning for multi-storeyed parking facilities and rationalization of parking charges with respect to parking duration, area, mode.**
- **The construction and completion of the multi-storeyed parking facilities were given time frame of 6-12 months and 1-5 years respectively.**

New policy opportunity for parking levers under JNNURM: The National Urban transport Policy did not tie up funding under the Jawaharlal Nehru National Urban Renewable Missions (JNNURM) with any precondition for cities to leverage parking strategies as a car restraint measure. On the contrary, the explicit focus has been to give priority to multilevel parking structures under the National Urban Renewal Mission.

The new JNNURM scheme makes parking policy conditional to getting one time grant for buying buses This is expected to be designed as a car restraint measure.

This will now change significantly. The Ministry of Urban Development has announced a stimulus package for the bus industry as a one time measure to provide assistance to the state governments for the purchase of buses under the JNNURM programme. This financing scheme announced on January 2, 2009 is tied to conditional reforms in urban transport in the beneficiary cities. The state government will enter into an agreement to initiate the reforms outlined by the Ministry of urban development.

One of the key pre-conditions and reforms includes designing of parking policy wherein parking fees will have to represent the true value of the land occupied by vehicles, and this is to be used to make public transport more attractive. Parking will have to be banned on arterial routes. Multi-level parking centres and park and ride facilities are also the part of the reforms for public transport management prescribed by the Urban Development ministry. Cities are also required create dedicated funds from revenues from variety of sources including higher taxes on personal vehicles and diesel cars.

This is an important opportunity for the state governments to develop parking

policy for cities as a car restraint measure. As it is tied to funding under the JNNURM programme the initiative can produce effective results. The central ministry will have the opportunity to review the proposals from the city/state governments in relation to well established criteria to ensure that the proposed parking policies are capable of delivering on the stated objectives.

All municipal and development agencies are focussing on multilevel parking facilities and underground parking lots. Increasing parking spaces remains the policy obsession

Policy action in Delhi:
A statement of concern on the rapidly growing vehicle numbers in the city was presented by the Centre for Science and Environment to the Chief Justice bench of the Supreme Court in 2004. The bench converted the statement of concern into an interim application and served a notice to the Delhi government directing it to formalise a strategy to control the number of vehicles and congestion.

The Environment Pollution (Prevention and Control) Authority (EPCA), in its report of July 2004, recommended that a parking policy be framed as a first step towards priority travel demand management measure. Based on the EPCA's report the Court on November 19, 2004 directed: "*The Delhi government shall not clear any project as the aspect of the parking policy would be a relevant consideration for clearance of the projects.*" But the court order was flouted and projects were cleared. Subsequently the Court in its order dated April 8, 2005 directed the Chief Secretary of the Delhi government to discuss the matter with all concerned so that a proper policy could be framed and placed before the Court by July 15, 2005.

In July 2005, the Delhi government submitted the draft parking policy to the Supreme Court. In November 2005, the EPCA reviewed the draft and found it focused only on parking supply and recommended integration of traffic restraint principles. Finally in March 2006, the Delhi government finalised the parking policy, has put EPCA's recommendation on board — "*Focus on demand management through parking control and pricing rather than increasing supply*" (see Box: *Parking policy of the Delhi government: Salient features*). On May 5, 2006, the Court directed EPCA and the Delhi government to issue necessary directions for implementation of the parking policy.

It is clear from Delhi's parking policy that the action plans of all the civic and development agencies aim at further augmenting parking spaces instead of taking up demand side measures. One key component common to all action plans is multilevel parking facilities and underground parking facilities. However, Delhi Police, the agency responsible for parking enforcement in the city, has proposed restrains on parking demand in the city. Their measures include restraint on new vehicle registration, and reasonable restriction on vehicle registration unless intending buyer has garaging facility. Though these seem to be fairly good plans, no action has been initiated on these fronts.

The execution of the parking policy will require coordinated action by the DDA, MCD, NDMC and Delhi Police. Delhi government has mentioned in its parking policy that directions with time limitations (if any) proposed, need to be issued to all the specific agencies concerned. The EPCA and the Delhi government are overseeing the implementation of the parking policy in the city. The concened agencies are now working on the operational aspects of the policy. The development since the adoption of the parking policy in Delhi includes revision of parking charges by NDMC within its jurisdiction, demarcation of parking lots by MCD and construction of multilevel parking lots by NDMC.

Among all cities, Bangalore has taken the lead in drafting a comprehensive parking policy that incorporates the priciples of car restraint (See Annex 3: Key highlights of

PARKING POLICY OF THE DELHI GOVERNMENT: SALIENT FEATURES

The basic mandate for a parking policy in Delhi comes from a series of directives of the Supreme Court. Delhi government framed a draft parking policy in July 2005 and the final policy came in March 2006. The policy lists the action plan proposed by the various concerned agencies that are directly or indirectly involved with the provision and management of parking. The key features of the action plans given by the various agencies are as follow.

DELHI DEVELOPMENT AUTHORITY (DDA)

i. **Multilevel parking: To be preferably developed in the designated parking space or in the vacant areas/undeveloped green area with development controls. All existing areas where there is absence of adequate parking and there is congestion should be identified and listed and based on the studies of vehicle volumes, specific projects for multilevel parking using the latest technologies should be formulated and implemented in a time bound manner. Development of these facilities may be taken up wherever feasible in a public-private partnership framework with private sector investment and involvement for which incentives may be provided by way of land use and FAR etc.**
ii. **Parking in public places: Major corridors along which commercial activities have grown should be identified and taken up for redevelopment with a major objective being the identification and development of open spaces for parking, green development and pedestrianisation. In all new commercial, business, industrial centres, adequate parking on the surface as well as below and above the ground must be provided. The revised norms in ECS would need to be strictly adhered to and enforced.**
iii. **Parking facilities in bus depots of the Delhi Transport Corporation (DTC): The use of DTC terminals and depots for development of public parking along with parking of DTC buses, private buses and chartered buses should be explored and specific projects developed.**
iv. **Underground parking: Parking facilities can be created under the open spaces without disturbing the green areas on the surface and surrounding environment based on the site availability and after getting approvals from the concerned agencies.**
v. **Parking in residential areas: All encroachments on residential streets in the form of kitchen gardens/ roadside private greens, large projections/ramps etc need to be removed. Road cross-sections may be redesigned wherever possible to accommodate planned car parking along the residential streets and also creating more space for surface movement. Other options in selected areas such as creation of underground parking below parks and open spaces will also have to be considered. Resident welfare associations (RWAs) will have to be called upon to participate in this process by raising contributions from the residents on the basis of objective criteria such as number of cars owned etc. Problem of congestion arising on account of traffic generated by schools have to be specifically addressed and the main responsibility for putting up required additional facilities has to be borne by the schools themselves and policy guidelines will have to be evolved for this**
vi. **Park and ride facility**
vii. **Stringent provisions by way of fine and other penal actions need to be provided for violation of parking rules.**
viii. **A graded parking fee structure should be evolved as a measure of parking demand management and encouraging the use of public transport.**
xi. **Serious consideration to be given to evolve policy linking registration of new vehicles to availability of owned parking facilities.**
x. **All encroachments on land earmarked for public parking should be removed, However public parking areas may be used for second hand car bazars on payment basis only during holidays subject to meeting requirements of the concerned authorities**

NEW DELHI MUNICIPAL COUNCIL (NDMC)

i. **Multilevel parking: Introduction of new multilevel parking in and around Connaught Place. Three locations for the construction of multilevel parking lots at Baba Kharak Singh Marg, Hindustan Times Building Kasturba Gandhi Marg and Sarojini Nagar have been selected.**

MUNICIPAL CORPORATION OF DELHI (MCD)

i. **Multilevel parking: Proposed to develop 15 automated multilevel parking in the first phase through public-private partnership. It also proposed to auction 175 additional parking sites and to identify new sites and to develop them every month.**
ii. **Pricing parking: Proposed to enhance the parking fee.**
iii. **Steps to enforce parking regulations: Necessary steps have been taken by MCD to restrict misuse of residential buildings for commercial purposes. Steps have also been taken to restrict the misuse of organised parking spaces including basement for commercial purposes which results in creation of additional parking demands.**

DELHI POLICE

i. **Restraint on new registration of vehicles**
ii. **Reasonable restriction on registration of vehicles unless intending buyer has garaging facility**
iii. **Commercial vehicles to be registered only when the intending owner has proper place for idle parking**
iv. **Use of private transport to be discouraged by increasing the parking charges which have to be staggered and according to time slot.**
v. **Reasonable economic returns from the owners who park their vehicles for long duration for nominal**

parking charges on government land
vi. A strict policy and enforced landuse
vii. Discouraging roadside/pavement parking
viii. Introduction of park and ride schemes in congested areas
xi. New commercial complexes/buildings must have the 3 level basement parking. Civic bodies must not clear the plans unless such provision of parking has been made
x. Basements of all multistoried buildings to be used as parking areas necessarily
xi. Provision of parking lots near all court complexes, temples, PVRs be made necessarily

TRANSPORT DEPARTMENT
i. Development of world-class public transport: Already initiated action to introduce multimodal transport system in Delhi in the form of metro rail, high capacity bus system, monorail and LRT system.
ii. Unified metropolitan transport authority: In view of the fact that a large number of agencies like Delhi Traffic Police, Railways, Ministry of Urban Development and DDA etc are functioning under the government of India, the Ministry of Urban Development should draft the legislation for setting up of UMTA (IMTA) for Delhi. A task force had been set up in the Ministry to prepare the draft legislation as well as to formulate interim arrangements till the final legislation is passed by Parliament.
iii. Restriction of private vehicles growth in the city: It is not considered advisable to put a blanket ban on owning of the vehicles and thus restrict growth of private vehicles. However, through other mean like making parking charges exorbitantly high and putting other restrictions like banning of entry for the vehicles during particular hours in particular areas which are congested etc, plying of private vehicles can be checked. However, coercive measures to contain the increase in number of vehicles can only follow the provision of a robust public transport system and will be taken up at an appropriate time.
iv. DTC depots and other places utilised for parking of commercial vehicles: The transport department is acting as a channelising agency for collection of Rs. 4,000 per year for each bus and other big commercial vehicle as parking charges and transfer the proceeds to MCD. It is MCD who has to provide parking facility after having got the fees for this. DTC started using its bus depots for private parking during day time but this has been discontinued on the grounds of security after the blasts in the city.

PUBLIC WORKS DEPARTMENT (PWD)
i. With the increase in purchasing power of the middle class and the shift towards possessing four wheelers instead of two-wheelers, it is necessary to look at revised norms for parking spaces at type I to type IV quarters where at present only space for scooter/cycle garages are provided for. It is suggested that 50 per cent of type III and type IV quarters and 25 per cent of type II quarters should be provided with car garages.
ii. To improve the carrying capacity of the main road as well as that of service road, it is essential that unauthorised parking from the adjacent residential colony and tehbazari market on footpaths and service roads etc are prohibited and proper queuing up of buses is ensured in front of bus shelters.

Source: Anon 2006, The Parking Policy in Delhi – Volume II, Urban Development department, Government of Delhi, March.

bangalore parking policy). The Bruhat Bangalore Mahanagar Palike (BBMP) has prepared the draft parking policy for the city. The policy aims to relieve congestion on roads, ensure safety of pedestrians, ensure safe and secure parking in the city, reduce adverse effects of unregulated parking, prevent misuse of parking space, establish parking facility to promote use of public transport vehicles, and use parking management as a tool to reduce the demand for private mode of transport.

However, it has yet to get the final nod from the state government. This needs to be expedited as soon as possible. It is important to ensure that the policy remains dynamic, sets clear milestones, and further strengthens the elements that are related to curtailing of parking demand, usage of parking facilities for park and ride and a pricing strategy to influence commuting choices in the city.

A wide variety of parking pricing and parking management tools have been adopted world wide to reduce congestion and peak traffic.

6. LEARNING FROM OTHERS

A wide variety of parking pricing tools and parking management tools have been adopted by different governments to reduce parking demand and congestion. When parking management combines adequately priced parking, limit on parking space and improving access to the same place through other modes of transport, it is most effective in stimulating the switch from private cars to alternative modes of

transport. This can, however, become truly effective if integrated with other mobility management measures. There are many examples from round the world where such approaches have been applied with measurable success.

The governments who have focussed on supplying more parking spaces find the insatiable demand for parking difficult to meet. Bangkok is the most important example. States Todd Litman in the 2003 study, *Mobility Management, Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities*, prepared for the GTZ, that Bangkok has 338 parking spaces per 1,000 CBD jobs. This far exceeds the average levels in an Australian city and is only little less than the average US city with 380 parkings. And yet Bangkok is under severe pressure to provide more parking. On the other hand, by contrast, Singapore, Tokyo and Hong Kong together average a mere 67 parking spaces per 1,000 CBD jobs as they have been able to put a cap on car use by adopting a variety of measures.

A wide variety of parking pricing and parking management tools have been adopted targeting the congested areas and also peak traffic to influence change (See Table 12: *Parking restraint measures worldwide*). These have been separately designed targeting the on-street and off-street parking. Success of many of these schemes presents the opportunity to design a package of measures in Delhi as well. Experience around the world shows that parking measures require a great amount of detailing depending on the objectives and site-specific features.

Broadly, these measures cover i) appropriate pricing of both off street and on-street parking to influence parking demand. ii) A variety of management measures for on-street parking that includes controlled parking zones, removal of on-street parking during peak periods and pedestrian only streets. iii) For off-street parking new developments are regulated by the maximum parking that can be allowed, commuted payment schemes or the amount of money that the developers pay in lieu of providing car parks, setting of parking ceiling which is the total spaces that can be used for parking, reducing parking provision according to the level of public transport etc. In existing spaces differential rates for long term and short-term parking are implemented, park and ride facilities are created at the periphery of the centre with dedicated bus service, etc are followed.

International best practices shows that a combination of parking management strategies can reduce parking demand and also traffic.

Action in other countries

Parking restraint measures have been widely used as a traffic demand management tool in many countries. These measures have been successfully implemented in city centres where there is high traffic congestion and a viable public transport system is in place. A recent report of the Australia based official advisory body, Victorian Competition and Efficiency Commission (VCEC) (*International Approaches to Tackling Transport Congestion: Paper 2 (Final): Parking Restraint Measures*, 2006) has documented the international good practices with regard to parking management. Some key highlights of these best practices are as follow:

Portland, Oregon: Portland, Oregon was one of the first cities in the US to limit the parking supply as a trip reduction strategy by setting up a maximum parking space requirement that developers may not exceed. It set an overall cap of approximately 40,000 parking spaces downtown, including existing and new parking facilities. These initiatives had begun in early seventies. In 1975, ceiling of off-street and on-street parking spaces was enforced with the objective of limiting car use. This excluded hotel and residential parking. The 1990 plan allowed for only 3 per cent increase in spaces.

Table 12: Parking restraint measures worldwide

The available literature gives the following overview of the international best practices

Parking restraint measure	Scheme features	Locations where the schemes are implemented
On-street parking		
Parking charges – on-street	On-street parking is charged	Many cities world-wide
Residents parking zones	Residents only-parking by permit	London, other UK cities, US cities
Controlled parking zones/ parking concepts	Management of parking in an area to balance the demand and supply (estimation of demand from an in-depth analysis of the area involved and attempt is made to balance demand and supply among the different user groups)	UK cities, German cities
No long-stay parking in city centre	Time restrictions preventing all day parking	UK cities
Bus Lanes/ clearways	Removal of on-street parking during peak periods	London, many UK cities
Pedestrian-only streets	No traffic at all in the street	UK cities, European cities
Off-street parking – new developments		
Maximum parking standards	Maximum number of carparks for new development (maximum acceptable provision for the most common forms of development and provision above this level will normally not be permitted)	London, other UK cities, US cities
Commuted payment schemes	Developers pay $amount in-lieu of providing carparks (If a developer could not meet the minimum parking required by the local authority standards on a development site, the authority could require a payment (commuted sum) based on the cost of providing parking spaces away from the site to make up the deficit)	London, other UK cities, US cities
Commuted payment schemes	Developers pay $amount in-lieu of providing carparks (If a developer could not meet the minimum parking required by the local authority standards on a development site, the authority could require a payment (commuted sum) based on the cost of providing parking spaces away from the site to make up the deficit)	London, other UK cities, US cities
Parking ceiling	Maximum number of total parking spaces in city centre are set	Portland, Boston
Ban parking spaces in new buildings	Parking spaces are banned in new buildings in certain parts of city	Zurich
Ability to reduce minimum standards	Minimum parking standards can be reduced if carpool spaces or free public transport passes are provided	Seattle, US
Maximum parking standards tied to public transport provision	Maximum no of carparks but to lower the maximum where there is higher level of service of public transport	Zurich, Berne
Existing private non-residential off-street car parks		
Licensing of off-street carparks	This allowed regulation of number of spaces, scale of charges, split between spaces for different times and types of customer etc. Have been rarely used	London

Continued…

Contd: Parking restraint measures worldwide

Parking restraint measure	Scheme features	Locations where the schemes are implemented
Parking levy – off-street carparks	Yearly fixed amount levy is set for business district car spaces including private non-residential spaces	Sydney CBD and North Sydney business district, Perth, Nottingham (proposed)
Public off-street car parks		
High occupancy vehicles (HOV) carparking	In public carparks, spaces are reserved for carpools	US cities
Long-stay vs short-stay charges	In public carparks, long-stay spaces are priced at higher rate than the short stay spaces	US cities
Parking levy – public carparks	Parking tax on all publicly available spaces (generally % is added to the parking charge)	US cities
Park & Ride / Peripheral Parking	Park and ride facility on periphery of city centre in conjunction with dedicated bus service	Oxford, Canterbury
Employer funded parking		
Fringe benefit tax on parking	Tax on employer funding of carparks	Australia, New Zealand
Cashing Out	Requires employers to provide employees with the option of receiving the cash equivalent of parking subsidy	California

Source: Anon 2006, International Approaches to Tackling Transport Congestion: Paper 2 (Final): Parking Restraint Measures, Victorian Competition and Efficiency Commission, April, p 10.

Table 13: Impact of parking measures on parking demand

Strategies	Descriptions	Typical reduction (in per cent)
Shared parking	Have each parking space serve multiple users and destinations	10-30
Increasing capacity of the existing facilities	Increasing parking supply by using otherwise wasted space, smaller stalls, valet parking etc	5-15
More accurate flexible standards	Adjust parking standards to more accurately reflect demand in a particular situation	10-30
Parking regulations	Regulations that favour higher value uses such as service vehicles, deliveries, etc	10-30
Parking maximum	Establish maximum parking supply or cap	10-30
Parking pricing	Charge motorists directly and efficiently for using parking facilities	10-30
Remote parking	Provide off-site or urban fringe parking	10-30
Smart growth	Encourage more compact, mixed multi modal development to allow more parking sharing and use of alternative modes	10-30
Mobility management	Encourage more efficient travel pattern	10-30
Improve user information and marketing	Provide convenient and accurate information on parking availability and price using maps, signs etc	5-15

Source: Todd Litman 2006, Parking Management: Strategies, Evaluation, and Planning, Victoria Transport Policy Institute, April.

The parking code sets maximum spaces allowed depending on proximity to public transport. No minimums are set except for residential use. Parking is approved by conditional use permit only. There are reserved parking spaces for carpoolers in city and state garages, and in on-street metered spaces. In 1987, nearly 43 per cent of commuters that came into the city centre used public transport. Carpool rate was estimated at 17 per cent. From 1975 to 1989 the number of parking spaces remained the same at 40,000. It has helped the city to increase public transport usage from 20-25 per cent in the early 1970s to 48 per cent in mid 1990s.

The parking freeze and high parking rates have helped Boston to meet the federal clean air standards.

Seattle: Seattle allows a maximum of one parking space per 100 square metres of downtown office space. Excess amount is allowed only by administrative review. Minimum parking requirements also vary according to the proximity to public transport. Carpool spaces and free public transport passes reduce minimum; in-lieu provision allows up to 100 per cent of long-term requirement to be waived for contribution to Downtown Parking Fund. Employees offered 4 free or discount parking passes per month if they purchase bus passes. Nearly 45 per cent of city centre employees use public transport and few carpools set aside spaces. The parking charges for carpools at two downtown parking facilities were reduced from $25 to $5 & $0. This resulted in increase in the number of carpoolers. 25 per cent of carpoolers previously were solo drivers, 45 per cent previously used public transport and 29 per cent previously carpooled.

Boston: In Boston, as a part of the air quality control measure ensuing from two agreements with the USEPA, under the Clean Air Act, the city was allowed to freeze its parking requirements at 10 per cent higher than the 1973 levels. Exemptions are allowed only for private off-street parking based on need, and residential parking under special cases. Since 1975, the off-street parking spaces in the CBD have been frozen at the 1972-73 level. The eliminated existing spaces are placed in a 'space bank' and might be reallocated to the new parking facilities within the freeze area. As a result of these measures parking spaces have grown by only 9 per cent between 1977 and 1997. The cost of parking in Boston as compared to other American cities is among the highest – second only after New York. More important, the parking freeze has helped Boston to meet the federal clean air standards.

San Francisco The city aims to keep an informal lid on the parking supply. Only 7 per cent of a building's gross floor area can be devoted to parking. The new city centre buildings must have an approved parking plan before receiving an occupancy permit. In some cases, only short-term parking is approved. The long stay parking must be charged higher than short stay parking. There has been a 25 per cent increase in taxes on private commercial and city owned parking. The developers and parking operators comply with letter of code on parking pricing rates. As a result of increase in the parking tax, parking rates have been changed at some garages. The number of parked cars declined to about 50 per cent of the earlier number but also increased at some other garages. The developers and parking operators comply with letter of code on parking pricing

Washington DC: The city has a comprehensive parking enforcement programme along with 12 per cent parking tax. Nearly $13 million was generated from parking enforcement in 1979 and $8 million from parking tax. Parking charges were imposed for federal government workers. This led to 1 – 10 per cent reduction in car driver mode share at central area sites, 2-4 per cent reduction in car driver mode share at suburban sites. The price changes had the greatest effects at central area locations with good public transport accessibility.

Oxford: The park and ride facilities were introduced in December 1973. Commuted

carpark payments at $3,000 per space are used for park and ride sites, which have been there since December 1973. Since 1983 over $1 million have been raised with 100 commuted payment agreements. Many on-street spaces are reserved for residents. Large reduction in long stay parking has been observed at public spaces. The city has few free public spaces. There has been an increase in the park and ride usage since 1975.

Amsterdam: In Amsterdam, parking spaces are allocated according to employment levels. The parking norm for offices in the city is zero, and elsewhere it is 25 spaces per 100 jobs. As a travel demand management initiative, employers encourage their staff to use the most appropriate travel mode according to environmental criteria.

Zurich: The city sets the limit for maximum allowable parking spaces. If the number of parking spaces is higher than the maximum limit in a building they have to reduce it to the maximum limit if a major building renovation is undertaken**.** Parking provision in new buildings in certain parts of the city centre has been forbidden. Pedestrian areas have been created after removing a large number of parking spaces. The blue zone parking spaces have been designated as residents parking zones. High level of public transport service is being provided. This has resulted in 33 per cent of visitor traveling by tram or bus, 25 per cent by train and only 19 per cent by car. An increase in city centre parking fees in January 1997 resulted in significantly more free parking spaces available. No adverse effect on the city centre economy was noted. Sales figures of the shops in the city centre did not decrease.

Germany: Residential parking permits have been legally introduced since 1980. Area-wide parking management have been introduced in several cities. In case of new building development, parking spaces are to be provided. Othrewise, an amount is paid to the council for spaces to be used for park and ride. The major problem is the widespread illegal parking which is 40 to 50 per cent of the total parking.

Munich: The resident parking scheme has been introduced in part of the inner city. This has reduced drive-alone share from 44 per cent to 32 per cent, while public transport share is up from 40 to 47 per cent.

In Munich resident parking scheme has reduced drive-alone share from 44 per cent to 32 per cent, while public transport share is up from 40 to 47 per cent.

Utrecht: The parking enforcement has been strengthened with doubling of the number of patrols. Residents only parkings have been created. Bollards and flower boxes are used to protect against illegal parking. Fixed penalty tickets have been replaced by increased and variable parking fees depending on the location and duration. This has reduced illegal parking substantially, and led to small modal shift to cycling and public transport.This has also increased willingness to pay.

Vienna: The city has implemented the parking area management schemes. This involves short-term parking zones that allows maximum two hours, charged parking within zones and permit scheme for residents. This has resulted in switching over of 25 per cent of visitors to public transport, and 5 per cent to walking, and cycling.

Aalborg: The city has set up a parking guidance system. The real-time information is provided to motorists on main roads to city centre about the availability of parking spaces in the centre city parking facilities. As a result, the percentage of drivers unable to park in Aalborg reduced from 21 per cent to 9 per cent. This reduced extra drving of 930km/ per day. The pollutants reduced by 0.1 per cent.

Helsinki: Dynamic parking guidance system exists in the city. In the inner city, on-street parking is mainly reserved for short-term charged parking in CBD area and in

front of business blocks. In residential areas most on-street parking is reserved for residential parking.

Paris: In Paris, where employers provide free parking, 48 per cent of employees use cars to commute. But in areas without employee parking, only 18 per cent commute by cars and the rest by public transport, cycling and walking. Restrictive parking regime in the inner cities with high parking fees and limited parking space can be supplemented by the provisions of parking in the periphery and incentives to access by public transport. Park and ride models are now practised in many OECD countries.

Perth: The licensing and levy system for all non-residential carparking within the central city area was introduced in July 1999. This required all non-residential parking in use with the defined area to be licensed and property owners were made responsible for licensing. An annual licensing fee (or tax) was imposed for most types of parking (initially at $70 Australian). The city set requirements for parking in new developments and required existing parking to be managed within approvals. For example public car parks must have no more than 10 per cent of users stay longer than 6 hours. Substantial penalties were introduced for non-compliance. The system was combined with extensions to free city centre bus service. The scheme resulted in high level of compliance. Around 10 per cent of the total parking supply identified in survey was not registered. Many public parking operators acted to mange their short stay parking facilities to conform to licensing requirements. This was often done by increasing (doubled in some cases) the cost of long stay parking. The outcome of this has been availability of more spaces for the shoppers.

Very high parking fees and limited parking supply has dampened car ownership phenomenally in New York, one o f the richest cities of the world.

Parking charges: Global examples

New York: Very high parking fees and limited parking supply has dampened car ownership phenomenally in one of the richest cities of the world, New York. Car ownership rate in this city is estimated far below the average rates in other US cities and much closer to European cities.

Bremen: There is no free or unregulated parking in urban centres. The parking prices are related to the demand (that is highest prices at attractive locations). Parking prices are fixed so that the car use plus parking charges should not cost less than using public transport. As a result, 50 per cent of trips to city centre are made by public transport and 22 per cent by cycle. Public transport is used by 58 per cent of the shoppers in the central district.

Berne: Spatially coordinated parking fee system exists in Berne. Parking at public facilities is charged. No public parking over two hours is allowed in the city centre. There is area wide parking guidance system in city centre instituted by owners of private car parks. Park and ride has been promoted. The residents parking zones have been designated as blue zone parking spaces. In 1999 Local Authority have been given legal power to oblige a shopping centre to charge fees on its customer spaces. The current approach is now to get companies to sign voluntary agreements on parking policy measures. High level of public transport service has been provided. As a result only 27 per cent of commuters in the city travel by car. Introduction of blue zones (which included removal of 10 per cent of parking spaces) resulted in a decrease of traffic volumes by 14 per cent in morning peak and 21 per cent in evening peak. Commuters were displaced out of these areas, which became more attractive for shoppers. Some private companies have set up parking ‘guidelines’ in cooperation with the local authority.

Copenhagen: The parking fees for most public parking areas in the inner city were introduced in 1990-91. Within a year's time, there was a 25 per cent reduction in number of cars parked in the inner city and 10 per cent reduction in traffic to and from the area. Recently around 2 per cent of all passengers to the four city public transport stations had shifted from car.

United Kingdom: Many councils in UK have initiated to impose emission based parking charges. The Richmond council is the first local authority to introduce this system. The parking charges are based on carbon dioxide (CO_2) emissions of cars. This means, cars with low CO_2 emissions will be charged less, while those with high emissions will pay more especially the gas-guzzlers.

Chicago: Parking charges were raised by 30-120 per cent to bring them up to market rates. This resulted in 35 per cent decline in the number of parked cars. The number of all day parkers arriving before 9.30 am dropped to 72 per cent.

Madison: Peak hour surcharge of $1.00 at 4 parking facilities was imposed combined with a new shuttle service. This led to switching over of 5 – 8 per cent of commuters to public transport. Around 22 per cent of commuters switched the parking location and 6 per cent parked after the peak time.

Eugene, Oregon: Parking charges at two city parking buildings and charges at 2 surface lots were raised by 2-3 times. There was no change to meter charges but the fines increased for short-term shopper parking. As a result, the monthly parking permit sales declined from 560 to 360 parkers (36 per cent). Half of these became carpoolers or rode a free shuttle while the rest appeared to have changed their parking locations.

Sydney: Since 1992, parking levy is imposed on each car parking space in commercial office buildings in CBD and North Sydney. This amounts to $400 per annum; earlier it was $200 per annum. Approximately 37,500 spaces are covered by levy. The levy is paid by the building owner. The funds raised are used for public transport infrastructure. There is no evaluation of the results of the parking levy. When it was initially raised, there are claims of adverse consequences by the car parking owners.

Bogota, as part of the city's programme to reduce private car use was to increase public parking-fee and to remove limit on the fees that private parking companies could charge. The additional revenue is dedicated to road maintenance and public transit service improvement.

Canterbury: The park and ride facilities were introduced in December 1973 on principal routes in the city centre. While park and ride carpark charge £1 per day with free bus trip to city centre, the long stay carparks outside city centre charge £1.80 per day. Parking charges in city centre carparks discourage long stay parking. Parking for over 5 hours in short stay space incurs excess charge of £50.

After the increase in parking fees, an impressive 30 per cent drop in parking demand was noted in Shanghai

Belgrade in Yugoslavia applies a scale of parking charges so that the hourly rate becomes progressively more expensive for each additional hour.

Germany: German cities have complied with parking restriction measures — strict reductions in the number of parking lots in the city centres. Selected streets or areas are closed for passenger cars (except deliveries and taxis and sometimes buses). There are restricted parking areas (residents only) and parking guidance systems. All parking areas are regulated. In most cities, the parking fee is atleast 1 Euro per hour except Munich where it is around 3 Euro per hour. In other cities,

parking tickets may be used by two persons as public transport tickets for trips within city centre during the parking time. In all mega events (concerts, sports events), the entrance ticks includes public transport ticket.

High penalty and enforcement against parking violations have drastically reduced congestion in Tokyo and other Japanese cities.

Asian cities

Shenzhen: After the increase in parking fees recently, a remarkable 30 per cent drop in the parking demand has been noted. Out of the city's total 350,000 parking spaces, 50,000 parking spaces have become costlier. Under the new rules, parking fees in the city center have been increased from less than 5 yuan per hour to 15 yuan for the first hour and 1.5 yuan every additional 30 minutes during peak hours on weekdays. During weekend, the parking fee will be 5 yuan (US$0.62) for the first hour and 1 yuan for each additional hour. Now few cars are reported to be using the parking lots in downtown Shenzhen on weekdays.

However, parking lots are found to be crowed during weekend, as parking is cheaper. There is no increase in the monthly parking fees for the 250,000 parking spaces in residential areas and public sector buildings. Temporary users, however, need to pay an extra 5 to 10 yuan per day. The government expects traffic flow to decrease by 12 percent temporarily and 4 percent in the long term due to the parking fee jump, which will alleviate downtown traffic congestion and encourage the use of public transport. The new rules could raise local car owners' monthly parking expenses from an average of 534 yuan to 694 yuan, an increase of 30 percent. The parking fees would count for nearly half the cost of keeping a car. The new tariff also made Shenzhen the most expensive mainland city - along with Shanghai - in terms of parking fees. Recently the Mayor of Shenzen also asked the residents of his city not to buy any more car as this would further worsen pollution.

Beijing: Inorder to discourage people from driving into busy city areas, the municipal authorities in Beijing are considering to increase the parking fee. Busy commercial districts like the CBD and Zhongguancun, and congested areas like Yansha and Beijing Western Station are likely to be targeted. The currently applicable parking rates in the busiest areas are 2.5 yuan per half hour for small cars and 5 yuan per half hour for large vehicles, about 3 yuan more than other areas. The parking charges near public transport modes such as near major subway stations and bus terminals on the city's outskirts are to be lowered to encourage people to park their cars there and then travel to urban areas by public transportation. The city government announced to built 26 free or low-cost large-scale parking lots near subway and bus stops to encourage drivers to use public transport in downtown Beijing. The new rates will be released after further consultation.

Tokyo: Parking pricing had a major impact in Japanese cities. Since June 1, 2006, enforcement against parking violations have drastically reduced congestion in major cities. Earlier, the police used to enforce the parking regulations and periodically check to see how long cars had been parked in banned areas, marking cars' positions with chalk and ticketing them if parked longer than 15–30 minutes. But after the revision of the Road Traffic Law, private firms have been assigned to issue tickets for parking violations regardless of the number of minutes vehicles have been parked in banned locations.

Depending on the type of violation, the parking fines for regular cars range between 10,000 yen to 18,000 yen (US$86–155). Strict enforcement along with no grace period (15 minutes or more of "free" parking for drivers) led to expensive on-street parking, which costs 10,000 yen (US$86) (as a penalty fee) for parkers. This implementation effectively increased the on-street parking prices for drivers and also increased the

average parking prices in major cities in Japan at the same time. Three months after the implementation, the National Police Agency reported a decline in illegal parking on main roads in Tokyo (73.9 per cent) and Osaka (73.3 per cent), reduced congestion length on main roads from 27.3 per cent to 23.1 per cent at 2p.m.-4p.m, and increased travel speed at 2 p.m.-4 p.m. by 9.5 per cent and 11.8 per cent, respectively, compared to same period of the previous year.

The agency estimated economic benefits of this policy to be 181 billion yen (US$1.6 billion) and the reduction in CO2 emissions to be 15.2 thousand tonnes/yr. Retail shops with parking lots have also attracted more people since implementation, while popular restaurants without parking lots are said to have experienced a decrease in customers. Increases in the average prices of off-street parking lots are also observed, due to heightened demand for off-street parking. Also, more people have been using taxis and buses to reach restaurants since the strict parking policy was implemented.

Singapore: With regard to parking policy Singapore is different. The Singapore government already controls the increase in car numbers with a variety of restrictive measures that include very high road pricing, licensing, regulated permits for car purchase and various development controls norms. As a result, it does not have to use parking levers to control car usage in commercial and public places separately. Parking policy in Singapore therefore states that "Actual number of parking spaces provided in a development should be the parking demand that the use of the development will likely generate. However, the number should not be lesser than the requirement under the Parking Places (Provision of Parking Places and Parking Spaces) Rules." Comparison of the parking norms in Singapore shows that Indian norms allow more ECS for the comparative land use category.

7. THE WAY AHEAD

Delhi and many other cities of India share similar predicament and have no wherewithal to address the parking crisis — rapid increase in personal vehicles that require enormous amount of parking space at home, at work and at shops. Cities do not even have adequate land space to park the ever growing numbers of vehicles. It entails enormous costs in terms of real estate and infrastructure for parking, opportunity cost of the land, and pollution and congestion costs. It also goes against the equitable use of urban space in the developing country cities where car using population is in minority.

Parking demand is gregarious and insatiable. No amount of parking provision can help to satisy the growing need. Parking policy must reflect car restraint principles.

Parking demand is gregarious, aggressive, and insatiable. No amount of parking provision can help to satisfy the growing demand. Parking provision should work on the principle of parking restraint to put brakes on car growth. Policy makers should turn the debate around. Provide parking not to incite more parking demand but to manage and restrain its provision to meet the immediate need but also to discourage people from using personal vehicles. The future roadmap should hinge on this principle.

The detailed assessment of the parking problem in Delhi underscores that a combination of strategies are needed to develop parking policy as a decongestion and a restraint measure and to reduce the overall demand of parking. Though many cities of the world have experimented with different types of parking policies, it is still very difficult to find a perfect and `one size fits all' strategy. An appropriate combination of strategies should be customised to address the local imperatives. Parking policy has the potential to be an effective first generation car restraint measures in Indian and Asian cities as they already have some system of organising parking.

The recent announcement from the Union ministry of Urban Development in January 2009 on the funding scheme for purchase of buses and urban transport systems under the Jawaharlal Nehru Urban Renewable Mission (JNURM) has created a mandate for cities to develop parking policies as a car restraint measure. To be able to access this fund the city governments will have to give commitments to initiate institutional reforms for public transport management and implementation, create dedicated funds from revenues from variety of sources including higher taxes on personal vehicles and diesel cars, among other measures. The key conditions include parking policy wherein parking fees represent the true value of the land occupied; which is used to make the public transport more attractive; bans parking on arterial routes; and multi-level parking centres are used more as park and ride facilities etc.

The new multi-level parking structures should be used innovatively to encoucrage park and ride and improve integration of public transport.

This is an opportunity for the cities to prepare the blue print for the parking policies. An immediate blue print for the future roadmap is needed to reflect the following principles.

Developing strategies for parking policy

Utilise parking facilities to improve usage of public transport and non-motorised public transport: The new parking structures should be used innovatively to improve usage and integration of public transport. Locate parking structures close to the interchange points of the public transport nodes like metro and bus stations, and, use them for park and ride system to reduce pressure in the commercial centres. Link them with the targeted commercial areas with feeder services that include three-wheelers, cycle rickshaws, small buses or easy pedestrian ways.

Improving access and connectivity of places through improved public transport that can reduce overall parking demand. Ticketing system of public transport should incorporate park and ride component. Parking rates should favour intermediate transport including three-wheelers and taxis and also non motorised vehicles. Review the proposed sites for the multi level parking structures to see to what extent these can be located at or close to the public transport interchange nodes with a good feeder system that links the key commercial destinations. This can help to decongest the busy commercial areas. Free shuttle buses and free transit service connect destination with remote parking facilities. These facilities can also be developed as an overflow parking plan and other special event transportation management. Taxis and three-wheelers can play an important role in the feeder system for park and ride system.

Free parking should be minimised or eliminated: It is important to eliminate or minimise free parking. Pricing of parking should be based on user pay principle and aim to go for full cost pricing. Use pricing in a manner that it reduces peak demand, and congestion in convenient places. Experts point out that parking charges gradually make urban road users aware that driving within city cannot be free.

Use variable rates more widely to reduce peak demand: Parking fees should be designed to target the peak hours and peak demand to influence commuter choice and open up options. All municipal agencies must develop variable parking fees according to commercial importance of areas; according to duration of stay to reduce peak demand; according to weekdays when demand is high, and weekends when low.

New Delhi Municipal Council (NDMC) has started enforcing graded fee structure. There is no reason why other agencies cannot develop similar systems. This

strategy should be developed on a city-wide scale. Civic agencies in other cities should begin to evolve similar pricing strategies.

Also discourage payment of parking rates as a fixed annual amount to replace graded fee structure to be paid on usage. Annual payments will defeat the purpose of using parking rates as a demand management tool. This will grossly underprice parking of personal vehicles and act as a subsidy for the car owners.

Parking rates should be lower at park and ride sites to influence commuting choices: With park and ride system the long term parkers who are largely the office goers will not crowd at the commercial centres but utilise long distance parking facilities. The proportion of the short-term and long term users vary from site to site though the short-term users dominate in most sites. The longer term parkers (employees and employers) should be encouraged to use parking that are located at some distance from the work place, but connected with a good feeder service. These can be priced lower than the convenient places located close to the work place. This will also encourage long-term parkers to shift to public transport. Short-term users who are largely shoppers and visitors prefer convenient spaces close to the work place and these spaces are priced higher. Limiting parking duration for short-term users can also ensure higher customer turnover rates for local businesses and also reduce local congestion. Ticketing system of public transport should incorporate park and ride component. Parking rates should favour intermediate transport including three-wheelers and taxis and also non-motorised vehicles.

Need parity in rates of surface parking and structured parking. For the first time Indian cities are making a transition from lowly priced or free surface parking to cost intensive structured parking. If the cost of the investment in the structured parking is recovered through higher parking fees, it will have significant impact on parking rates in the city. This upward revision is important to recover the cost of investment and also to reduce parking demand. Investment in these structures cannot continue unless there are clear plans on pricing. Moreover, this will require some revision of the surface parking rates for optimal utilisation of both. Higher parking rates in the structured parking lots will widen the gap with the current surface parking rates manifold. In this regard the following will have to be addressed:

- Rate of parking on surface and multilevel structured parking be brought to equivalent, or near parity rates. Civic agencies should develop a management model to ensure that parity works. In Delhi it is estimated that parking charges based on full cost pricing can increase parking charges in the multilevel parking lots to Rs 30 to Rs 40 per hour. In the initial stages NDMC has proposed to fix the rates at Rs 10 per hour. If this becomes the minimum floor price in the structured parking lots then the civic agencies must work out parity with the rates in surface parking lots and also develop a roadmap in advance for progressive increase in parking rates over time to reach full cost pricing and to allow the market some time to adjust. A phase-in plan will also enable the commuters to adjust.
- Use regulatory measures such as restrictions on total numbers for parking on surface and congested on-street parking so that structured parking is optimally utilised. Pricing distortions can lead to under utilisation of the capital intensive parking structures as has been noticed in some sites in Indian cities.
- Parking pricing should influence commuter behaviour in favour of public transportation and lower parking demand. Graded rates should also be introduced according to the commercial importance of the site.

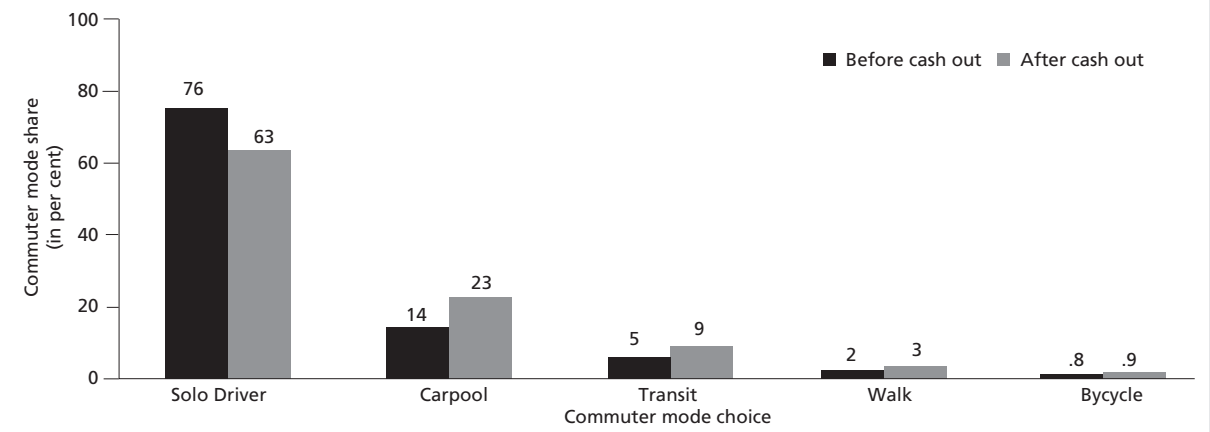
Parking pricing should be based on user pay principle and aim to recover full cost of providing parking.

IMPACT OF PRICING MEASURES: SOME ILLUSTRATIONS

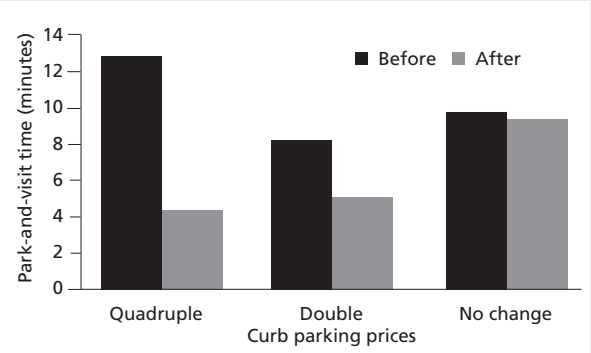
Introduction of pricing strategies in other countries show a definite impact on car usage. For example in California under the 'cash out programmes' employers offer employees the choice of free or subsidised parking; or, a transit or vanpool subsidy equal to the value of the parking (of which upto $100 per month is tax free under the current federal law); and a taxable payment approximately equal to the value of the parking in cash to commuters who bicycle or walk to work. California's parking cash out law has helped to reduce the number of cars driven to work by 11 per cent. After its enforcement employees traveled 652 fewer vehicle miles per year and consumed 26 gallons of fuel fewer per year (see Graph 1: *Commuter mode share before and after parking cash out in California*).

Similarly, in London, increasing the price of curb parking has showed an impact (see Graph 2: *Park-and-visit times before and after changing the price of curb parking in London* and Graph 3: *Park-and-visit times before and after parking prices were quadrupled*).

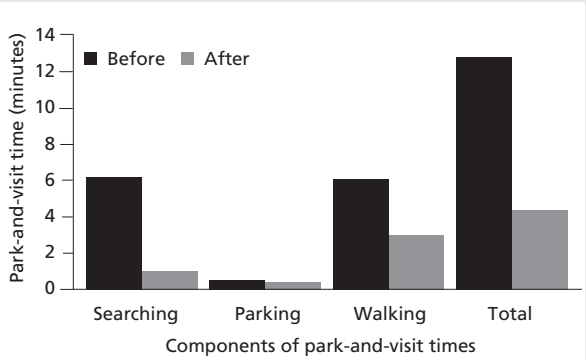
Graph 1: Commuter mode share before and after parking cash out in California



Graph 2 Park-and-visit times before and after changing the price of curb parking in London



Graph 3 Park-and-visit times before and after parking prices were quadrupled



Surface parking, especially on street parking should be progressively curtailed in areas where structured parking is being constructed.

Develop metropolitan wide parking fee system. Incorporate a metropolitan-wide view for regulating parking that must cover both commercial business districts (CBD) and non-CBD area. Though the rates in the CBD areas are expected to be higher than the non-CBD areas, maintain parity within zones. Or it may end up shifting parking demand and affect business in the regulated areas. The rates will have to be fixed according to the commercial attractiveness of the area as classified by the civic bodies. Also tightening of parking measures without improved access will be politically difficult to implemen.

Higher level of parking restraint can be applied in areas that have good public transport connections

Enforcement of norms: At this stage even the minimum provision of parking in buildings as per the norm of the Delhi Development Authority under the Master Plan 2021 are not adhered to. Spaces to be allotted for parking in buildings are diverted for other uses or are not built. As a result, there is a huge spill over on the roads. After ensuring that norms are implemented, use regulations effectively to ensure that they are utilised and spill overs are prevented.

Reassess parking standards for future application: Delhi and most other cities normally set a minimum parking standards. But as improved parking pricing policy comes into full effect and parking management begins to work in tandem with public transport augmentation plans, the city governments should begin to consider need based flexible parking standards for different locations and also capping of the provision of parking. This will help to prevent oversupply and wastefulness. Develop parking inventory, current parking utilisation pattern to identify area of deficit and then develop an integrated parking policy to identify specific measures, tasks, responsibilities, budgets and schedule. These detailed systems are needed to develop a plan to limit parking supply.

While developing these policies a higher level of restraint can be applied to areas with good public transport accessibility whereas a lower level of restraint can be applied to areas with poor connectivity. This process can be dynamic. Examples from other countries show that with improvement in connectivity of sites with parking deficit actually turn into surplus. Mobility management programmes often reduce parking demand, and many parking management strategies help reduce vehicle traffic or support other mobility management objectives. Even as the parking provision is made to meet the basic requirement simultaneous effort should be made to limit the parking supply to restrain car use.

Promote efficient utilisation of existing spaces: Surface parking both on-street and off-street will continue to remain the cost effective model of parking in Indian cities. Field assessment shows that the present parking contractors are utilising the available spaces very effectively and maximising earnings from it. But there is still further scope of qualitative improvements and there is considerable international guidance on this matter that can provide the basis for such improvements. However, surface parking, especially on street parking should be progressively curtailed in areas where structured parking is being constructed. Promote shared parking for maximum utilisation of existing spaces. As far as possible parking spaces should be managed as common areas. For instance, VTPI experts gives practical suggestions — use currently wasted areas (corners, edges, undeveloped land etc). This can be particularly appropriate for small car spaces, two-wheelers and bicycles.

Special measures are needed to review the siting of shopping malls and commercial complexes that generate enormous traffic and parking needs.

Reviews also point out that where there is adequate street width, shift from parallel to angled street parking helps. Maximise the number of on-street parking spaces by using a curb lane for parking during off-peak period and keeping small spaces for two-wheelers. Encourage two-wheelers to share parking spaces. Use valet parking, particularly during peak time. This can increase parking capacity by 20 to 40 per cent compared to users parking their vehicles. Identify sites where on-street parking will either have to be restricted during peak hours or all day parking. On-street parking on key arteries will have to be curtailed to reduce congestion. Management of authorized parking lots should be improved in terms of defined boundaries, display of proper signboards etc. Entry of heavy vehicles in the city should be restricted. Their parking should be allowed in outskirt areas.

Siting of commercial complexes and shopping malls need careful review to

prevent spillovers and congestion: Cities are witnessing massive boom in the construction of mega commercial complexes that induce huge traffic, increase parking demand and congestion in the neighbourhood. It is very important to review the siting of these structures to prevent such fallouts. Often these complexes lead to massive spill over in the surrounding roads that lead to more congestion. This aspect should be thoroughly reviewed in the environmental impact assessment that are carried out for complexes spanning over 20,000 sq meters. Such complexes should not come up in high density traffic corridors and along main arteries. Special measures are needed to review appropriateness of siting of large commercial complexes that generate enormous traffic and parking needs well beyond the capacity of the site.

Parking controls can discourage use of personal vehicles and encourage shift towards more sustainable forms of transportation.

Develop parking strategies for residential areas: Parking provision in most residential areas are very ad hoc and in most cases the building bylaws that define the parking norms are not met. This often goes awry due to multiple ownership of cars and densification of the residential units. Often car numbers exceed the available parking spaces. In some areas of Delhi residential areas have opted for self regulation. There is considerable scope for application of wide ranging parking strategies that can meet parking demand and at the same time reduce cars. Develop innovative strategies for residential parking that while meeting the basic demand puts brake on multiple ownership of cars by families. Discourage as much as possible captive use of parking spaces by individual owners. Common and shared parking lots should be encouraged. Commecial usage of residential areas should not be allowed without a parking strategy.

Globally, one of the most effective strategies for restraining car usage has been linking of registration of personal vehicles with the availability of space to park personal vehicles. This can be combined with appropriate pricing. Indian cities can begin to look at a special parking pricing stategies for controlling multiple car ownership.

Special challenge of mixed land-use areas: This is the most daunting challenge in Indian cities. Most Indian cities have dense mixed land-use areas that makes Indian cities compact and amneable to public transit oriented growth. In countries like Singapore mixed land-use areas are well planned. But in Indian cities these have grown in unplanned manner. But parking pressure is one of the most important cause of congestion in these areas. A variety of strategies are possible. If space is available then common structured parking structures can be created in the neighbourhood. But this should not happen at the cost of sacrifising green areas that are essential in residential neighbourhoods. To maximise usage of the available parking spaces the thrust should be on treating the parking areas as common area and are shared instead of holding the parking spaces captive for individual usage. Also consider promoting pedestrian walkways linked with distant parking to restrict entry of non-resident cars in congested stretches. Non-motorised vehicles can play an important role here.

Improve management coordination and enforcement

Create institutional interface to address parking pricing, management and parking regulations and enforcement across jurisdictions in a composite manner. Ultimately, the traffic management authority should be able to effectively enforce a restrictive parking policy, to collect parking fee, and to fine offenders. Any institutional weakness can undermine the entire initiative.

Reinvent mobility: The ultimate solution

Cars are overwhelming the urban space and road infrastructure. They have eroded

public spaces and urban commons to meet the insatiable need for roads and parking. Cars are locking up enormous resources to provide mobility to a minority – bringing in their wake unacceptable social inequity and pollution. Public transport, pedestrians, and cyclists are the immediate victims of this car mania. This car dependency can be reversed with right policies. City governments can discourage car usage while improving access to more sustainable forms of transport. Cities need to build and expand public transport: The only way out of the congestion mayhem is to massively augment public transport so that the road space can be used more efficiently to carry more people and at greater speed. Integrate all modes of transport to maximize access to public transport systems and its usage. Cities need tax and road pricing measures that will actively discourage car usage. Within this larger framework parking controls can discourage use of personal vehicles and provide incentives for shift to more sustainable forms of transport.

Annex 1: Cost details of the structured multilevel parking proposed by NDMC

1. Hindustan Times Building Multilevel Parking Project - NDMC

Hindustan Times Building Parking Project	**Integrated Project (parking and commercial activity)**	**If parking alone implemented**
Projected parking demand for 2020 (Number of ECS)	1475	1475
Permitted level of street parking (No. of ECS)	450	450
ECS provided through project (No. of ECS)	1025	1025
ECS provided through project, plot and street (No. of ECS)	1475	1475
ECS due to commercial activity (No. of ECS)	184	0
Number of underground levels envisaged (In Numbers)	4.2	4.2
Capital cost for parking (Rs in million/ECS)	0.4	0.4
Plot area (in sq. metre)	6143	6143
Aggregate parking area(in sq. metre)	21143	21143
Aggregate commercial area (in sq. metre)	6143	0
Ratio of parking area to aggregate commercial and parking areas	22.51%	0.00%
Far utilized	100%	0%
Project IRR, pretax (in %)	12.68	12.69
Revenues to private party [if integrated]		
From parking - structure and surface (Rs in million)	191.80	647.70
From commercial, incl. receipt of sec deposits, if any (Rs in million)	743.40	0
Annuity payments, to subsidize parking if no commercial (Rs in million)	0	-90.3
Aggregate amount (Rs in million)	935.20	557.40
Costs to private party		
Capital costs (Rs in million)	409.50	324.4
Property tax (Rs in million)	143.3	0
Concession fee payments (Rs in million).	90.30	0
Surface parking, supplementary contract payment (Rs in million).	17.50	17.50
Working expenses – parking (Rs in million).	75.10	189.10
Working expenses – commercial (Rs in million).	16.60	0
Aggregate (Rs in million).	752.30	531.00
Parking rate	Rs 10/hr	Rs 39/hr

Continued

Annex 1: Cost details of the structured multilevel parking proposed by NDMC

2: Baba Kharak Singh Marg Multilevel Parking project - NDMC

Baba Kharak Singh Marg Parking Project	**Integrated Project(parking and commercial activity)**	**If Parking alone implemented**
ECS 2020 demand A (Number of ECS)	872	872
Permitted level of street parking (Number of ECS)	92	92
ECS provided through project (Number of ECS)	780	780
ECS provided through project, plot and street (Number of ECS)	872	872
ECS on account of commercial space (Number of ECS)	161	0
Number of underground levels envisaged (Number of ECS)	4.05	4.05
Capital cost for parking Rs in million/ ECS	0.4	0.4
Plot area (in sq. metre)	6320	6320
Aggregate parking area (in sq. metre)	16105	16105
Aggregate commercial area (in sq. metre)	5368	0
Ratio of parking area to aggregate commercial and parking areas	25%	0%
FAR utilized	85%	0%
Project IRR, pretax	12.68%	12.67%
Revenues to private party		
From parking - structure and surface (Rs in million)	152.70	444.80
From commercial, incl. receipt of sec deposits, if any(Rs in million)	519.70	0
Annuity payments, to subsidise parking, if no commercial	0	-28.00
Aggregate amount(Rs in million)	672.40	416.80
Costs to private party		
Capital costs (Rs in million)	320.50	246.10
Property tax (Rs in million)	100.20	0
Concession fee payments (Rs in million)	28.00	0
Surface parking, supplementary contract payment (Rs in million)	7.0	7.0
Working expenses – parking (Rs in million)	58.80	131.80
Working expenses - commercial(Rs in million)	14.50	0
Aggregate(Rs in million)	529.00	384.90
Aggregate net surpluses with private party (Rs in million)	143.50	31.90
Parking rate	Rs 10/hr	Rs 30/hr

Annex 2: Parking policy of Bangalore: Key highlights

The Bruhat Bangalore Mahanagar Palike (BBMP) has prepared the draft parking policy for the city. The key highlights of the policy are as follow:

Owners in multistoried buildings in busy commercial areas to be charged annual levy if fail to provide for parking: The building regulations specify a minimum provision of parking area. But there are many defaulters who later convert the parking spaces for other purposes. The policy suggests providing off-street multistoried parking lots in these areas. The owner who fails to provide required parking spaces as per the regulations should be charged an annual levy equivalent to the market value for the shortfall in parking area provided. The collected amount and the parking charges collected will be subsequently enough to meet the repayment installments of loan which were taken to construct multistoried parking lots. Once such facility is in place, the on-street parking can be prevented.

Zonation based parking for proper management and control: The policy proposes to divide the city into 3 zones – A, B and C.

Zone A: These will be central areas inside the core ring road for only short term parking between 9 am to 9 pm with charges increasing every hour of parking.

Zone B: These areas will be between the core ring road and outer ring road with either automatic/conventional multilevel parkings at selected interchanges especially at the Transit Management Centres (TTMCs) and other identified locations closer to public transport corridors. In this case, short-term time based parking at a slightly lower charge.

Zone C: These will be areas outside the outer ring road. Here large conventional multilevel parkings to be provided at the TTMCs and other locations adjoining the public transport stations of metro, monorail/LRT/BRT etc. These will be long term parking lots of 8 to 12 hours durations with nominal charges to encourage vehicle owners to park their vehicles here and ride the public transport system.

Restrict on-street parking: Safety and efficiency of the public road network is to be maintained /improved through adoption of effective on-street parking restrictions and management principles.

Short stay parking: Short-stay parking is preferably located in proximity to trip destinations and protected from long stay parkers; Separate short stay parking facilities may be required for business users, entertainment and tourist visitors, office visitors, visitors to residential units etc; Protection from long stay parker should be by means of time restrictions and.or by appropriate pricing structures; Prevent/discourage parking of vehicles by owners and employees of establishments in short stay parking lots for long stay purposes

Parking in residences: Resident parking within the premises should be implemented as necessary to protect local residential environment. Public roads are a public resource intended primarily for the movement of vehicles and not for parking. Vehicles owned by residents should not use the roads in residential areas for long stay parking. Sufficient parking facilities should be available within the premises or at off-street locations for such long stay parking. Additional parking facilities over and above the residents' requirements are needed to meet the parking demand of the visitors particularly in premises where flats/apartments have come up. The required parking facilities should be met by having adequate number of off-street parking places.

Parking in public institutions, cinema theatres etc: These should provide adequate off-street parking facilities for employees, visitors etc. Adequate number of off-street parking spaces should be made available to meet the demand of employees and visitors. Spill over of parking arising from these establishments on to the streets is discourages/prevented.

Heavy vehicle parking: Overnight parking of buses, trucks, omni buses, tourist buses, vans, water tankers, container, lorries etc along major roads should be discouraged. Specific off-street parking facilities should be made available by the owners/operators of the vehicle for night time parking or when the vehicles are not in use. Such vehicles should be discouraged from occupying the road space of the major roads for long stay parking.

Parking in Railway stations/MTC bus terminals: Commuter parking should be provided at the railway stations and at the MTC bus terminals to facilitate park and ride concept.

Commercial Areas: On-street parking: To use a mix of pricing regimes, time and parking restrictions to encourage the turn over of on-street parking in areas of high demand.

Off-street parking lots and buildings: To ensure that the provision, management and pricing of parking only facilities reflect consistency with this strategy.

Central city: On street parking: To minimize parking provision in areas where high quality street amenity is desired. Need high levels of parking enforcement. To encourage long term parking to be principally provided off-street. To allow temporary lease of on-street parking spaces for trade/development activities. Banning of on-street parking of private vehicles in CBD areas and major roads.

Intermodal transfer facilities: Provide convenient inter modal transfer facilities at railway stations, transport terminals etc to bring down the use of private vehicles. Design suitable interface facilities enabling the bus and rails systems to work in close coordination in respect of operation, fare structure, comfort, convenience etc. Agencies operating the bus system and the rail system should periodically review their functioning and if necessary revise taking into account the aspirations of the commuters.

Parking near special areas: Planning and design of parking facilities (both on-street and off-street) close to heritage sites or sites of architectural importance of sites of archaeological importance should consider the possible visual and aesthetic issues and provide suitable protective measures.

Multilevel parkings: Multilevel parkings (ramp type and mechanical parking) should be planned and developed at suitable locations. Development could be by government agencies or private developers. Lands owned preferably by government departments and urban local bodies and other institutions could be considered for developing off-street parking lots. These units should be designed with all supporting infrastructure facilities adopting the standards and other conditions as laid down by the agencies, granting approval for development.

Public transport systems: Provide efficient, easily accessible, affordable public transport facilities serving all around the city and urbanized areas. Existing bus services should be operated to be user friendly in respect of comfort, convenience, travel fare, frequency of operation and accessibility. They should help in replacing

private vehicle trips by mass transport systems thereby bringing down the demand on parking spaces at travel destinations. Incentives may be given to employees for using the public transport systems.

Control of parking demand by curbing the vehicular growth: It is necessary to bring down the demand on parking spaces both on-street and off-street. Necessary actions may be initiated to bring down the growth rate of vehicles in the city such as efficient operation of public transport systems, encourage car pools, discourage vehicular registration through higher taxes, limiting vehicular permits etc.

Land use planning: Since transportation is a function of landuse, allocation of spaces for various uses within the city could be done with a view on reducing the use of private motorized vehicles such as high dense developments, exclusive commercial neighbourhoods, discouraging mixed landuse developments etc.

Traffic restraint measures: Areas in which entry of private vehicles to be restricted may be identified and notified. Traffic restraint measures could be adopted with a focus on the concept of reducing the number of entering an area where they may cause traffic congestion. This could be achieved by adopting one or more of the following strategies —– introducing area licensing scheme where vehicles other than public transport vehicles are charged for entry into the area; levying high parking charges and lowering parking space availability within the designated area.

Design of parking lots: On-street and off-street parking facilities should be designed to comply with design standards including dimensional and circulation requirements. DCR provisions on off-street parking should be followed in designing the facilities. Provisions made in the National Building Code should be followed on design of multilevel parking lots.

Control parking: Parking demand can be controlled by implementing transport management measures like staggering office and school working hours and banning on-street parking of private vehicles in the CBD and major arterials.

Licensing of parking places: All parking places could be operated only with permission granted by the competent authority. This is to enable the agency to exercise regulatory control over the maintenance and operation of parking places. This is to help the agency to monitor the utilization of spaces and parking charges levied and there from to revise the parking/transport policies, if required.

Parking standards: Parking standards for various land uses should be evolved and implemented. Standards evolved could vary from zone to zone or city to sub-urban areas within the city. Standards may be reviewed periodically and revised if necessary. The number of employees/staff/workers, visitors, built up area needs to

be considered while arriving at the standards for various activities. Standards should be evolved taking into account the constraints faced and the need for maintaining the desired quality of environment in the city (for example air quality, noise quality). Stakeholders should be involved in the process of formulating/revising the parking standards.

Parking pricing: Parking pricing should be judiciously devised to manage the parking problem on the demand side. It could help in more efficient use of parking facilities, address specific parking problems, ensure that parking is available for intended users, reduce total parking requirements, provide the required cost of maintaining the parking and associated facilities. Parking pricing can have significant transportation impacts. Even modest parking fees can affect vehicle travel patterns. Variable parking price could be adopted with higher rates during peak periods and lower prices during off-peak periods. Parking pricing could create revenue that can be used to recover the cost of maintaining the related facilities and fund for other programmes. Parking pricing just in one area may cause spill over effects in other areas. Efficient fee collection techniques should be devised and used to minimize delay and inconvenience to drivers.

	Proposed Parking charges (Rs)				
	Duration	**Two-wheelers**	**Private cars**	**Van/minibus**	**Lorry/bus**
In business areas	For first 30 minutes	10	15	-	-
	For next 30 minutes	20	25	-	-
	For first 60 minutes	-	-	30	10
	For next 60 minutes	5	10	15	15
	For every subsequent hour over initial 2 hours	3	3	3	5
In non-business areas	For first hour	5	10	10	5
	Upto 2 hours	10	15	15	10
	For every hour after first 2 hours	2	2	2	2

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