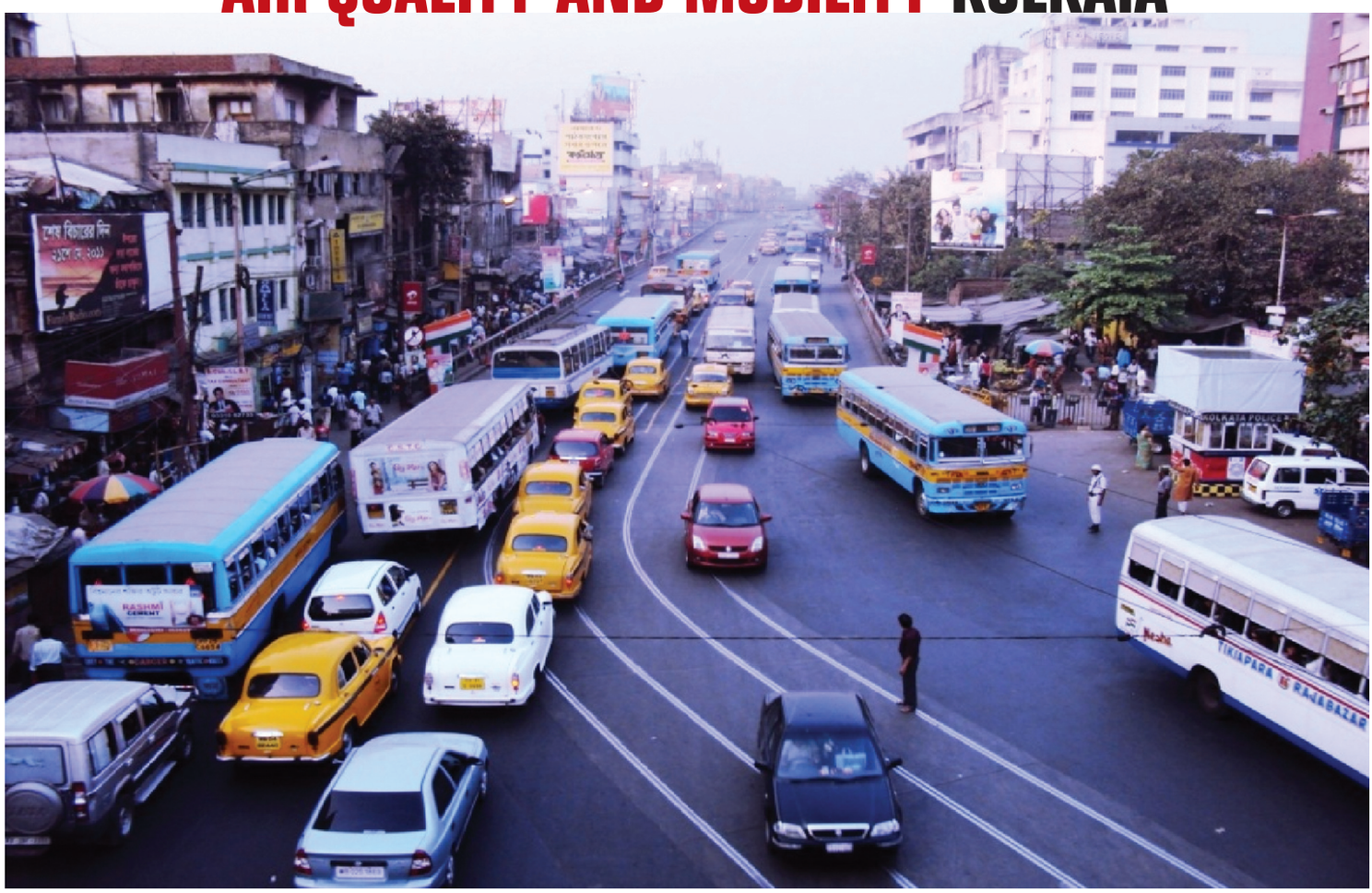
CITY ACTION
AIR QUALITY AND MOBILITY KOLKATA



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RIGHT TO CLEAN AIR CAMPAIGN

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Voice from grassroots

India is preparing for a massive urban transformation. It is clear from the 2011 census that the new growth story in India is about the growth of cities. While more than half of the global population is in cities, India is also quickly catching up with the trend. Over 40 per cent of its 1.2 billion people – more than the size of the US population — are now expected to be in cities. This urban boom demands urban renewal for cities of hope that are liveable, clean, energy efficient and sustainable.

The consequence of the urban explosion and the blue print of the urban renewal cannot be managed within the conventional paradigm of planning. This is starkly evident in the way cities are trying to deal with mobility impact of this urban growth and the rising income levels. Already across India we are beginning to notice urban sprawl, increasing travel distances, growing dependence on cars, declining share of public transport, and erosion of cycling and walking. Growing motorization is causing more pollution, energy use and high road fatalities and injuries. If we do not get the template of planning and implementation right to arrest this trend we may end up locking up enormous pollution and carbon in the urban transportation infrastructure, and set an irreversible trend towards unsustainable cities.

Urban growth has exposed enormous deficit in transport infrastructure and services in our cities. It is astounding to note the two assessments of the independent studies of Mckinsey Global Institute and the 'High powered expert committee' commissioned by Ministry of Urban Development. These have projected that mass rapid transit services and roads together would require nearly more than half of the projected investment for urban services including housing in cities in the coming decades. This will cost more than Rs one lakh crore per year for the next 20 years for urban transport.

As India has yet to build much of its projected urban transport infrastructure, this presents a challenge as well as an opportunity. The new investment if guided by the principles of sustainability can make a lot of difference. The question that India needs to ask is whether it will be able to see the turn around soon in its cities. The infrastructure, once built, can not be reversed, and it begins to determine the commuting choices in the city. Cities need swift and incisive action, and share the collective wisdom and understanding of what is needed to protect public health and avert energy guzzling through sustainable mobility practices. Cities can have the conversation on their unique challenges and solutions. This series of citizens' report on city action has been initiated facilitate this conversation. This report on grassroots action on clean air and mobility in the Capital city of Kolkata is third in the series that looks at the challenges of one of the prominent metro cities in the country.

It is important to carry forward this conversation in Kolkata as the policy opportunities have begun to evolve to influence the infrastructure and investment decisions. At the national level the National Urban Transport Policy upholds the mobility needs of the people, and focuses on equity, integrated land-use and transport planning, alternatives to cars that include public transport, cycling and walking. It also advocates demand management – transport tax and parking reforms to restrain car usage. National Ambient Air Quality Standards sets the benchmark for clean air in cities. The mission on sustainable habitat framed under the National Climate Action Plan, provides for sustainable mobility action. The Jawaharlal Nehru National Urban Renewal Mission (JNNURM) has catalysed a reform process which is patterned along the lines of key principles of the National urban Transport Policy. The second phase of JNNURM programme is expected to carry forward the reform process. The national habitat mission standards will be more precise on targets and guidelines and standards for a range of interventions. At the same time the state government is setting its own reform agenda and scaling up its investment priorities in the transportation sector and also urban planning. The grass root action in cities will be even more powerful to drive this action.

This citizen's report looks at ways the city can address the local challenges to find its unique solutions as well as harmonise and align with the larger national goals of clean air and energy security. This discussion in one flagship city of the state can help to create the template for a state level policy to leverage the change in the entire state. The city action is expected to inform and guide state level policy for air quality and mobility.

Why Kolkata?

Killer pollution, energy guzzling and warming impacts of motorization grips Kolkata like any other major city. But Kolkata is amongst the very few cities that have fought bitter battles over their right to clean air. It has not been an easy battle for the city. It has fought protracted legal battle to build support for pollution control measures; engaged in excruciating negotiations with the local business and trade lobbies to deflate resistance to pollution control efforts. This is also among the very few cities that have generated its own but matured air pollution and health information to inform the policy debate and action.

The action itself has proven that the game of pollution cannot be won so easily. For decades old and polluting vehicles have clogged this city's roads, emitting dark noxious fumes. But deeply entrenched local business and trade interests made their phase-out very difficult, nearly impossible. The embittered battle ended up in the High Court. Finally, strong civil society opinion, strictures from the court, and executive action have combined to break the resistance from the lobbies. In 2009, the city succeeded in phasing out the very old commercial vehicles including three-wheelers, taxis and many old buses. These were replaced with cleaner LPG models. The city also moved to the next rung of emissions standards of Bharat Stage IV in 2010.

Kolkata has seen the real change. But this gain can not be sustained if future roadmap is not set immediately. Even before its air pollution could be solved the city is also hurtling towards energy guzzling. But solutions can emerge only from the deeper understanding of its unique strength and the challenges.

Kolkata's solution lies in its inherent character. Kolkata is a mega city with a difference. Its highly concentrated population, compact city design, limited road infrastructure and a substantial network of public transport and inter-mediate public transport has worked to its advantage. Its compact city design has enabled dense walking network that is highly permeable. Its early investments in trams, buses, metro have already created extensive public transport network. It has excellent feeders in low cost taxis and three-wheelers that have reduced dependence on personal vehicles especially for short distances. Limited parking spaces in many parts of the city have also dampened car ownership. This city has an enormous opportunity to set an example in the country by thinking differently, and acting differently.

Its strength remains in its huge base of public transport usage, zero-emission tram network, and enormous share of walking. It will be a terrible mistake if Kolkata disregards this inherent strength and a legacy as a sign of underdevelopment. It is this model of mobility that the rest of the world is aspiring to achieve to fight its pollution and global warming battle. Early recognition of this strength and its nurturing can take this city to a lead position. This will require effective policies and implementation to accelerate the sustainable growth path during the early stage of motorization.

This question confronts Kolkata now as the city has completed the implementation of the first phase of pollution control action. It has improved emissions standards for vehicles through the successive stages of Bharat Stage I norms to Bharat Stage IV norms along with 50 ppm sulphur fuels. It has banned two-stroke autorickshaws; mandated pre-mixed 2-T oil dispensing within Kolkata Metropolitan Area and banned supply of loose 2T oil; introduced unleaded petrol with one percent benzene; Only LPG driven three wheelers are registered in Kolkata; About 21,000 autos, 3,000 buses and minibuses, and 7,000 taxis have been replaced in the city. Petrol blended with 5 percent ethanol is mandatory now. The PUC testing centers for monitoring on-roads emissions have been upgraded. The same phase has also seen the expansion of metro system in the city.

The city has also initiated action on polluting industry. It has stricter location policy for new industrial units and restriction on setting up of polluting industries in municipal area of Kolkata Metropolitan Area; regulatory compliance for grossly polluting industries; stricter emission standards for boilers, ceramic kilns, foundries and rolling mill. It has also mandated cleaner fuels for industrial use; financial assistance for installation of pollution control devices in small-scale industries; Coal use is restricted in industries, about 67 percent of the coal fired boilers and about 73 percent of the coal fired ceramic kilns have already been converted to oil fired ones. The West Bengal Pollution Control Board is encouraging the industries to go 'beyond compliance' and do more. Thermal power plants are also regularly monitored to control the emissions etc.

A combination of these steps has helped Kolkata to stabilize the air pollution problem. This has also given health benefits. A World Bank study estimates that Kolkata has been able to save more than 3000 premature deaths due to air pollution related diseases. This gives the confidence for the future action — if we act we will see the results.

What are the unique challenges in Kolkata?

The game of pollution cannot be won by chasing the problem. The city needs to leap ahead of the problem. The ongoing pollution control efforts have exposed the complexity of this challenge.

Lost gains: Kolkata shares the dilemma of the other mega cities where the first phase of action has helped to lower and stabilise the problem, but the gains could not be sustained. Both particulate and nitrogen dioxide (NO2) levels – the key pollutants of concern in our cities have shown an upward trend. Kolkata is in danger of losing the gains. The levels are still much elevated and sometime rising. Also from the public health stand point what matters is the daily exposure to pollution. The numbers of days violating the daily air quality standards for PM10 and NO2 are quite high in many locations. The recent tightening of the national ambient air quality standards has further changed the air quality profile of the locations in Kolkata. For example, particulate pollution in locations like Dunlop Bridge and Behala Chourasta has turned from moderate to high. With tightening of NO2 standards seven locations in the city are now classified as "critically polluted". Moreover, the levels of air toxics – that are dangerous even at a very small trace amount, are high as evident from the 2010 CPCB study in the city.

Kolkata takes the lead in generating hard evidences of health effects of air pollution: Kolkata has taken the lead in generating very valuable hard evidences on insidious health effects of air pollution not just for the city but also for the nation. A six-year study conducted by the Chittaranjan National Cancer Institute (CNCI), Kolkata, has concluded that 18 out of every 100,000 persons in Kolkata fall victim to lung cancer annually. Seven out of 10 people in Kolkata are afflicted with some form of respiratory ailment. Most exposed groups are hawkers, traffic policemen, commuters, public transport drivers and shopkeepers. Traffic related air pollution is associated with 6.5 fold rise in alveolar macrophage number in traffic policemen and street hawkers of Kolkata compared with relatively less exposed office workers. The alveolar macrophage number in sputum is a sensitive biomarker of exposure to air pollution. Also the percentage of children suffering from upper respiratory infections, cough, wheezing and eye irritation is increasing in direct proportion to the increasing concentration of PM10. It has also shown how cellular changes have taken place as an effect of air pollution that can ultimately lead to deadly diseases like cancer.

The effects of dirty air can be even more severe if the risk assessment begins to account for the unique factors in Indian cities — very high levels of pollution – incomparable with those in the industrialized countries, multiple pollutants rising at the same time, and the vulnerability of large number of poor people in Indian cities. This can be worse if the vulnerability of the children, elderly and those with respiratory and cardiac symptoms are also accounted for. At each step of pollution control newer challenge has emerged and the clean air goal has remained elusive.

Vehicles are a special problem in the city: Cities need to pay special attention to vehicles as vehicle emissions take place in the breathing zone of the people. This increases daily exposure to deadly dose of toxins. Vehicles are responsible for the maximum amount of human exposure to air pollution. Studies carried out by the World Bank in other cities have shown that nearly half of the total exposure to particulates that make people ill could be due the vehicles. In Delhi studies carried out by the researchers from University of California Berkeley has shown that actual exposure to particulates inside open vehicles while traveling on roads can be 15 times the permissible limit. More studies carried out by the Health Effect Institute has shown that the effect of vehicular fumes is maximum upto 500 meters from any roadside and in Delhi more than 55 percent of the population live within that zone. This can be much higher in more dense cities like Kolkata.

The rapidly increasing vehicles numbers threatens to undo the small incremental gains. West Bengal State Pollution Control Board has carried out very valuable studies to generate important evidences

for the city. Their studies have found that automobiles contribute significantly to particulates of the size class as small as 1.1 micron. These are so tiny that they are invisible and go very deep inside our lungs and cause serious health damage. Overall the vehicles account for nearly half of the air pollution load in the city. The West Bengal State Pollution Control Board forecasts a decline in the share of pollution from industrial sources but an increase from automobiles.

Diesel capital: Kolkata is noted for very high use of diesel, to the extent that it has earned the epithet of being the diesel capital of the country. Toxic emissions from diesel vehicles are a major concern in the city. Diesel vehicles contribute maximum to the particulates, nitrogen oxides, toxic hydrocarbons (3-nitrobenzanthrone, 1,8-dinitropyrene etc.) – that are the special concern in the air of Kolkata. According to CPCB estimates 55 per cent of vehicles in Kolkata are diesel-driven. While all commercial vehicles including the large taxi fleet runs on diesel, many of these are also very old. Currently, the share of diesel cars is also increasing which in the total national sales is close to 40 percent already. The World Bank study of 2004 has estimated that diesel combustion in the city can contribute significantly to the total PM2.5 levels. During winter the share can go as high as 62 per cent of the PM2.5 load. This has serious health implications as diesel emissions have been branded by the WHO, International Agency for Cancer Research, USEPA, California Air Resources Board as human carcinogen. India has still not introduced clean diesel with sulphur content as low as 10 ppm and is used with advanced after treatment systems. The current Bharat Stage norms in force in the city legally allow diesel cars to emit three times more NOx and several times more particulates compared to petrol cars. Only for the small vehicles like three-wheelers the city has implemented LPG programme. The city does not have clean diesel.

Energy guzzling: The spillover risk of motorization that has remained largely neglected in Indian cities is the energy impact. Unrestricted oil guzzling is taking off in Indian cities even when India is reeling under severe energy crisis and staggering effects of oil prices. Bigger cities that have longer travel distances and also a much larger share of personal vehicles pollute as well as guzzle more fuels. The Indian cities that fall in the class of more than 8 million population like Kolkata and also have higher share of vehicles, emit two times more per capita carbon dioxide emissions that is directly linked with the amount of fuel burnt. This is largely the reflection of the way people travel in cities. A Wilbur Smith Associate study of 2008 on 30 Indian cities for the Union Ministry of Urban Development shows that the maximum fuel consumption by vehicles for all cities classified in terms of population size is contributed by cars and motorised two-wheelers.

Kolkata mirrors this trend. Cars and two wheelers together already use up about 40 per cent of the total energy consumption of the city's road transport. This will further skew if the dependence on personal vehicles continues to increase. The total transport energy consumption in Kolkata is still about 60 per cent of that of Delhi because of lower vehicle ownership. But automobile dependence can increase vulnerability to oil shocks. The state government will have to actively pursue fuel saving measures in the transportation sector with the help of public transport and non-motorised transport.

Kolkata in grip of mobility crisis: Mobility crisis begins to build up in a city when a large share of daily trips is made by personal vehicles that occupy more road space but carry fewer people, pollute more, and edge out walking, cycling, buses and intermediate public transport. Growing dependence of personal vehicles is already showing one of its worst impacts – gridlocked roads.

The growth rate of cars has already overtaken that of two-wheelers in the city. Between 1998 and 2008 the car ownership by households has increased from a mere 1.73 percent to 11 percent in 2008, the ownership of two wheelers has increased from 5.67 percent to 16.5 percent. At the same time households that did not have any vehicle has fallen from 61 percent to 49.2 percent. Kolkata has 0.4 million cars as opposed to 1.3 million cars in Delhi which is severely gridlocked. What will happen if Kolkata has the same number of cars?

Both cars and two wheelers occupy the maximum road space but carry just about 12 per cent of the daily trips in Kolkata. Share of cars in the traffic volume on key roads can be as much as 40 per cent but they meet only 4 per cent of the travel needs. This clearly shows that car users are a very small minority in the city. But a lot of things can go wrong if the city continues to design itself for car owners ignoring the travel needs of the majority which is using public transport and walking.

The city is paying high costs: Kolkata like other cities is paying a very high price for congestion. Traffic jams lead to fuel wastage, more pollution and serious economic losses. During peak hours a normal commuting time of half-an-hour has increased to two-hours. In fact, the difference between peak and non-peak hour is rapidly disappearing. The average peak hour traffic speed in 72 per cent of the roads in Kolkata is less than 20 km/hour – even slower at some stretches. In 65 percent of the arterial roads in the Kolkata Metropolitan Area the traffic volume has exceeded the designed capacity and the service level of the road. This is unsustainable.

More roads are not the answer: If any city thinks that more road building will ease congestion and pollution then it is wrong. Learn from Delhi's experience. Delhi is the most privileged to have more than 21 per cent of its large geographical area under road space. Delhi has built the maximum roads and flyovers. But Delhi has not been able to solve its problem of pollution and congestion by building more roads and flyovers. Its roads are gridlocked. Peak hour traffic speed has even slumped to below 15 km/hour. Cars and two-wheelers in Delhi occupy 90 per cent of the road space but meet less than 20 per cent of the travel demand. More roads are clearly not the answer.

But Kolkata is also at the risk of making mistakes like the other cities. Maximum investments are being made for car centric infrastructure. While at the national level more than 70 per cent of the investments have been made in car centric infrastructure including flyovers and road widening, there is a similar trend at the city level. The JNNURM funding in the city illustrates this point. Flyovers have dominated JNNURM Urban Infrastructure funding in Kolkata Metropolitan Area. There is barely any investment in pedestrian and bicycle infrastructure. On the contrary, active policies are being followed to restrict bicycle usage in the city.

People of Kolkata want change: How do people of Kolkata perceive the problem? Centre for Science and Environment has carried out a rapid stakeholders' perception survey. This is part of its ongoing assessment to understand the perception of the air pollution and mobility problems in the city. They have reflected on the core issues that must be looked into for making the next generation action agenda. The analysis of responses shows the following key highlights:

- The majority – about 80 per cent of respondents have said air pollution is worsening
- About 70 per cent have said incidence of respiratory diseases, asthma, eye irritation are on the rise.
- Most respondents have identified congestion as a big problem in the city
- About 60 percent respondents have said that cycles and cycle rickshaws are important and should be given space
- Nearly 60 percent have rated public transport services good, 40 percent have rated city public transport services as average, similar opinions are for the intermediate transports.
- There is nearly unanimous support for improved public transport and nearly 60 percent have supported dedicated lanes for buses
- Nearly 80 percent think that growing demand for parking of vehicles is leading to the problem of encroachment of footpaths, open spaces and leading to congestion
- The majority find the walking infrastructure poorly maintained. Respondents say that the footpaths only in some areas in the city are well maintained, clean and walk-able? This needs immediate attention as pedestrian traffic is the strength of the city
- Overwhelming support for tramways. But there is poor understanding of how it could be integrated with the overall transportation system of the city.

Way ahead

Kolkata must build on its strength: Why a city like Kolkata where 84 percent of the daily trips are by public transport, bicycles, and walk should suffer such crippling congestion and killer pollution? Kolkata records one of the highest usages of bicycles in the country. The Comprehensive Mobility Plan of Kolkata has set the goal of further increasing the modal share of public transport to 90 per cent of the total passenger volume by the year 2025 to minimize environmental impacts. This is the low polluting and low carbon mobility paradigm that the world is trying to achieve today to be more sustainable. Kolkata must be made conscious of this strength. But such a target can be achieved only if the current erosion of public transport and non-motorised trips is arrested and reversed.

Public transport is the way: Kolkata city has a dense network of public transport – a combination of metro, bus, tram and also suburban rail. These are also served by a good para transit system – autos and taxis. But each system is not getting adequate attention. These are not well integrated in a seamless system for proper access and optimum use of each system. The city needs a good multi-modal integration plan. This will require specific design guidelines that will make the transfer from one mode to the other inside the city easy, fast and safe. Within the multi-modal system the bus system that is the spine of the public transport in the city is the most neglected area. With the JNNURM buses fleet augmentation has taken off. Instead of letting different public transport modes — the metro, trams and buses — compete and undermine each other, Kolkata authorities need to develop a plan to integrate them and leverage them to cap motorisation. Unfortunately, a major part of the public transport including the tram network in the city is threatened by infrastructure for motorized traffic that will largely benefit the car traffic that meets only 8 per cent of the travel demand in the city.

Bus transport needs attention: Buses meet the highest travel demand – more than half — amongst all forms of public transport buses in the city. Yet the bus transport reforms for better operational efficiency and improved service levels are lagging behind. Despite the growing travel demand in the city the load factor in buses – the passenger carrying capacity of the state owned transit buses has declined. Though the bus capacity in the informal private sector has increased it is not amenable to quality service delivery. The bus reforms will have to be pursued more aggressively. Also the new townships need to plan intricate bus services including bus rapid transport system to improve the attractiveness of the buses. So far only a small component of BRT has been planned. Buses caught in congestion get very slow and unattractive to commuters. Dedicated space can help to increase its speed and attraction. The sustainable transport modes that include the buses, cycling and walking will have to be brought out of the congestion and given their own legitimate space for speed and operational efficiency. Service will have to be credible, reliable with adequate frequency and GPS enabled. It needs smart bus fare collection system including integrated ticketing. The city needs a rigorous monitoring system for service quality as well as user satisfaction to plan further upgrades. B us transport will also require a finance plan. Dedicated urban transport fund and land monetisation are expected to be key means for resource mobilisation.

Reinvent Tram: The gravest of all losses is the tramway system in Kolkata, the oldest zero emissions mass transport system in the country. At a time when globally and even nationally efforts are being made to bring back more dedicated road spaces to public transport the rich network of trams in Kolkata is being allowed to decay. This is a sharp and progressive decline over 20 years due to lack of investments and modernisation, and unreliable services. The system is now finding it more difficult to ply in a mixed and congested traffic without any right of the way. There have been repeated attempts over a period of time to dismantle it. Already, in some parts of the city, tram lines have been dug up to make way for cars. The share of tramways is consistently falling in the city due to de-reserving the right of way of tramways, no expansion, and lack of technology improvement. Tram works on the most fundamental principle that must govern all public transport system — dedicated right of way, operates at grade, users have easy and at grade access to the system and is affordable. The city needs to expand its volume capacity and modernize the system. Tram system in Kolkata deserves the privileges and protection of a heritage and leveraging for the future.

Uniquely walkable but under stress: The compact and dense design has fostered walking in the city. Nationally, studies have shown that the average distance of the 85 per cent of all travel trips in Indian cities is less than 10 kilometer, nearly 40 to 45 per cent is less than 5 kilometers. In Kokata, as

mentioned earlier, 60 per cent trips have length of about 3-4 km. This makes the movement network very permeable and enables walking to become a good feeder to the transportation modes as well as reduce motorized trips for short distances. Even today the walk trips far outnumber the number of motorized trips in the city especially car trips. Though walking is highly impeded in many parts of the city the design of the sidewalks – especially those built recently in southern parts of the city for instance – display comparatively improved features in terms of height and width, surface, universal design etc compared to many other mega cities. There are however strong concerns about disruptions and erosion of the walk space because of the flyovers and road widening and encroachments. The city does not have a composite policy for walking. This is critically needed to reverse the trends and protect the baseline. Walking will be the key link for multi-modal integration. Delhi has very recently adopted street design guidelines that have now become mandatory for all new roads and redevelopment of footpaths. Similar approach is needed in other cities to make walking comfortable and safe. Walkability audit of the roads and pavements is needed as a legal instrument.

Many market places in Kolkata have natural pedestrian precincts, by virtue of the sheer pedestrian volume. This can be further built on to make pedestrian zones. Global experiences have shown that walking access to market areas without the interference of motorized traffic and parked vehicles actually improves business volume and transactions. It is often not clear to the shopkeepers that the majority of the shoppers are actually public transport users and not car owners. In fact, during festive sessions when the prime commercial areas like Park Street become the pedestrian heaven the sheer volume of transaction increase quite significantly. Therefore, providing comfortable walk space attracts more pedestrian traffic, makes the street life alive, and safe with other attendant environmental benefits.

Kolkata's compact city form is an advantage: Very high level of walking, cycling and public transport trips are a reflection of the way the city is designed. Dense and closely built forms reduce travel distances and make the city more walkable. It is therefore not a surprise that 60 per cent of the total trips generated in the Kolkata Metropolitan Area have an average distance of less than 3-4 kms. This makes walking, cycling, para-transit and public transport extremely attractive and feasible.

But the new development in the suburbs is becoming sprawls and gated with poor public transport connectivity. The peri-urban areas are also experiencing pollution and environmental degradation. According to the City Mobility Plan the new activity centers are developing outside the metropolitan core in the suburban areas. Small townships including Rajarhat and Dankuni Townships are most prominent and expected to decentralize the city. Salt Lake and Rajarhat Township are developing as the new high density mixed use centre. But authorities need to adopt active integrated land and transport planning to maintain compact form.

Keep the city and the community transit oriented: The state government needs transit oriented development guidelines. The new urban development in the periphery has poor direct connectivity. Car centric designs and large building block size and gated community approach make the routes long and circuitous that discourages pedestrians, cyclists and also bus transport. New towns need dense street networks based on more direct shortest routes to make walking, cycling and bus transport more accessible. The new spaces need to be compact and accessible. The majority residence should be able to access workplace and public and institutional areas by public transport or bicycle or walk. Kolkata will have to adopt specific guidelines to enable this kind of development to retain the advantage of compact cities.

The city mobility plan explains that Kolkata Metropolitan Development area has expanded in the Nortn-South direction. Transportation corridors, arterial roads and metro have developed along this direction as the road connection in east west direction is hindered by the railways and the river. Lack of major arterial roads along east-west direction has increased the volume count ratio on the existing north-south corridors (higher than 0.8). Congestion is acute. The CMP has proposed Tram– new north-south elevated corridor, and LRT system within Rajarhaat. But getting the public transport blue print and the accessibility network right for the new development area is critical. Public transport network linkage is weak in this section.

Parking policy to restrain car usage: It is often not clear to the regulators how parking policy can be designed to meet clean air and climate objectives. But this a popular legal instrument globally to discourage car usage and promote alternatives. The National Urban Transport Policy in India has

adopted parking as the travel demand management instrument. It states that the parking pricing should be linked with the value of the land that the cars occupy to promote usage of public transport. The JNNURM reform agenda is linked with the parking reforms. In fact to fulfill this reform mandate Kolkata has developed a parking policy.

Kolkata has already taken the lead in reforming the parking pricing. The parking rates for cars in all classes of parking areas in the city are among the highest in the country. It is uniformly Rs 10 per hour. This is in sharp contrast to very low rates in other mega cities. In other mega cities this rate exists only on a limited scale and that too in the multi-level parking lots, not in surface parking areas. This is an important step forward given the fact that parking pricing will be an important instrument for travel demand management. This will have to be carried forward not only to dampen demand for car usage but also increase parking revenue that can be used for improving public transport.

However, the parking policy of Kolkata is still supply driven and hinges on the conventional planning approach of continually increasing parking areas to accommodate the growing demand without realizing that parking demand is insatiable. Increase in parking supply will divert more of scarce urban spaces from more important and valuable public usage like schools, health care centres, public green spaces, neighbourhood parks for children etc. Also more parking infrastructure will also induce more car ownership. The city Mobility Plan has also advised the city to build more multilevel car parks and off site parking facilities. It has not yet been understood the importance of limiting parking infrastructure to dampen car ownership and usage. In fact, the comparatively lower car ownership in Kolkata is one of the fallouts of the limited car parking spaces in the city. This is similar to Hong Kong, the financial capital of the world, where very limited parking infrastructure and very high parking charges has kept the car ownership very low. In fact, Hong Kong has less cars than Kolkata. Provision of parking should not be prioritized in the city for environmental and social benefits. The existing network of public transport and its future improvement offers a very important opportunity to give people more attractive alternatives to cars and limit parking.

City needs enforceable air quality targets: Strong public opinion, judicial and executive actions have accelerated clean air action in Kolkata. But it has yet to achieve the national ambient air quality standards. The eleventh five year plan has envisaged that all major cities should meet the clean air standards by the end of the plan period. But as of now clear mechanisms have not been set to achieve those targets. Cities need to set the clean air targets to achieve the National Ambient Air Quality Standards in a time bound manner. Kolkata now has to gear up for second generation action to meet these targets. Air quality management will require increased capacity for continuous assessment of air quality, pollution contribution of air pollution sources and their inventory and health impact studies. The next gen-action will have to rely heavily on reducing personal vehicle usage, upgrading public transport, walking and cycling, and leapfrogging vehicle technology to much cleaner emissions levels.

City needs aggressive vehicle technology and fuel quality roadmap: The new stock of vehicles can lock up enormous amount of pollution if the new investments are not linked with more stringent emissions targets. Kolkata has introduced Bharat Stage IV emissions standards and commensurate fuel quality. But this will not help to address the emerging air quality challenges as these standards legally allow diesel vehicles to emit more NOx and PM compared to petrol vehicles that are the concerns in Kolkata's air. Also these are not stringent enough to require the advanced emissions control systems for particulate matter for effective reduction of PM. Only Euro V and VI norms will ensure adoption of advanced and effective emissions control system in diesel vehicles – light duty as well as heavy duty. Kolkata will have to demand for clean diesel technology and fuels and also plan fuel substitution strategy. Clean diesel with 10 ppm sulphur content should be made available to the city and its metropolitan area immediately with clear target for state wide introduction.

As vehicles and clean fuels cannot be isolated from each other clean fuel is needed to reduce many of its own harmful components that contribute to toxic risks, as well as to enable use of advanced emissions control technologies to cut emissions. It is possible to mitigate the diesel emissions if more advanced emissions control technology including particulate traps are used with diesel fuel with 10 ppm sulphur. Higher sulphur levels can damage the emissions control systems, and also reduce the conversion efficiency of all emissions control systems. Clean fuels can reduce emissions from existing fleet as well and allow better emissions performance.

Reduce in-use emissions: Kolkata has fought bitter battles to phase out very old vehicles from the city that were the most polluting segments. The Asian Development Bank (ADB) study of 2005 had shown that more than 30 per cent of the buses in the city were in the age group of 20-30 years and more. Another 30 per cent was in the age group of 15 to 20 years. The ADB study showed that the bus fleet in Kolkata caused as much as 46 per cent of the particulate pollution load from all vehicles. An old diesel bus could emit 12 times more pollution than a new bus. Similarly, the city was saddled with very old two-stroke powered three-wheelers and old taxis. Following the High Court intervention the very old vehicles were phased out from the city in 2009. The immediate impact of this move showed up in the air quality of the city.

Kolkata will have to continue to work with a clear roadmap for controlling in-use emissions from on-road vehicles. It has also implemented the pollution under control certificate programme. But this programme as evident from the experience of other cities, is weak in content and design and therefore not a very effective instrument. While the national government will have to be prodded to further tighten the PUC norms and test procedures matching the technology levels, the state government will have to revamp the institutional framework to replace numerous small PUC centres with centralized high volume test only centres capable of conducting more sophisticated inspection and roadworthiness of vehicles and deliver credible and authentic results. Moreover, Kolkata has taken the lead in piloting a loaded mode test for three wheelers. Such approaches should be made more broadbased.

India is now enforcing the onboard diagnostics (OBD) I and OBD II norms in vehicles to be produced from 2010 and 2012 onwards. This system is capable of recording the performance the actual performance of the emissions control system. This will have to be integrated with the inspection and maintenance programme. The transport department will have to develop capacity to read the OBD information for compliance strategy. In the meantime, the national government will have to respond by adopting the in-use compliance regulations to ensure that the vehicles remain low emitting during their lifetime.

Fuel substitution strategy: Kolkata does not have access to natural gas and there is yet no timeline for its introduction in the state. Therefore, as one of the in-use emissions reduction strategies Kolkata has opted for LPG programme targeted at a very polluting segment the autos. LPG is a clean fuel and can help to leapfrog to much cleaner emissions. It is very suitable for small vehicles as this can be compressed at lower bar pressure requiring small and easily mountable storage tanks on vehicles. However, this needs to be implemented with stringent safety and emissions protocol for conversion. Experience in Bangalore and Pune shows that quality control of conversion in autos is important or there can be a problem of white smoke emissions. There has also been some discussion on use of coal bed methane for transport. But this has not been taken to the commercial scale.

The city government will have to ensure high degree of safety enforcement and quality control. The kit installation in vehicles can only be done by workshops authorized by the kit manufacturers and suppliers. The city government will have to lay down the technical and legal requirement for the workshops. Workshops will require authorization and accreditation. The city governments will have to carry out periodic audits of these workshops. If the workshop fails to fulfill the requirement its accreditation to convert engines should be withdrawn. Type approval certificate should be recalled in the case of non-compliance. Conversion of agencies should be held liable.

LPG application in buses has not been possible in India. The Automotive Research Association of India (ARAI), the vehicle certification agency in Pune has not given type approval certificate for conversion of any diesel bus model to LPG. There are some special concerns regarding the conversion of old diesel buses to LPG. The diesel compression ignition engines are not suitable to run on gaseous fuels. Only spark ignition engines that run on petrol can be adapted to run on LPG or CNG. This makes conversion of big diesel engines very challenging. Diesel vehicles will first have to be changed into spark ignition engines before the LPG kit can be installed. This makes conversion of big vehicles like buses complicated and unsafe. One is never certain whether simple conversion made on old diesel and used engines that have been subjected to a great deal of wear and tear adhere to manufacturers specifications. These can lead to serious emissions and safety problems.

Many innovative fiscal schemes are possible to meet the cost of replacement – subsidized loan, easy

repayment etc. State government can be asked to come up with such schemes. Cost of this scheme can be recovered from an extra small cess on the diesel fuel sold in the city, higher taxes on on cars and older vehicles. For instance, Delhi has imposed an environment cess of 40 paise per litre of diesel sold in the city to create an Air Ambience Fund to finance pollution control measures.

Need institutional strategy: Ultimate delivery will depend on the institutional strength and capacity. Lack of coordination and fragmented institutional arrangement remains a strong impediment to effective implementation. It is not yet clear how the model of Unified Metropolitan Transport Authority will work in the city in interface with the concerned line departments. This will have to be the priority strategy to ensure delivery and service level improvements. The state government should also devise fiscal incentive scheme to help meet the cost of pollution control and sustainable mobility measures. Kolkata must not repeat the mistakes that Delhi and other mega cities have made of following pro car policies. Kolkata still has the chance to plan its future growth differently and avoid the path of pollution, congestion and energy guzzling. Cities need to make maximum investment in redesigning their existing road space and travel pattern to provide the majority of the people affordable and efficient mode of public transport.

—— Right To Clean Air Team

01

AIR QUALITY

At risk of losing gains

Kolkata has begun to act on air pollution. It has seen improvement in air quality. But the city is in danger of losing the gains. Particulate levels are elevated and rising. Kolkata is also the third most polluted city in terms of nitrogen oxide levels and 12th most polluted city in terms of PM10 levels according to the statement given by Ministry of Environment and Forests to Lok Sabha in August 2010.

But Kolkata has also been a leader in generating valuable evidences on the tiniest fraction of particulates – the key pollutant of concern in Indian cities — that has helped the Central Pollution Control Board to define the air quality standards for PM2.5. The West Bengal State Pollution Control Board has found that particles as small as 3.3 micron are 74 percent of the PM10. An even tinier fraction, smaller than 1.1 micron, is 57.5 percent of the total PM10. Such tiny particles that come largely from vehicles and combustion sources are very toxic and go deep inside the lungs and pose a serious public health threat.

The new national air quality standards has further changed the air quality status of the locations in Kolkata. Dunlop Bridge and Behala Chourasta that were earlier classified as moderate pollution zones for particulate pollution are now bracketed as high pollution locations. For NOx seven out of nine locations are now classified as “critically polluted”. Kolkata needs urgent action to reduce the toxic risk and protect public health.

- **Kolkata is in the grip of multi-pollutant crisis. Several pollutants including particulates, nitrogen dioxides, ozone and several air toxics can go up together. This deadly cocktail laces the breathe of the citizens.**

- **The number of days in a year when pollution exceed standards have increased. On a larger number of days people are exposed to harmful pollution levels. In Lal Bazaar, Cossipore and Kasba both PM10 and NO2 exceed standards nearly half of the days. Minto Park and Moulali show more violation of NO2 standards.**

- **In its August 2010 study CPCB identified highest numbers of volatile organic compounds in residential areas (132 compounds), followed by traffic intersections (130 compounds) and in industrial locations (86).**

- **Pollution levels peak during winter when cold and calm weather conditions prevail. Pollutants do not disperse quickly and remain trapped close to the ground level. Air pollution related diseases escalate during winter months.**

- **Studies forecast a decline in the share of pollution from industrial sources, but an increase from automobiles.**

- **Kolkata needs clean air action plan to meet the national ambient air quality standards in a time bound manner. Air quality monitoring can help to identify the non-compliance status of locations and set the target for compliance.**

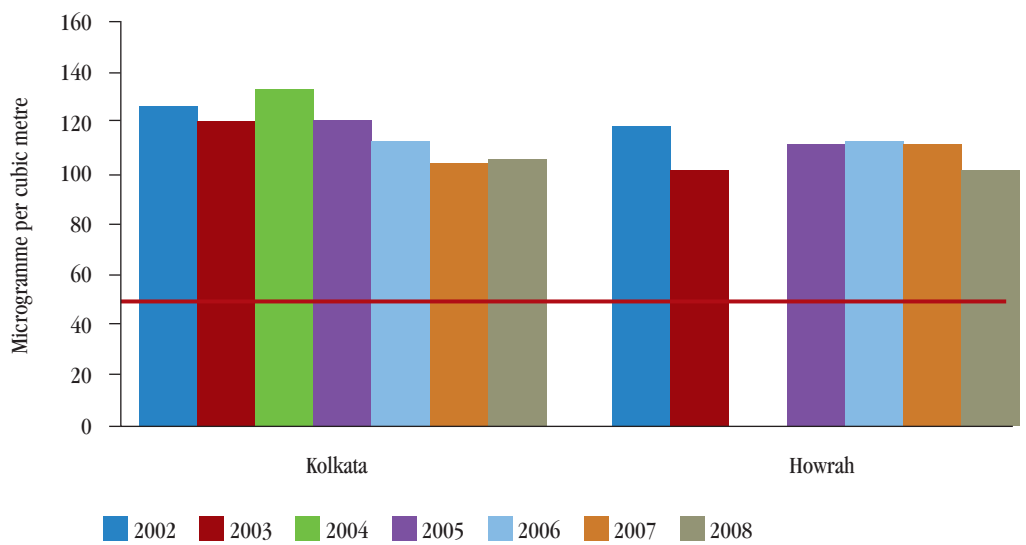
AIR QUALITY CHALLENGE

The West Bengal State Pollution Control Board (WBSPCB) tracks air quality of Kolkata with the help of 17 monitoring stations on a routine basis. They monitor criteria pollutants including particulate matter, nitrogen dioxides, sulphur dioxide and carbon monoxides. They also carry out limited monitoring of ozone, hydrocarbons and carbon monoxide. The city has the capacity to monitor benzene, toluene, xylene, sulphates and polycyclic aromatic hydrocarbon composition of small particles.[i] The information on a variety of air toxics is limited. The emerging air quality data however captures the air pollution risk in the city as well as in the adjacent city of Howrah. What are the unique highlights of air quality of Kolkata?

Killer particles: Kolkata faces a very difficult pollution challenge. Tiny particles that go very deep inside our lungs and cause serious health damage are several times higher than the permissible limit. The levels have stayed elevated for a long time. The twin city of Kolkata and Howrah show high peaks of particulates of less than 10 micron size (PM10). Diameter of one human hair is 50 micron. Imagine how small these particles are that go deep inside. (See graph 1: Graph: Trend in annual average PM10 levels in Kolkata and Howrah)

Tiny and deadly particles: The WBPCB is among the first in the country to generate data on the tiniest fraction of the particles. They have carried out special studies on particulate matter less than 2.5 micron size (PM2.5) in six stations during the winter of 2003. This has drawn a lot of national attention. This has also been an important input for the subsequent development of the national ambient air quality standards for PM2.5.

Graph 1: Trend in annual average PM10 levels in Kolkata and Howrah
PM10 levels have remained several times above the standards



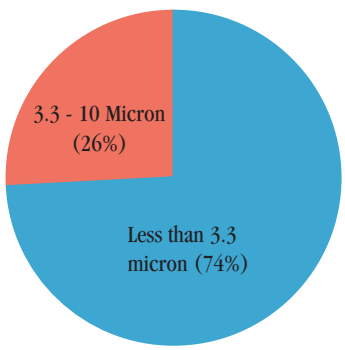
Source: CSE analysis of National ambient air quality status reports for the period 2002 – 2008

The WBPCB study shows that on an average PM2.5 is about 73 percent of the total PM10 in the city. The actual range varies between 67-78 per cent. The benzene soluble organic fraction (BSOF) of the particulates that is highly toxic is about 10 to 18 per cent of the PM10 mass. This is a little higher in PM2.5. The WBPCB scientists explain that the tiny and numerous PM2.5 provide greater surface area for absorption of toxic organic pollutants. PM2.5 absorbs more BSOF per unit of mass than PM10. From the public health perspective, it is more important to monitor and control the small particles.

This study has also put spotlight on the air quality around several prestigious schools in the city to create awareness among the parents. This shows a very high level of smaller particulates near schools. The observed size range between 0.2 to 0.4 micron. This is invisible and penetrates deep inside the lungs.[ii] This makes children extremely vulnerable to dangerous levels of air pollution.

In seven locations of the city the WBPCB study has found particles smaller than 1.1 micron to be about 57.5 per cent of the total PM10. This is a very serious health threat. The average concentration of PM10 in Kolkata is around 300 microgramme per cubic metre in winter. From this it is possible to guage the sheer load of the tiniest particles. [iii] Heavy traffic areas have predictably shown high levels of pollution.

Graph: Size distribution of PM10 in Kolkata (in microgram per cubic metre)
Smaller the particle, deeper they go inside the lungs and cause serious health damage

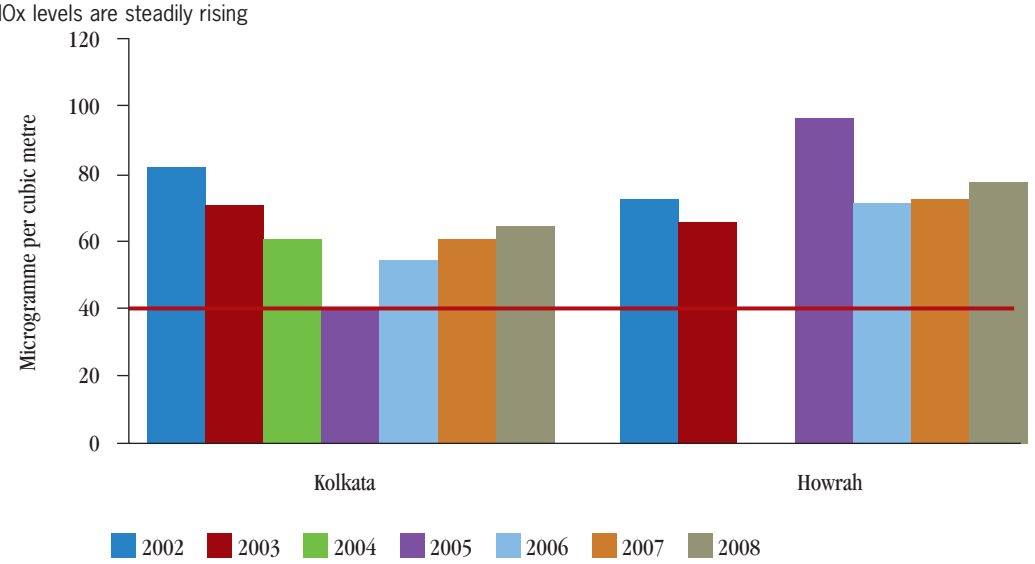


Source: Dipak Chakraborty 2009, Alarming air quality of Kolkata – a real health concern, cost of inaction will be too high, a presentation, Chief Scientist, West Bengal Pollution Control Board

Nitrogen oxide — emerging problem: Nitrogen oxide is the emerging problem in the city. Kolkata and Howrah have recorded one of the highest levels of NOx in the country. The level of exceedance is certainly higher than other cities. Kolkata is experiencing a steady increase in NOx levels after a short respite. (See Graph 2: Trend in annual average NOx levels in Kolkata and Howrah and Graph 3: Long term trend in NOx levels in Kolkata). Available studies in India strongly associate NOx levels with high traffic volume. National and global trend prove that NOx will remain a serious concern and the next gen challenge in the future as cities are experiencing rapid motorization . While NOx is a harmful gas in itself it also catalyses the formation of yet another very harmful gas in the air, ozone. Control of NOx has to be the priority in Indian cities.

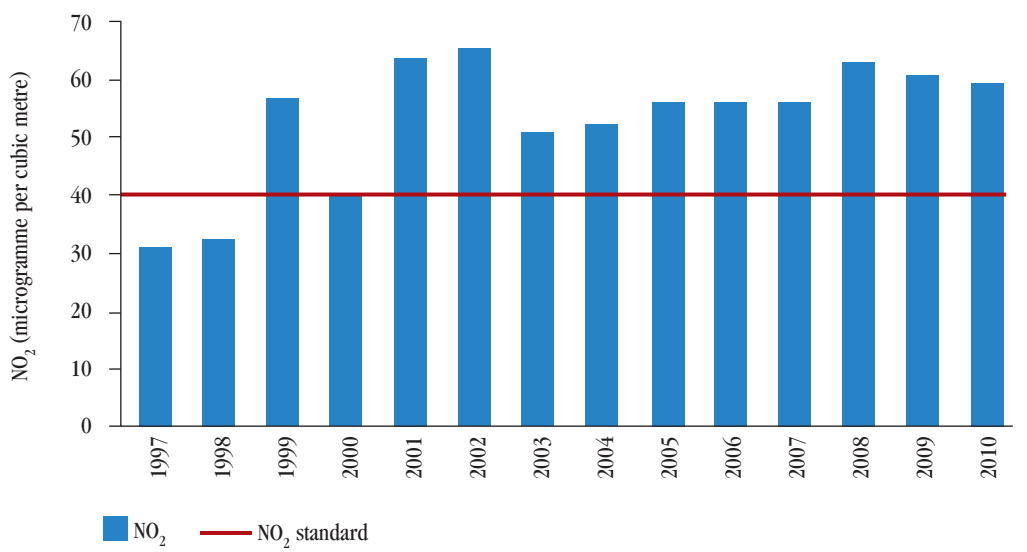
Graph 2: Trend in annual average NOx levels in Kolkata and Howrah

NOx levels are steadily rising



Source: CSE analysis of National ambient air quality status reports for the period 2002 – 2008

Graph 3: Long term trend in NOx levels in Kolkata



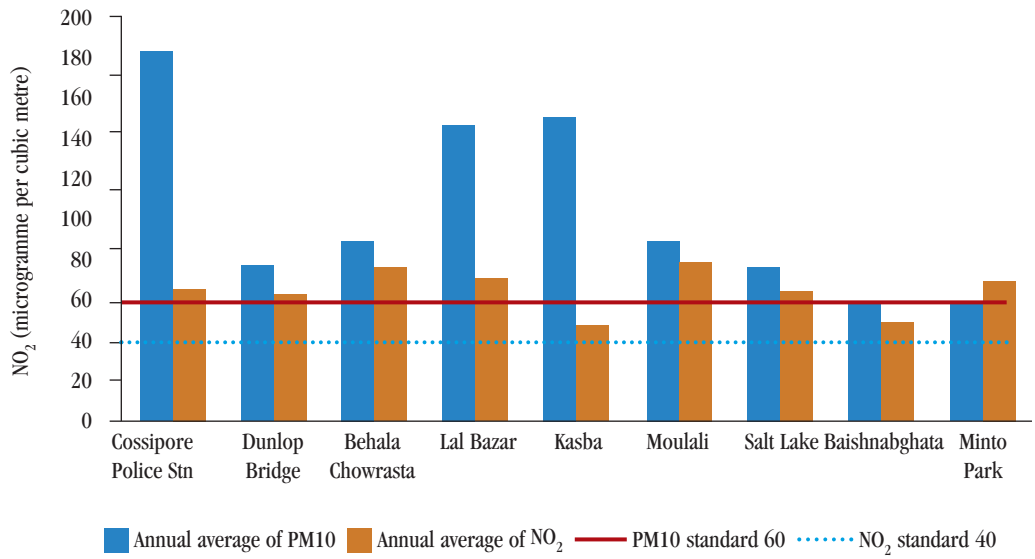
Source: West Bengal Pollution Control Board

Ozone raising its ugly head: Ozone hitherto an unknown problem in India has begun to raise its ugly head in big cities. Kolkata is also falling into its grip. The data on this is very limited. The CPCB study of 2010 has assessed the status of ozone concentration in Kolkata. The study observes that the monthly diurnal variation of ozone concentration at the sites monitored during the study period indicate high levels. Percentile distribution of hourly concentration of ozone shows that from November to May about 95 percentile values crossed the standard of 100 µg/m^3 in residential areas. In most industrial locations have lower levels the standard was never exceeded. Only at the industrial site of Behala the concentration exceeded the standard 5 percent times during July and December to March. At Rashbehari crossing which is a traffic site, violation of standard was observed 5 percent times in the month of February. At all petrol pumps ozone concentrations have exceeded the standard 5 percent times in the month of July.

Ozone is a very harmful gas. It is particularly very harmful for those who are already suffering from respiratory and asthmatic problems. Even short duration peak can trigger symptoms immediately. Ground-level ozone is not emitted directly by any source, but it is formed by chemical reaction between oxides of nitrogen and volatile organic compounds in the presence of sunlight. Therefore, control of NOx and VOCs is critical for control of ozone.

Pollution hotspots in the city: Air quality varies across locations in Kolkata. Some locations show very high levels. Cossipore, Lal Bazaar and Kasba have recorded highest PM10 levels. The NOx hotspots include Moulali, Behala Chourasta, Lal Bazaar and and Minto Park with levels 1.7 to 1.9 times higher than the permissible levels. (See Graph 4: Kolkata – location-wise PM10 and NO_2 levels)

Graph 4: Location-wise PM10 and NO_2 levels

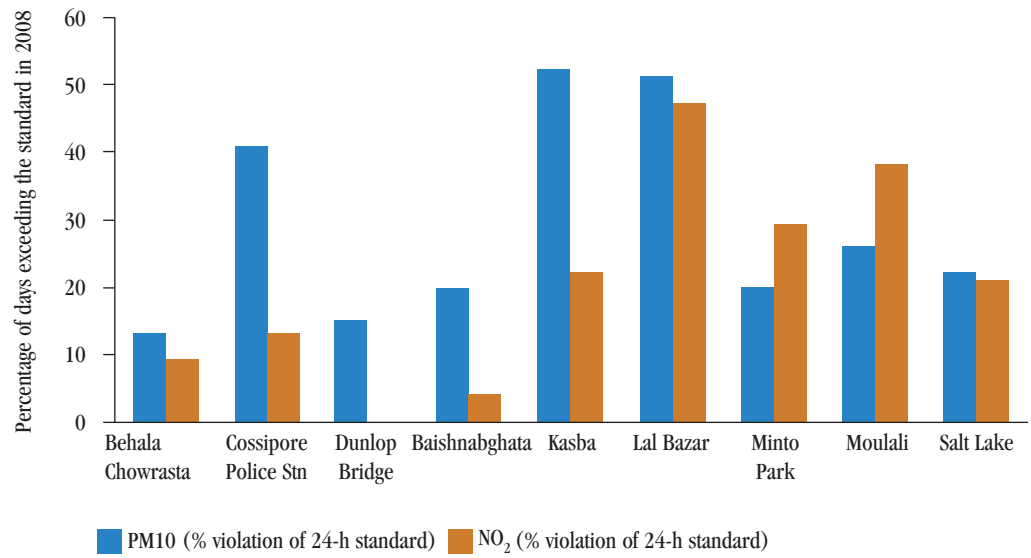


Source: Based on CPCB data

High daily levels: The annual average levels of air pollution may not capture the number of days that exceed standards in a year and therefore the high exposure days. It is possible that even if annual average levels show a decline, the number of days exceeding the standards can increase in the city. This is worrying from health stand point as this increases the number of days with high exposure levels. The PM10 levels in Lal Bazaar shows that nearly half of the days both PM10 and NO_2 exceed standards. Similar trends have been observed in Cossipore and Kasba. Minto Park and Moulali show more violation of NO_2 standards compared to PM10 violations. Other locations too have shown exceedances. (See Graph 5: Daily violation of standard for PM10 and NO_2 in different locations of Kolkata).

Winter woes: Winter months are the worst months for pollution. During winter pollution, levels peak because cold and calm weather conditions do not allow the pollution to disperse fast. As the air begins to hang close to the ground level due to lower mixing height and inversion pollution also remains trapped close to the ground level. This leads to very rapid build up of pollution. This is also one of the reasons why air pollution related diseases– respiratory and cardiac symptoms escalate during winter months. (See Graph 6: Rapid build up pollution during winter (2010-2011).

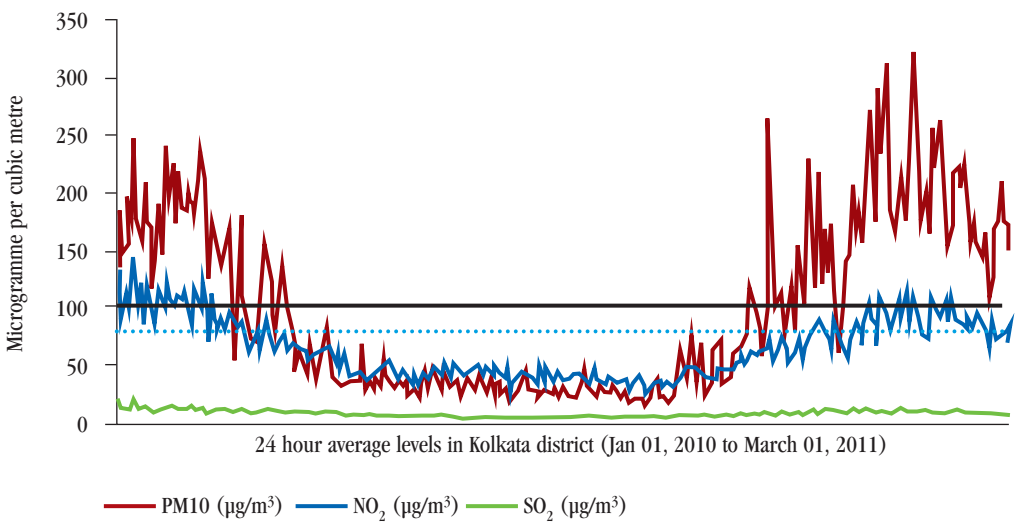
Graph 5: Daily violation of standard by PM10 and NO_2 in different locations of Kolkata



Source: Based on data provided by the CPCB.

Graph 6: Rapid build up pollution during winter (2010-2011)

Winter months record very high level of pollution

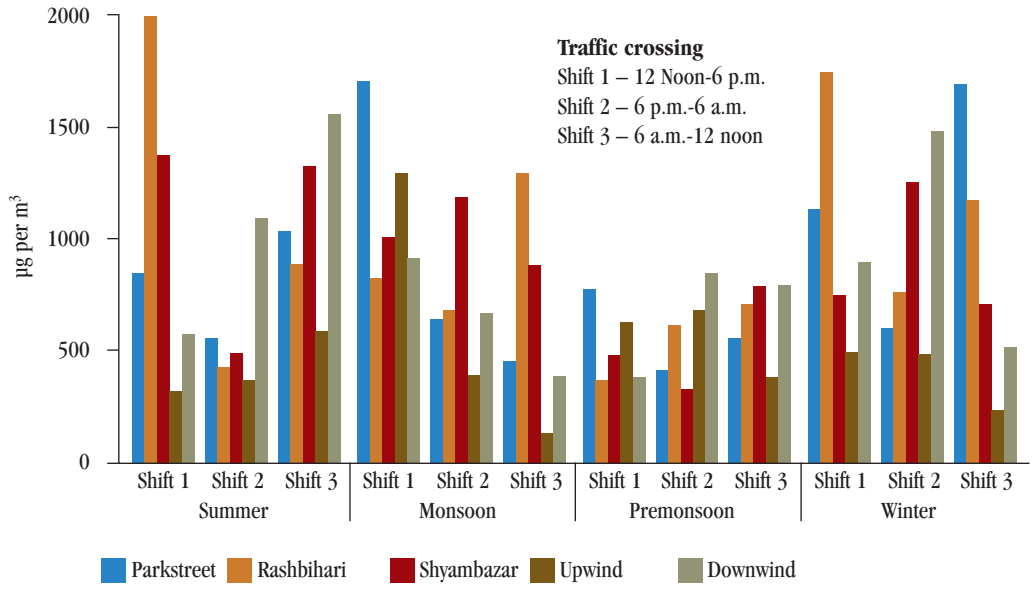


Source: Based on West Bengal Pollution Control Board's data

Air toxics — dangerous in small doses: There are numerous toxic gases in the air that occur at trace level. Some of them that are known to be very toxic are monitored on a limited scale in a few cities. Kolkata is one of them.

The Central Pollution Control Board has carried out a detailed study through NEERI's Zonal Center in Kolkata to measure volatile organic compound (VOCs) including carbonyls in ambient air of Kolkata. Some of the VOCs are strong carcinogens. This study released in August 2010 by CPCB[iv] has found highest number of VOCs in residential areas (132 compounds), followed by traffic intersections (130 compounds), in petrol pump (85) and in industrial locations (86).[v] Carbpnyl levels are also very high in Kolkata (Graph 7: Total carbonyls at Traffic Intersections in Kolkata).

Graph 7: Total carbonyls at Traffic Intersections in Kolkata (seasonal variations)



Source: CPCB 2010, Study of Urban Air Quality in Kolkata for Source Identification and Estimation of Ozone, Carbonyls, NOx and VOC Emissions, Control of Urban Pollution Series: CUPS/72/ 2010-11, Central Pollution Control Board, Ministry of Environment & Forests, August, 2010

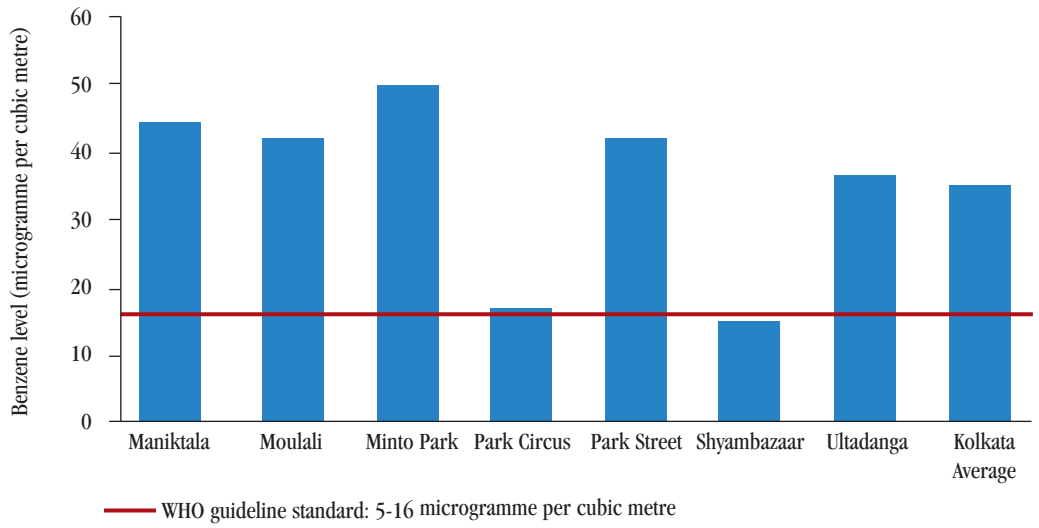
According to this study petrol and diesel exhaust, combustion of naphtha and mineral spirit and cigarette smoke are the major sources of VOCs in Kolkata's air. Fuel adulteration especially naphtha and mineral oil combustion are also an important source.[vi]

It is also very worrying that the benzene levels are still very high. These come largely from petrol combustion and evaporative emissions in refueling centres. According to the WBPCB in spite of lowering of benzene level in petrol, benzene, a potent carcinogen (responsible for human leukemia) remains alarmingly high in the air. The average benzene levels during 2004-2005 were 29.15 microgram per cubic metre, and during December 2005-February 2006 the levels increased to 33.34 microgram per cubic metre. In December 2006-February 2007 the levels further increased to 35.58 microgram per cubic metre[vii]. (See Graph 8: Carcinogen benzene in Kolkata's air). This has serious health implications and needs urgent remediation.

More poisons in the air: A WBPCB study has also assessed the polycyclic aromatic hydrocarbons (PAH) composition of PM2.5 and PM10. These are a group of very toxic hydrocarbons. The WBPCB has identified potent carcinogens — benzo (alpha) pyrene and indeno (1,2,3 cd) pyrene in Kolkata's air. These have strong cancer potency. Diesel vehicles are a major source of this group of hydrocarbons.

There is also a lot of interest in tracking secondary pollutants in the air. These are not directly emitted by any source but form in the air as a byproduct of reaction among different pollutants. The WBPCB is conducting studies on sulphate and nitrate particles and chloride concentrations. The sulphate values in the city correspond to 8-10 per cent of the PM10 (in the range of 7-14 microgramme per cubic metre), which is very significant. Several health effect studies show that sulphur dioxide gets converted into sulphate particles, which are finer in nature and more toxic.[viii]

Graph 8: Carcinogen benzene in Kolkata's air
The benzene levels are high in the city

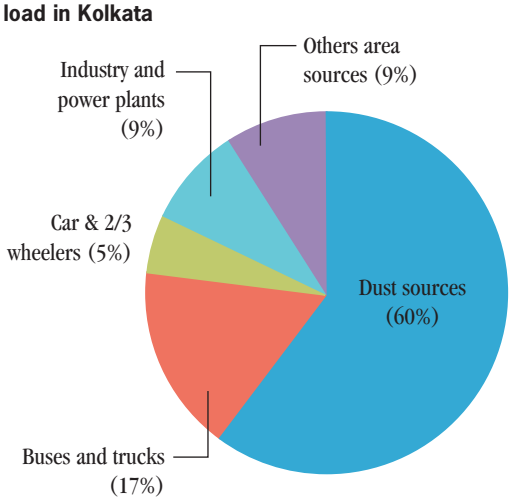


Source: Dipak Chakraborty 2009, Alarming air quality of Kolkata – a real health concern, cost of inaction will be too high, a presentation, Chief Scientist, West Bengal Pollution Control Board

WHERE IS POLLUTION COMING FROM?

The city needs to know its principle sources of pollution and carry out the inventory of pollution sources to develop source-wise mitigation strategies. This kind of exercise is very limited in Indian cities. A study was carried out with support from the Asian Development Bank to assess the sources of respirable particulate matter in Kolkata in 2003. This study has projected that the respirable particulate emissions from vehicles, road dust, other area sources and industry will grow from an estimated 75,140 to 136,796 tons per year in 2014 if significant efforts are not made to reduce emissions and improve air quality. (Graph 9: Contribution of different sources to particulate load in Kolkata). Assuming a proportional change in RPM air quality, 2003 air quality would degrade by an estimated 7 ug/m^3 to 107

Graph 9: Contribution of different sources to particulate load in Kolkata



Note: Kolkata: PM10 sources (source app.) All vehicles contribute about 22%. Share will be much higher if PM10 only from combustion sources are considered
Source: Anon 2005, Strengthening environmental management at the State Level (cluster) – Component E-Strengthening environmental management at west Bengal pollution control board, Final report Volume V: Air quality management, Asian Development Bank, TA No. 3423-IND, Intercontinental Consultants and Technocrats Pvt Ltd, Ballofet International LLC, USA, WAPCOS

ug/m^3 annual average. Using published mortality response factors, this further degradation in air quality would likely to result in a total of about 6,700 additional RPM-related premature deaths within the KMA by 2014.[ix]

ADB estimates show an overwhelming impact of road dust followed by vehicles. But if the same data is reanalyzed considering only the combustion sources the share of vehicles increases significantly. The WBPCB has further estimated that more than half of the very tiny particles come from the vehicular sources. Vehicles are a special challenge in Kolkata.

CHANGING CLEAN AIR BENCHMARK

Even as the city is fighting its pollution battle the clean air benchmark for the country has become more stringent. Union Ministry of Environment and Forests has revised and tightened the National Ambient Air Quality Standards. This has changed the air quality status of locations in the city. With tightening of the benchmark some of the locations have moved to higher bracket of pollution category. For instance, Dunlop Bridge and Behala Chowrasta that were earlier classified as moderate for PM10 levels are reclassified as high. Salt Lake, Moulali, Minto Park, Lal Bazar have moved from high to critical for nitrogen oxides.

Table 1: New Ambient Air Quality Standards change air quality status of locations in Kolkata
Tighter standards have reclassified air quality status of locations

Monitoring locations	Nitrogen dioxide		PM10	
	Previous air quality status	New air quality status	Previous air quality status	New air quality status
Salt Lake	High	Critical	High	High
Moulali	High	Critical	High	High
Minto Park	High	Critical	Moderate	Moderate
Lal Bazar	High	Critical	Critical	Critical
Kasba	Moderate	High	Critical	Critical
Dunlop Bridge	Moderate	Critical	Moderate	High
Cossipore Police Stn	Moderate	Critical	Critical	Critical
Behala Chowrasta	Moderate	Critical	Moderate	High
Baishnabghata	Moderate	High	Moderate	Moderate

Source: CSE analysis based on CPCB ambient air quality data

THE WAY AHEAD ON AIR QUALITY PLANNING

Kolkata should set clean air targets to meet air quality standards: Even though air quality is monitored to identify the level of non-compliance, there is no legal system to ensure that the cities meet the ambient air quality standards in a time bound manner. This is urgently needed to meet the second generation challenge in the city. Soft options are over. Low hanging fruits have been picked (See box: First generation reforms have exhausted soft options). City needs harder decisions to meet the clean air standards.

In fact, the eleventh five year plan had proposed that all major cities should meet the ambient air quality standards by the end of the plan period. But this was not expedited with any clear mechanism. This needs to be expedited in the 12th five year plan to make the national ambient air quality standards legally binding. This will enable the city to prepare city clean air implementation plan to meet the standards with clear milestones and timeline. To make this enforceable, the quantum of the central assistance

FIRST GENERATION REFORMS HAVE EXHAUSTED SOFT OPTIONS

Action on air pollution has begun in Kolkata and even shown results. A combination of these steps has helped Kolkata stabilise its air pollution levels. The High Court's order led to replacement of about 21,000 autos, 3,000 buses and minibuses, and 7,000 taxis in the city. The information available from the West Bengal Pollution Control Board indicates that ban on two stroke autorickshaws has showed benefits in reduction in emissions.

This first generation action has helped Kolkata – as a World Bank study shows — to save more than 3,000 premature deaths due to air pollution-related diseases. This gives immense confidence for future action — if we act, we will see results.

First generation action in the city includes:

Action on vehicles:-

- The city has introduced Bharat Stage IV norms for vehicles in 2010
- Two-stroke autorickshaws banned
- Selling of pre-mixed 2-T oil made mandatory within Kolkata Metropolitan Area since November 2001.
- Ban on supply of loose 2T oil.
- Introduced 50 ppm sulphur fuels
- Up gradation of PUC emission testing centers
- Unleaded petrol introduced since February,.2000.
- Benzene content in petrol reduced to 3 percent from 2001 subsequently to one percent
- Only LPG driven three wheelers are registered in Kolkata since June 2003.
- Petrol blended with 5 percent ethanol mandatory since January 2003.

Action on industry:-

- Stricter location policy for new industrial units and restriction on setting up of polluting industries in municipal area of Kolkata Metropolitan Area (KMA)
- Efforts to ensure regulatory compliance for grossly polluting industries
- Introduction of stricter emission standards for boilers, ceramic kilns, foundries and rolling mill of KMA with effect in May 11, 2001
- Mandatory use of clean fuels
- Financial assistance for installation of pollution control devices in small-scale industries etc.
- Regularly complying industries are felicitated with Environmental excellence awards.
- Coal use restricted in industries
- About 67 percent of the coal fired boilers and about 73 percent of the coal fired ceramic kilns have already been converted to oil fired ones.
- Financial assistance to the small industries for pollution control by the WBPCB and the State Government; The WBPCB is encouraging the industries to go 'beyond compliance'. Industries are encouraged to go 'beyond compliance' and good performers are honoured with 'Environmental Excellence Award'; Thermal power plants are also regularly monitored to control the emissions.

Source: MOSRTH and Air Quality Trends and Action Plan for Control of Air Pollution from Seventeen Cities, CPCB, 2006

to states may be linked with the implementation of the city action plan. For this purpose verifiable benchmark and monitoring system can be developed. Health imperatives demand enforcement of the National Ambient Air Quality Standards in a time bound manner.

Support regular assessment of sources of air pollution: Air pollution control policies can be further refined if pollution sources are regularly inventorised and their contribution to air pollution load and trends are quantified to assess the impact of action. At the national level a massive exercise of pollution inventory and source apportionment has been recently completed in six cities. Kolkata has also done similar exercise from time to time. The city and the country have gained experience in these technical tools for air quality monitoring. Leverage this experience and the

investment to build a programme for regular multi-pollutant studies on air pollution inventory and source profiling, source apportionment, air quality modelling on an ongoing basis to assess the trend in sources of pollution, pollution load, set air quality targets, and assess the impact of action on air quality to further strengthen city action plans. Also include micro meteorological study including advanced air quality modelling. This should be made available for continuous evaluation to feed the action planning.

Strengthen air quality monitoring: The city has established air quality monitoring rid. Evaluate the current monitoring grid for criteria pollutants and plan expansion and coverage of additional neighbourhoods. Expand automatic real time monitoring of priority pollutants including PM2.5, and ozone. Further develop capacity for monitoring of air toxics and heavy metals and also secondary particulates. Create facilities for exposure monitoring. The current monitoring efforts are limited to tracking only ambient air quality. But from the public health stand point exposure to various micro environment including road side etc is of greater significance. Networking of existing manual and continuous air quality monitoring stations and data transmission on a daily basis from these stations to environmental data bank has been established. This needs to be strengthened further. Develop capacity for quicker publication of air quality information nationwide. The real time monitoring should be expanded and leveraged to create public information system based on air quality index for daily health alerts. Use this for health alert and pollution emergency measures.

Develop Clean Air Action Plan: City action plan should identify the implementation plan for meeting the clean air standards. This will also help to make a shift from project based funding approach to more programme based funding approach. City action plan can improve local planning, implementation and also the pollution levels. City action plan will define the combination of local, state, and central action and emission controls needed for an area to bring about compliance with the National Ambient Air Quality Standards. It will provide the basic link between state regulations, central supervision of state actions, and central enforcement. This needs to be periodically reviewed to reflect new regulatory requirements, new information, or change in attainment status. It should have provision for public consultation.

Regulatory system for reporting, monitoring and compliance will have to be developed for effective implementation of City action plan. Presently, some cities have adopted the model of setting up of a Task Force with representations from the concerned state agencies under the aegis of the SPCB. This structure will have to be further developed for effective coordination but with effective authority and accountability. Properly structured City action plan will become the basis of financing the city action plan with dedicated state and central funds.

02

PUBLIC HEALTH

Toxic fumes in breathing zone

There is enough evidence on health effects of air pollution to push action and reduce the public health risks to children, elderly, poor and others. Kolkata will have to take action now to reduce the toxic risk.

The series of studies carried out by the Chittaranjan National Cancer Research Institute (CNCI) in Kolkata have thrown up very valuable data and scary evidences on the very harmful effects of air pollution. One of the CNCI studies has shown that more than 18 persons per one lakh people in Kolkata fall victim to lung cancer every year compared to the next highest 13 per one lakh in Delhi. More than 7 in 10 people here suffer from various kinds of respiratory disorder. Air pollution is a very serious contributory risk factor.

The most vulnerable are the roadside hawkers, shop owners, traffic policemen, auto-rickshaw drivers, rickshaw-pullers and those who spend long hours on the road or in close proximity to roads. Children suffer from asthma while elderly people fall victim to lung cancer.

Studies have also found a strong correlation between air pollution and growing respiratory incidence. The levels are high around prominent schools. Traffic exposure is very high. Traffic policemen bear the brunt of the toxic breathe. The CPCB study of 2010 has estimated excess cancer risk for people in Kolkata. Given its population level this risk translates into 41,935 persons under threat of developing some kind of cancer due to inhalation of carcinogens.This is a scourge that the city will have to face up to with strident action.

- **As many as 65 and 64 per cent children in Kolkata and Delhi, respectively, suffer from lung function impairment as against 24 per cent in Sunderbans.**

  Nearly 75 and 71 per cent of non-smoking, healthy adults in Kolkata and Delhi, respectively, display respiratory symptoms compared to only 32 per cent in the Sunderbans.

- **Close to 42,000 persons are under threat of developing some kind of cancer due to inhalation of carcinogens floating in the air of Kolkata.**

- **Lower respiratory symptoms were reported to be more prevalent among bus drivers (62.5 per cent) followed by petrol pump workers (50 per cent) and garage workers (46.2 per cent). In comparison, office workers (37.5 per cent) showed these symptoms.**

- **Lung function impairment was found to be highest among petrol pump workers (92 per cent), garage workers (90 per cent) and bus drivers (86 per cent).**

- **CNCI studies have shown that traffic-related air pollution is associated with a 6.5-fold rise in alveolar macrophage number in traffic policemen and street hawkers of Kolkata. This is much higher than the less exposed office workers.**

PUBLIC HEALTH RISK

Outdoor urban air pollution is a serious environmental risk factor that causes and aggravates acute and chronic diseases. Also given the latency period of toxic risk Indian cities are likely to see more cancers due to increase in environmental health risk. This makes a strong case for control of air pollution. Health criteria need to be built into the air pollution control policies more clearly.

The first big study on air pollution in India came from the World Bank in 1995. The study found that PM10 and SO2 were responsible for over 95 per cent of the health damages in the cities. This study had put the annual number of premature deaths in Kolkata due to air pollution at 5,726.[x]

Since then more studies have followed from local institutions in Kolkata that have thrown up very valuable evidences not only for the city but also for national policy making. Great amount of clinching evidences have come from Kolkata based premier institute the Chittaranjan National Cancer Institute (CNCI). Series of studies conducted by them since 2000 has added to the important body of knowledge not just for the city but for the country as well.

The CNCI study reveals that more than 18 persons per one lakh people in Kolkata fall victim to lung cancer every year compared to the next highest 13 per one lakh in Delhi. In addition, cases of heart attack are also rising rapidly. CNCI scientists explain that more than 7 in 10 people in Kolkata, especially children as well as elderly people, suffer from various kinds of respiratory disorder. The roadside hawkers, shop owners, traffic policemen, auto-rickshaw drivers, rickshaw-pullers and others who spend long hours on the road are the most vulnerable. Children mainly suffer from breathing difficulties like asthma while elderly people are victims of lung cancer.[xi]

Their studies have shown that traffic-related air pollution is associated with a 6.5-fold rise in alveolar macrophage number in traffic policemen and street hawkers of Kolkata. This is much higher compared to less exposed office workers. The alveolar macrophage number in sputum is a sensitive biomarker of cumulative exposure to air pollution. Also, the percentage of children suffering from upper respiratory infection, cough, wheezing and eye irritation is reported to have increased in direct proportion to increased concentration of PM10. (See Figure 1: Lung cells under stress from air pollution).[xii]

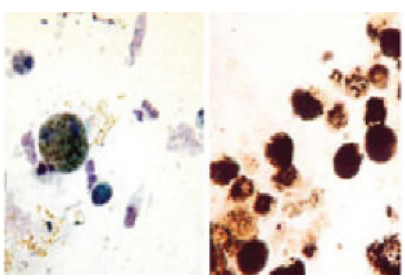


Figure 1: Lung cells under stress from air pollution
Lung cells mildly exposed to pollution; (right) Carbon black-laden lung macrophages, which engulf pollutants, of a traffic policeman in Kolkata

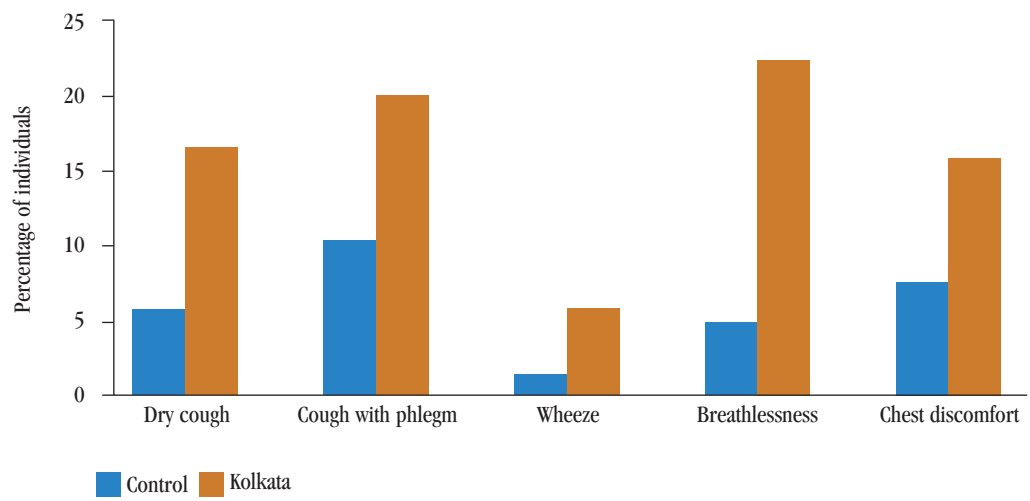
CNCI has conducted a 10-year study, funded by the Department of Environment, West Bengal, the Central Pollution Control Board and the Union ministry of environment and forests to assess health effects by using pollution-sensitive biomarkers. The objectives have been to prepare a database on respiratory and systemic changes in children of urban and rural areas, and adult residents of Kolkata and Delhi, with different age, gender, occupation and socio-economic status, and to explore the underlying mechanisms involved in pollution-related diseases so as to develop effective intervention strategies.[xiii]

The team has assessed respiratory symptoms through specially designed questionnaires and lung function tests in 12,000 children in rural and suburban areas of West Bengal. It has also analysed 3,200 and 3,500 children in the eight-16 age group in Kolkata and Delhi, respectively. The team studied air quality data from the West Bengal Pollution Control Board and CPCB. Detailed health and clinical data was collected. Statistical tests and mathematical models were used for analysis. Sundarbans, in the Gangetic delta, with its pollution levels close to the permissible limit — 60-80 microgramme per cubic metre — was taken as the control area for comparison. The effect of PM10 at three concentrations — less than 100, 100-200 and greater than 200 microgramme per cubic metre — on about 15,200 children of urban, suburban and rural West Bengal were monitored. The percentage suffering from upper respiratory infection, cough, wheezing and eye irritation was reported to increase in direct proportion to the increasing concentration of PM10.

Interestingly, the percentage of children showing symptoms of onset of respiratory allergy and headache was already high when exposed to PM10 concentrations of 100-200 microgramme per cubic metre, compared to the time when they were exposed to concentration greater than 200 microgramme per cubic metre. (See Graph 10: Air pollution and lower respiratory symptoms)

Upper respiratory infection and headaches were reported to afflict a high percentage even at a concentration less than 100 microgramme per cubic metre. Children showing symptoms of lung function impairment were also compared with those in the least polluted Sunderbans. As many as 65 and 64 per cent children in Kolkata and Delhi, respectively, suffered from lung

Graph 10: Air pollution and lower respiratory symptoms



Source: Manas Ranjan Ray, Health Impact of Air Pollution in Kolkata, Chittaranjan National Cancer Institute, Kolkata

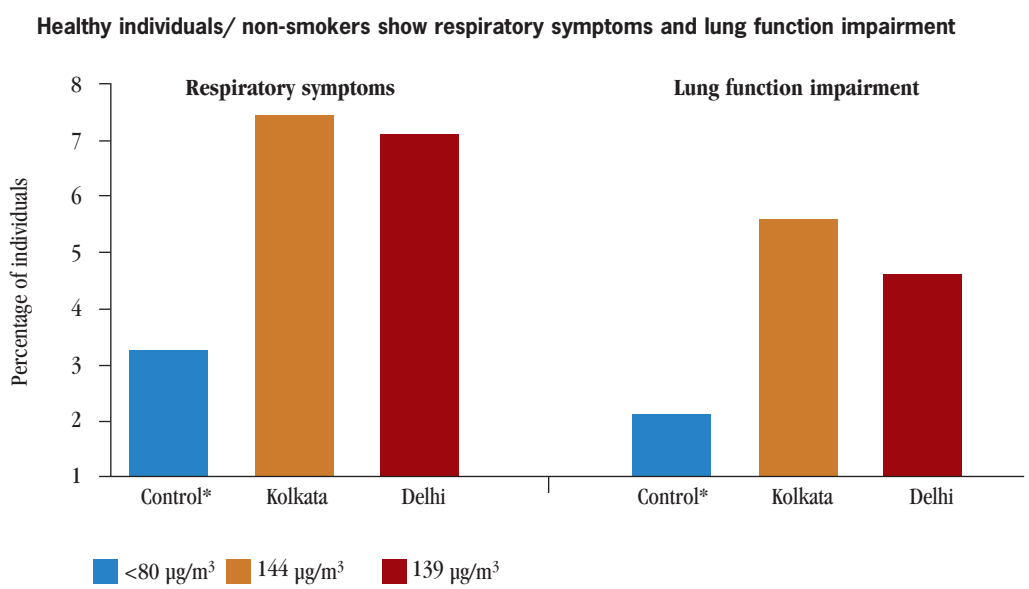
function impairment as against 24 per cent in Sunderbans. Similarly, nearly 75 and 71.4 per cent non-smoking, healthy adults in Kolkata and Delhi, respectively, displayed respiratory symptoms compared to only 32 per cent in the Sunderbans.

With regard to lung function impairment, Delhi fared only a little better with 46 per cent suffering, as against 56 per cent in Kolkata, and only 21 per cent in the control area. The study also targeted occupationally exposed groups like bus drivers, auto drivers, petrol pump workers and garage workers in Kolkata. They were compared with office-goers in terms of manifesting lower respiratory symptoms and lung function impairment. Their occupational exposure to respirable suspended particulate matter (RSPM) greater than 150 microgramme per cubic metre (annual standard 60 microgramme per cubic metre) was measured daily for 8-10 hours, five to six days per week, for more than five years. Lower respiratory symptoms were reported to be more prevalent among bus drivers (62.5 per cent) followed by petrol pump workers (50 per cent) and garage workers (46.2 per cent). In comparison, only 37.5 per cent office workers showed these symptoms. Lung function impairment was found to be highest amongst petrol pump workers (92 per cent), garage workers (90 per cent) and bus drivers (86 per cent). On the other hand, 45 per cent office workers exhibited such impairment.[xiv] (See Graph 11: Impaired lungs in Kolkata and Delhi and Graph 10: Impaired lungs in Kolkata and Delhi).

Scientists from CNCI have also identified other biomarkers to indicate the change in the body due to the effect of air pollution. Studies released in 2000 show higher prevalence of sputum eosinophilia and neutrophilia along with marked rise in the prevalence of respiratory symptoms in both adults and children of Kolkata. These changes have been attributed to the city's high air pollution level.[xv]

Most recent air quality study of CPCB[xvi] in 2010 has estimated excess cancer risk for people residing in Kolkata is an alarming 3,176 persons in

Graph 11: Impaired lungs in Kolkata and Delhi
More than 60% children in Kolkata and Delhi showed lung function impairments compared to a mere 24 per cent in controls



Note: *Sundarbans, West Bengal
Source: Twisha Lahiri 2004, assistant director and head, department of neuroendocrinology, Chittaranjan National Cancer Institute, Kolkata, CSE conference: The leapfrog factor, New Delhi, April 2004

every million population. According to Census 2001, Kolkata has 13,205,697 people. Therefore, the risk translates into 41,935 persons under threat of developing some kind of cancer due to inhalation of these carcinogens. The percentage contribution of different carcinogens towards the total cancer risk is found to be highest for Formaldehyde (40.3%), Chloroform (38.3%), Acetaldehyde (10.5%), Benzene (5. 3%) and the rest.[xvii] CPCB has therefore proposed a strategic air quality management plan.[xviii]

When local evidences are conjoined with the mounting global evidences, it certainly makes a case for accelerated and uregent action. The health risk of air pollution has already been borne out by the studies in other regions of the world. The studies of massive scale as those carried out in the US show increase of only 10 microgramme/cu m of PM2.5 is associated with significant increases in health risks. High exposure to PM2.5 is known to lead to increased hospitalisation for asthma, lung diseases, chronic bronchitis and heart damage. Long-term exposure can cause lung cancer. Rising level of nitrogen oxides can also have serious implications for respiratory diseases. Local evidences from Indian cities only confirm the scourge. But it is also clear that if we act on time and improve the air quality we can save lives and illnesses. The World Bank study of 2004 has confirmed that the air pollution control efforts have saved thousands of premature deaths in the city. Kolkata must not ignore these powerful evidences emerging locally as well as globally.

Way ahead on integrating health criteria with air quality planning

Health impact assessment must support air quality planning and management: Create a cell in the Department of Environment and WBSPB for supporting health studies (time series epidemiological studies and exposure studies) with wide population coverage for proper risk assessment. This body should work with the key health agencies, hospitals and doctors. It should enable development of proper methodology and scientific protocol for health studies. The studies should consider the special risk factors associated with poor socio economic conditions, effect of very high levels of pollution and multi-pollutant crisis that is unique to Indian cities.

Initiate and support health costs and economic costs and benefit analysis to support decision making. Coordinate with relevant agencies for preparation of exhaustive disease database linked with air pollution. These will continuously feed the rule making process. These studies can be conducted in partnership with key scientific and research organizations in the city.

There is need for support for research on health impacts of air pollution. The city needs to build preparedness for scaling up of health studies to continually inform policy making. This will require good disease data base to enable composite research on health impacts of air pollution. In most cases, the databases do not contain a detailed description on the diseases. Trained personnel need to be employed in this field. The data recorded should be accurate, consistent and comprehensive. Data should be regularly updated and should be easily accessible to all stakeholders, especially for research purposes.

Health based air quality planning: The emerging health evidences need to be integrated to drive air pollution control strategies. The strategies should consider the health costs as well as the health benefits. For instance, the World Bank has assessed that due to the initial improvement in air quality during the early years of the last decade has helped Kolkata to save 3,293 premature deaths in a year.[xix] This continuous elevation is important to give direction to policies as well as decide the stringency of the action.

03

VEHICLES

Pose a special problem

Cities have many sources of outdoor air pollution and all require mitigation action. But vehicles pose a special challenge. Kolkata is not likely to set up new polluting industrial units or power plants inside the city limit any more. But vehicles will increase exponentially. This will pose a very special challenge for air pollution mitigation and risk management in the future.

People are more vulnerable to vehicular fume as they travel on roads and live close to roads. In densely-populated cities more than 50 – 60 percent of the population lives or works near roadside where levels of vehicular pollution are much higher. Vehicular emissions contribute to significant human exposure. Pollution concentration in our breathe is 3-4 times higher than the ambient air concentration.

The low income neighbourhoods that are located close to roads are particularly vulnerable. Poor have a higher prevalence of some underlying diseases related to air pollution. Proximity to roadways increases the potential health effects. Road users, public transport users, walkers and cyclists – the urban majority — are the most exposed groups. That is why vehicles require more stringent measures.

Studies show that the pollution from vehicles is expected to increase in the city while that from industry will decline. Kolkata has its own evidences to show the influence of vehicles on air pollution levels in the city as well as on human health. This needs stringent and leapfrog action.

The West Bengal Pollution Control Board (WBCB) indicates that automobiles contribute significantly to particulates of the size of 1.1 micron and account for nearly 50 per cent of the air pollution load.

- **WBPCB studies in residential and kerbside areas show that the levels of respirable particulate matter and nitrogen dioxide are on-an-average 20 percent more in the kerbside areas indicating high impact of traffic.**

- **In Kolkata, nearly 65 per cent of the vehicles are diesel-run. Diesel emissions are very toxic and are branded as probable human carcinogen. Even Bharat Stage IV compliant vehicles have higher toxicity than the petrol counterpart. Diesel cars are legally allowed to to emit more nitrogen oxides and particulate matter than petrol vehicles.**

- **Large diesel buses account for nearly one-half of the vehicular particulate matter in Kolkata, estimates the ADB study. Large and small buses are also the principal source of nitrogen oxides. Car segment is also dieselising rapidly as is also the national trend.**

- **Ill maintained old vehicles are a major problem. The average age of passenger cars within the metropolitan region is about 10 years but over one-quarter of the large diesel trucks are over 30 years. ADB study shows that diesel buses and trucks contribute about 37 percent of the PM2.5 emissions.**

WHY VEHICLES ARE A SPECIAL CONCERN?

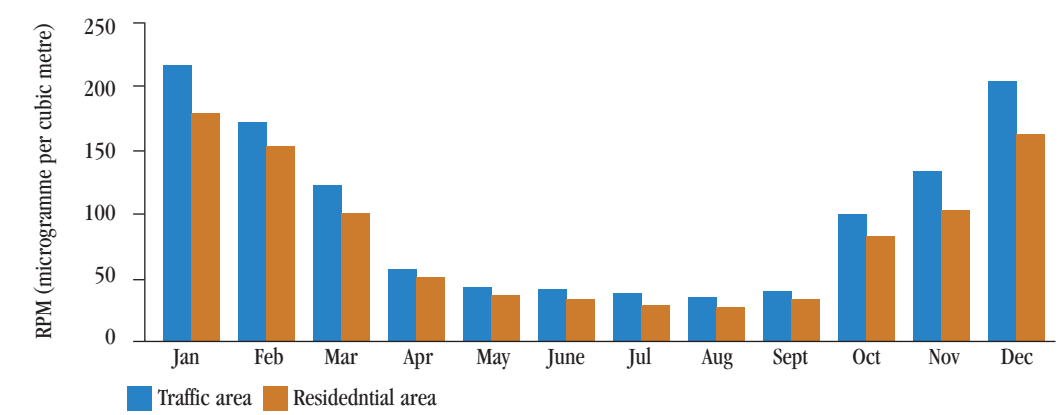
Vehicles emit in our breathing zone. People traveling on roads and living in close proximity to roads are most exposed to toxic fumes. In a sprawled city like Delhi 55 per cent of the population are estimated to live within 500 meters of any road network which is the influence zone of vehicular fume. This share is likely to be more in a compact and densely built city like Kolkata. Vehicles are the most rapidly growing source of air pollution in most Indian cities.

The emerging data in Kolkata bear out the high contribution of vehicles to the total air pollution load. The West Bengal State Pollution Control Board (WBPCB) has shown that automobiles contribute significantly to particulates of the size class of 1.1 micron and account for more than half of the air pollution load. Diameter of one human hair is 50 micron – imagine a size as small as 1 micron. WBPCB also forecasts a decline in the share of pollution from industrial sources but an increase from automobiles in the future.[xx]

Studies conducted by WBPCB in residential and kerbside areas shows that the levels of respirable particulate matter and nitrogen oxides are on-an-average 20 percent more at kerbside areas indicating high impact of traffic. This also indicates high exposure to city dwellers. The concentration of pollution close to road side is higher than the residential areas of the city (Graph 12: Average RSPM level in traffic area and residential area in Kolkata- 2009).

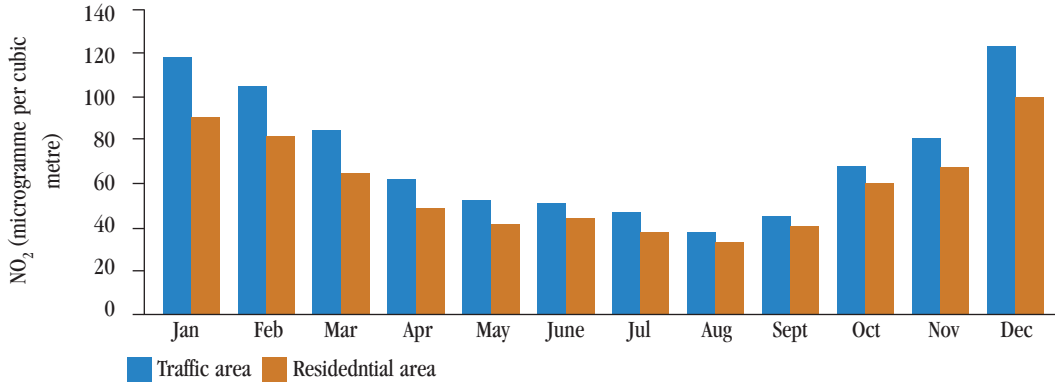
Diesel capital: Kolkata has earned the notoriety as diesel capital of India mainly because of high concentration of diesel vehicles and diesel use in the city. Toxic emissions from diesel vehicles are a major concern. In Kolkata, nearly 65 per cent of all vehicles and nearly 99 per cent of all commercial vehicles are diesel-run. Nearly 65 per cent of the vehicles in the city are more than 15 years of age. A study by ICLEI-South Asia reveals that Kolkata consumes more diesel in the transportation sector than petrol. The diesel consumption in the city was estimated to be 488,955 kL and petrol consumption 117,987 kL in 2007-08.

Graph 12: Average RSPM level in traffic area and residential area in Kolkata- 2009



Source: West Bengal Pollution Control Board

Graph 13: Average NO_2 level in traffic area and Residential area - 2009



Source: West Bengal Pollution Control Board

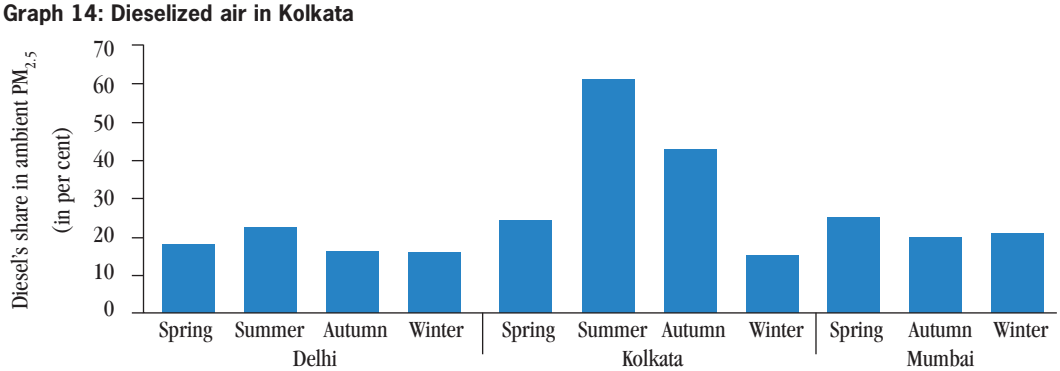
Diesel related emissions – both particulate and nitrogen oxides are of serious concerns in the city. A World Bank study (2004) found that depending on the season the contribution of diesel combustion to PM2.5 in Kolkata can be very high – it can vary from a quarter to more than 60 percent with an occasional dip. (Graph 14: Dieselized air in Kolkata).

In fact, another 2005 study on respirable particulate matter emissions within the Kolkata Metropolitan Area carried out by the Georgia Institute of Technology and supported by the Asian Development Bank[xxi] showed very high contribution of diesel vehicles to PM2.5 – as much as 36 percent. This is more than the individual contribution by other sources including bio mass burning, road dust and coal burning in the city. (Table 2: Percent contributions of sources to PM2.5 in Kolkata). This is certainly a very strong concern given the high toxicity of diesel emissions.

The same study[xxii] found very high contribution of diesel buses and trucks – 47 percent and 16 per cent respectively from vehicular sources to the respirable particulate matter (Graph 15: vehicle emission inventory results, 2003). Large diesel buses are the most significant source of diesel emissions within the Kolkata Metropolitan Area. Visible emissions from these old vehicles are a major source of public complaint. [xxiii] Large and small buses are also a principal source of NOx. On the other hand, the two-stroke powered two wheelers are the strongest source of carbon monoxide and hydrocarbon amongst all vehicle segments.

Moreover, the toxic emissions from diesel vehicles are a major concern in the city and according to WBPCB chief scientist the diesel vehicles are to be blamed for particulates (carbon soot), nitrogen oxides, toxic hydrocarbons (3-nitrobenzanthrone, 1,8-dinitropyrene etc.). These are making our breathe toxic.

Graph 14: Dieselized air in Kolkata



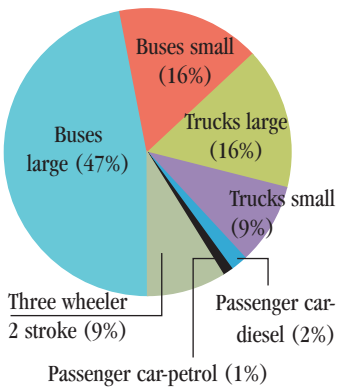
Source: Anon 2004, Towards cleaner urban air in south Asia: tackling transport pollution, understanding sources, Energy Sector Management Assistance Programme of United Nations Development Programme and World Bank, p 71

Table 2: Percent contributions of sources to $PM_{2.5}$ in Kolkata

Season	Diesel vehicles	Gasoline vehicles	Road dust	Coal burning	Biomass burning	Sec. SO_4	Sec. NO_3	Sec. NH_4
Spring	24	11	28	4	19	15	2	3
Summer	61	8	21	1	24	10	3	1
Autumn	43	21	7	5	32	8	1	2
Winter	15	9	5	13	17	4	3	3
Average	36	12	15	6	23	9	2	2

Note: Source apportionment studies were conducted between March 2001 and January 2002 in Kolkata by Georgia Institute of Technology. Twenty samples of the PM2.5 (only) fraction with an average mass concentration of 108 g/m3 were used to estimate seasonal average source contributions.
Source: Anon 2005, Final Report Volume V: Air Quality Management, Component E : Strengthening Environmental Management at West Bengal Pollution Control Board

Graph 15: Vehicle emission inventory results, 2003



Source: Asian Development Bank, 2005, Strengthening Environmental Management at the State Level (Cluster), Component E-Strengthening Environmental Management at West Bengal Pollution Control Board, Final Report Volume V Air Quality Management, TA No. 3423 – IND

Ill maintained old diesel vehicles are also a special problem in the city. Until the recent phase out of the pre-1993 vehicles the average age of the quarter of the large diesel trucks was over 30 years as there was little turnover in the fleet.[xxiv] However, following the High Court order many old commercial vehicles have been phased out in 2009 with some air quality benefits (See Box: Impact of phase out of old vehicles on air quality). But diesel vehicles still remain a concern in the city as the car segment is also dieselizing rapidly. In fact, the average age of passenger cars within the metropolitan region is about 10 years. The share of new car sales is also close to 40 percent. It also has a very large fleet of diesel taxis.

Kolkata is in grip of diesel. Global evidences show that there are serious health concerns over conventional diesel quality. According to the WHO and other international regulatory and scientific agencies diesel particulates are carcinogens. Studies in Europe show even at the level of Bharat Stage III and IV the cancer potency of diesel emissions remains higher than the petrol emissions. Diesel particulate matter has been specially branded as probable human carcinogen. Other health end points have also been associated with exposure to diesel emissions. Other global governments use unit risk factors (the number of excess cancer cases per million people per microgramme per cubic meter concentration of toxic air contaminants over a 70 year period) that are assigned to different toxins to indicate the relative toxic risks of pollutants. Accordingly, the unit risk factor for diesel particulate matter is 300 which overpowers other deadly toxics. Unit risk factor of one of the most strong toxic 1,3-Butadiene is 170. Kolkata needs to be careful and preventive as it is known to have high lung cancer incidence.

The current Bharat stage IV standards that were enforced in 2010 in Kolkata are also not adequate to address the toxic risk from dieselization. These standards legally allow diesel cars to emit more particulates and nitrogen oxides which are the key cause of concern in Kolkata. The diesel emissions also continue to remain more toxic (see graph 17: Legal license to emit more PM and NOx. Also more toxic).

Set the timeline for introduction of Euro V and VI emissions standards: The state government needs to demand from the central government early introduction of Euro V and Euro VI vehicles to reduce the impact of motorisation. The current norm of Bharat Stage IV is more than six years behind Europe. The central government has not yet set the timeline for the next stage of emissions standards. This decision must be taken urgently to reduce the time lag and bring clean technology to the city.

Diesel emissions control strategies: Kolkata requires urgent roadmap to

Phasing out of old commercial vehicles in Kolkata

July 31, 2009 was the phase out deadline of all pre-1993 commercial vehicles plying in Kolkata. This was also the last date for replacement of two-stroke and non-LPG four-stroke autorickshaws to four-stroke LPG autorickshaws. The Calcutta High Court had on July 18, 2008 set a December 31, 2008, deadline for phasing out of polluting two-stroke autos and to ensure that only four-stroke autos on clean fuel operate. It had also directed phase out of 15 year old commercial vehicles by March 31, 2009. These deadlines were extended to July 31, 2009 following a plea of the state government.

There was strong resistance to the order. In order to get reprieve from the High Court, the Bengal Bus Syndicate, an association of bus operators in the state approached the Court seeking extension of the July 31 phase out deadline. But the High Court on July 21 rejected their application observing that the right of citizens to breathe pollution free air is supreme. Thereafter, the state transport operators association filed a petition in the Supreme Court seeking a stay on the High Court order. The chief justice bench of the Supreme Court also refused to grant the interim stay.

High Court's order implemented: In accordance with the court order, the state government commenced its drive to phase out commercial vehicles older than 15 years. The police was out to seize pre-1993 vehicles found plying on the roads. Two-stroke autos were kept off the roads. Only few green autos were seen plying. Nearly 85 per cent of the taxis that came under the ban had already applied for replacement. Remaining 1,000 taxis did not ply. The bus operators also kept their 15 year old buses off the roads.

Scheme for replacement of pre-1993 commercial vehicles:

The state government announced fiscal scheme to cushion the cost of the maker over.

- **Taxis:** The government gave a subsidy of Rs 20,000. The rest, about Rs 3.2 had to come as a loan from the banks. The Hindustan Motors Limited also gave Rs 45,000 as scrap value.
- **Buses:** Bus replacement was linked with the JNNURM stimulus scheme for buses. In a meeting with bus owners' organisations and trade unions, the former transport minister of West Bengal had promised a package from the Rs.4,000 crore fund that the state government had received under the JNNURM programme. Accordingly, the government would provide 35 percent of the bus price or around Rs. 60,000 as subsidy. The bus owners would bear 15 per cent of the expenses. The remaining amount would be taken as loan.

Implementation glitches: On the first day of the ban, the officials impounded one auto, three taxis and one private bus. As expected, there were reports of protesters damaging two state transport corporation run buses. Auto owners called a strike during the day. Eventually, realizing there is no way out, bus operators decided not to ply pre-1993 vehicles. The Bengal Mini Bus Owners Syndicate informed that nearly 70 per cent of the old vehicles were already off the roads.

Special problem of two-stroke engines: The city faced a dilemma about phasing out of the two-stroke engines powered three-wheelers. Initially there were attempts to make the post-2000 two stroke autos survive by converting them to LPG. The state government announced on August 2, 2009 that the nine year old two-stroke auto-rickshaws could be allowed to ply if they were converted to LPG. Out of 70,000 two-stroke autos, that were banned under the High Court order, an estimated 10,000-plus were registered after the year 2000.

The chief justice bench on August 27, 2009 expressed displeasure over the state government's circular allowing conversion of post-2000 two-stroke autos to single-mode LPG through retrofitment after the ban on polluting vehicles came into effect. The circular was contrary to the order of July 18, 2008, wherein the court had directed replacement with four-stroke engines and single-mode LPG operated vehicles. Striking down the government circular, the bench stated, 'There shall be no deviation from the court's order dated July 18, 2008, to phase out polluting vehicles. The government notification (allowing two-stroke autos less than nine years old to convert to LPG and stay on the road) stands cancelled'. Reacting to the plea of the auto operators counsel that owners and drivers were starving because of the ban and the deadline be extended till the festive season, the High Court bench observed that one hand there was starvation and on the other death due to pollution. The chief justice also warned the state not to issue such circulars in future.

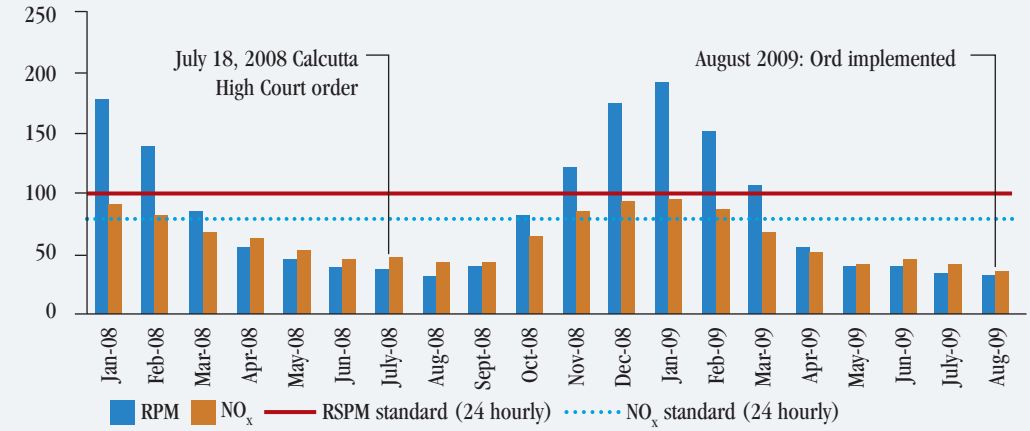
In the meantime, there were reports that hundreds of two-stroke autos had infiltrated south Kolkata and the northern fringes, particularly Shyambazar, Dunlop and Ariadaha and the Chetla-Behala route and most of these were plying late in the evening, when vigil was relaxed. This might have contributed to a marginal increase in pollution levels.

Subhas Datta, environment activist and petitioner of the case welcomed the phase out drive of the state government though he was not happy with the implementation of the order initially.

Drop in air pollution levels: The phasing out of old vehicles resulted in significant air quality gains immediately. The air quality data available from the state pollution control board shows drop in the air pollution levels immediately after the phase out. In August 2009, when the court order was implemented, the city recorded lowest respirable particulate matter and NOx levels. The levels were lower than previous year's levels. (See graph 16: Impact of old vehicle phase out on the air quality of Kolkata).

According to a study done by Saviour and Friend of Environment (SAFE), a city based organization, the first four days of the month had the cleanest air the city has seen in decades.

See graph 16: Impact of old vehicle phase out on the air quality of Kolkata



Source: West Bengal State Pollution Control Board

control diesel emissions and introduce clean diesel. It can mitigate the toxic diesel emissions only if diesel fuel quality and vehicle technology meet the international benchmark for clean diesel. This would require diesel fuel with sulphur content as low as 10 ppm sulphur that can allow use of advance particulate traps and NOx control strategies to drastically cut the harmful emissions. The current level of fuel sulphur in Bharat Stage IV vehicles is not conducive for that kind of application. Fuel sulphur reduces the conversion efficiency of all emissions control systems. Also fuel sulphur contributes linearly towards formation of particulates. Also very soon new diesel buses will come equipped with advance NOx control systems like exhaust gas recirculation, selective catalytic cracking (SCC) etc. Even these will also perform better with clean fuels. Therefore, it is important that the state government urgently introduces clean diesel fuel and technology in the entire metropolitan area.

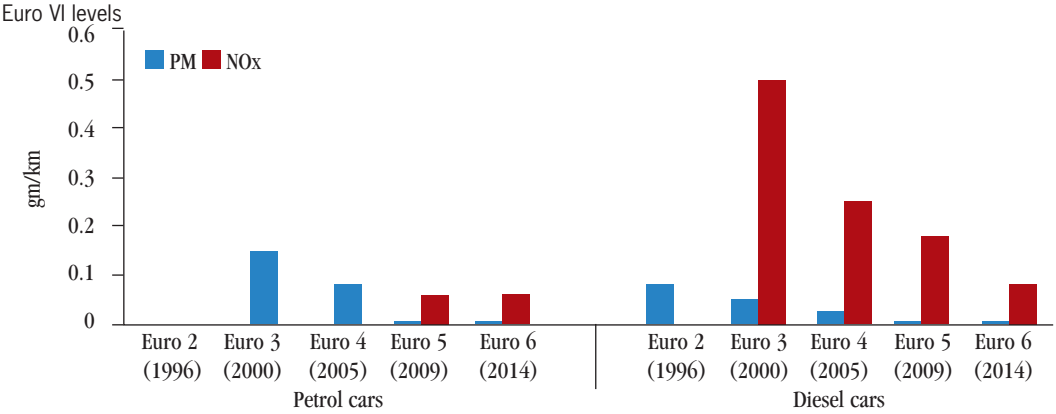
Control dieselization of car segment through a taxation strategy: Even at a national level it may take a while to rationalize the prices and taxes of diesel and petrol fuels to remove the yawning price differential between the two fuels. But this will continue to fan the increase the share of diesel cars in the city as elsewhere. On a nation-wide scale diesel cars are already close to 40 per cent of the new car sales and is expected to be half soon. As a local strategy it is important to rationalize vehicle related taxes to increase the tax on diesel cars. Tax the end use of diesel in cars high. Currently, under priced and under taxed diesel acts as a subsidy for the diesel car owners. This should be recovered from them through higher taxes on diesel car. Both petrol car and two-wheeler owner pay higher price for a litre of petrol than a diesel car and a SUV owner in Kolkata. The Kirit Parikh Committee report of 2010 done under the aegis of the Ministry of petroleum and natural gas has already recommended a similar strategy. Delhi government has also recently hiked the road tax on diesel cars. Kolkata also needs to consider these measures to reduce the toxic risk.

Retrofitment of diesel vehicles: There are already discussions in the city as well as at the national government level to retrofit in-use diesel buses with particulate traps to reduce particle emissions. But the city will have to approach this with caution. India is not yet prepared either with appropriate fuels or regulations for a good retrofitment programme. This will require commercial availability of clean diesel (10 ppm sulphur diesel). If emissions control devices are used with high sulphur fuels these will get damaged irreversibly and emissions will skyrocket to uncontrolled levels. Even the performance of the more sulphur tolerant devices can reduce significantly. Other countries that have implemented retrofitment

Graph 17: Legal license to emit more PM and NOx. Also more toxic

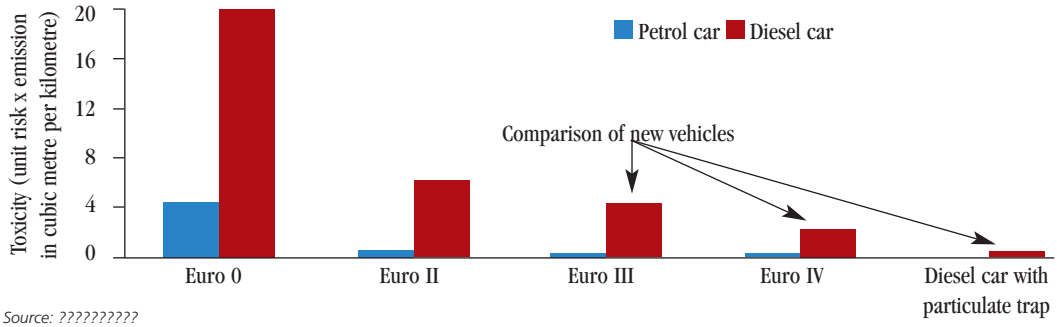
Comparison of PM and NOx emissions standards for petrol cars and diesel cars.

Diesel cars allowed to emit more PM and NOx: the pollutants of concern in our cities. They are comparable only at Euro VI levels



Toxic profile of diesel and petrol cars meeting Euro norms

A comparison of toxicity of emissions from diesel and petrol passenger cars meeting different norms in urban traffic



Source: ?????????

programmes have also enacted elaborate laws to set emissions reduction targets, ensure that the vehicles fitted with exhaust aftertreatment devices are of good quality and they retain their efficiency on road. Poorly regulated market can undermine the quality of the programme and its effectiveness. A strong certification system and durability conditions along with on-road checks and monitoring are needed for such a programme. Old vehicles with excessive fuel and oil consumption, and other engineering constraints may not have the favourable operating environment needed for optimum and durable performance of the emissions control devices. Cities will need very strong enforcement capacity for such programmes.

Regulatory preparedness for new diesel technologies: The future emissions control systems will become increasingly more complex and these will require strong enforcement capacity and monitoring to ensure these are working on road and the real world emissions are low. Improve inspection and monitoring system and in-use compliance regulations to ensure that the vehicles remain low emitting during their lifetime. New diesel buses will come with a new genre of emissions control technology including particulate traps for particulate control, selective catalytic reduction (SCR) for NOx control in diesel vehicles etc. Their in-use performance and monitoring will be of paramount importance to maintain the clean emissions. Cities like Kolkata that have already introduced Bharat Stage IV will be first targeted to introduce buses with SCR technology for NOx control. For instance, Bangalore has already done so. This will require more sophisticated monitoring system. These buses will need regular urea refill and extensive urea delivery infrastructure in the city. But Kolkata must first assess the actual emissions performance SCR-equipped vehicles before they are introduced. These buses may have significant off-cycle and unregulated emissions, improper urea dosing, catalyst poisoning, and the formation of catalytic byproducts like ammonia sulfate, that are very

harmful. This will require assessment and monitoring. Inspection systems will have to integrate on board monitors. Emissions regulations will need to include limit values for ammonia slip. The new roadmap will have to address these issues. The city must be prepared with the regulatory systems before these technologies are introduced.

Fuel substitution strategy: Kolkata does not have access to CNG. Also the possibility of using coal bed methane for transportation use has not matured. The only alternative fuel that it has access to is LPG. The application of LPG is still limited to small vehicles especially the high mileage autorickshaws. Compression of LPG under low bar pressure in small cylinders makes it very suitable for small vehicles. It is also a very clean fuel that given enormous benefits of particulate emissions reduction. Four stroke autos on LPG is therefore an appropriate choice to address this otherwise polluting segment.

However, this strategy will also require strong safety as well as emissions inspection and maintenance regime at the city level to ensure optimum efficiency and performance. The experience with LPG conversion in Bangalore and Pune has shown that quality control of conversion in autos is important. The city government will have to ensure high degree of safety enforcement and quality control. The kit installation in vehicles can only be done by workshops authorized by the kit manufacturers and suppliers. The city government will have to lay down the technical and legal requirement for the workshops. Workshops will require authorization and accreditation. The city governments will have to carry out periodic audits of these workshops. If the workshop fails to fulfill the requirement its accreditation to convert engines should be withdrawn. Type approval certificate should be recalled in the case of non-compliance. Conversion of agencies should be held liable. LPG needs careful handling as LPG is heavier than air. In case of leakage it cannot disperse fast, it collects and hangs close to the ground and becomes explosive. Safety measures will have to be very stringent in the city.

LPG bus is yet not a reality in India. There are also special concerns regarding the conversion of old diesel buses to LPG. In fact, conversion of old diesel buses to gaseous fuels is not usually recommended. The key reason why diesel engines are not encouraged for LPG/ CNG conversion is that the diesel compression ignition engines are not suitable to run on gaseous fuels. Only spark ignition engines that run on petrol can be adapted to run on LPG or CNG. This makes conversion of big diesel engines very challenging. Diesel vehicles will first have to be changed into spark ignition engines before the LPG kit can be installed. This makes conversion of big vehicles like buses complicated and unsafe. One is never certain whether simple conversion made on old diesel and used engines that have been subjected to a great deal of wear and tear adhere to manufacturers specifications. These can lead to serious emissions and safety problems.

So far in India, bus manufacturers have not produced dedicated LPG buses. Lack of CNG limits the scope of bringing buses within the gaseous fuel programme in Kolkata. It is therefore very important for Kolkata to push hard for clean diesel fuel (with 10 ppm sulphur content) and advanced emissions control systems in vehicles.

Electric vehicle programme: The automobile industry has diversified to electric drive train in small car and three-wheeler segments. This opens up the opportunity to build the para transit system based on zero emissions vehicles. But this will require good infrastructure support for on-street charging of vehicles. The West Bengal Renewable Energy Development Agency (WBREDA) has launched a small electric vehicle programme in

Kolkata city to arrest vehicular emission. WBREDA, in association with West Bengal Surface Transport Corporation is operating a few battery pperated 16 Seaters vehicles in the Kolkata city. The demonstration of battery operated three wheelers is already in operation in Salt Lake City.[xxv] At present ten battery operated three wheelers are operating. It is possible to develop a electric vehicle based taxi and three-wheeler service to feed the public transport system. This programme has a good potential to grow in the city if guided with good regulations and infrastructure support. This will also require a robust battery disposal system.

Need fiscal strategy to accelerate technology improvement: State government should also devise fiscal incentive scheme to help meet the cost of replacement with alternative fuel vehicles. Many innovative schemes are possible. – subsidized loan, easy repayment etc. Cost of this scheme can be recovered from an extra small cess on the diesel fuel sold in the city, or higher taxes on cars and older vehicles. For instance, Delhi imposes an environment cess of 40 paise per litre of diesel sold in the city to create an Air Ambience Fund to finance pollution control measures and conversion to clean fuels.

In-use vehicle programme: Cities will need a clear roadmap for controlling emissions from on-road vehicles. The ongoing practices include phasing out of old vehicles, bypassing of truck traffic from cities, retrofitment of on-road fleet with gaseous fuel, and the vehicle inspection programme including pollution under control certificate. All these strategies will have to be reviewed for effectiveness and integrated for best results.

Reform the pollution under control certificate programme for authentic tests and for credible results and proper enforcement. Both commercial and personal vehicles need to be brought within the folds of stringent I&M and roadworthiness programmes. The PUC centres will require rigorous auditing to ensure credible emissions tests. Kolkata must also introduce lambda tests for petrol cars fitted with three way catalytic converters for which provision has been made in the 2004 notification on PUC norms of the Union Ministry of Road Transport and Highways. This is needed to ensure effective functioning of catalytic converters and keep the cars low emitting.

The city now needs to move towards centralized emissions testing centres with upgraded tests procedures, proper audit system etc. that are capable of organizing a large number of authentic emissions tests. These can be mechanized for high level tests for the new generation vehicles and ensure fair and credible testing. This transition is needed immediately as the small decentralized PUC centres often fall prey to corruption and are not well equipped to deal with the inspection requirement of the new vehicle technologies.

Also Bharat stage IV vehicles will now come equipped with onboard diagnostic system (OBD) for on board monitoring of emissions and performance of the vehicle. India has already introduced the OBD regulations to be implemented from 2013 onwards. These new technologies will require many in-vehicle checks to ensure that new emissions control systems are not compromised. This will have to be integrated with inspection regime. Cities would need to work out the institutional and technical facilities for its implementation. Many of these tests cannot be done within the technical capacity of the of decentralised PUC centres. Cities will have to set up more advanced testing facilities and portable emissions measurement system.

Kolkata in fact has the unique experience of organising loaded mode emissions testing for three wheelers on chassis dynanometer. This should be leveraged to upgrade and upscale the vehicle insepction programme in the city to keep the in-use fleet low emitting.

04

MOBILITY CRISIS

Cities running to stand still

Even before Kolkata could curb its pollution problem, it has fallen in the pincer grip of mobility crisis. Steadily a large part of daily travel trips are shifting to personal vehicles that occupy more road space, pollute more, guzzle more oil, and push out walkers, bicycles, buses and intermediate public transport. There are clear signs of this crisis in Kolkata.

Peak hour journey speed in most arterial roads is falling. Traffic volume has exceeded the optimum designed capacity of the roads. Despite having comparatively smaller number of vehicles its congestion index is comparable to the other mega cities with much more vehicles. Kolkata can become unliveable if more vehicles begin to crowd its roads.

Kolkata has little over one million vehicles in contrast to 6.4 million registered vehicles in Delhi. But Kolkata must draw lessons from Delhi's predicament. Delhi with much bigger road network has worse congestion. Clearly, more roads are not the answer for Kolkata.

Personal vehicles – cars and two-wheelers — meet a miniscule amount of travel demand in the city – only 12 percent. In contrast, walking and cycling constitute 30 per cent of the daily trips. Clearly, building more roads for cars will not help.

City mobility plan has targeted to achieve 90 percent public transport share by 2025. But this needs clear blueprint for action that is legally enforceable.

- **Traffic volume count survey shows that 65 per cent of the arterial roads in the Kolkata Metropolitan Area are congested that do not meet the performance benchmark for level of services.**

- **Cars and two-wheelers together are more than 80 percent of the traffic but they carry 12 per cent of the trips. But buses that are 2 per cent of the vehicles carry 54 per cent of the travel trips.**

- **If public transport is combined with intermediate transport and walking the total share is as high as 88 per cent. This is highest among the key mega cities of the country. This needs to be protected and nurtured.**

- **Surveys conducted in the city have shown that share of households owning bicycles are steadily declining, but household ownership of cars is increasing steadily.**

- **In Kolkata the cars and two wheelers together use up about 40 per cent of the total energy consumption of the city's road transport. The oil consumption is expected to increase three times by 2030 with largest increase from four wheelers.**

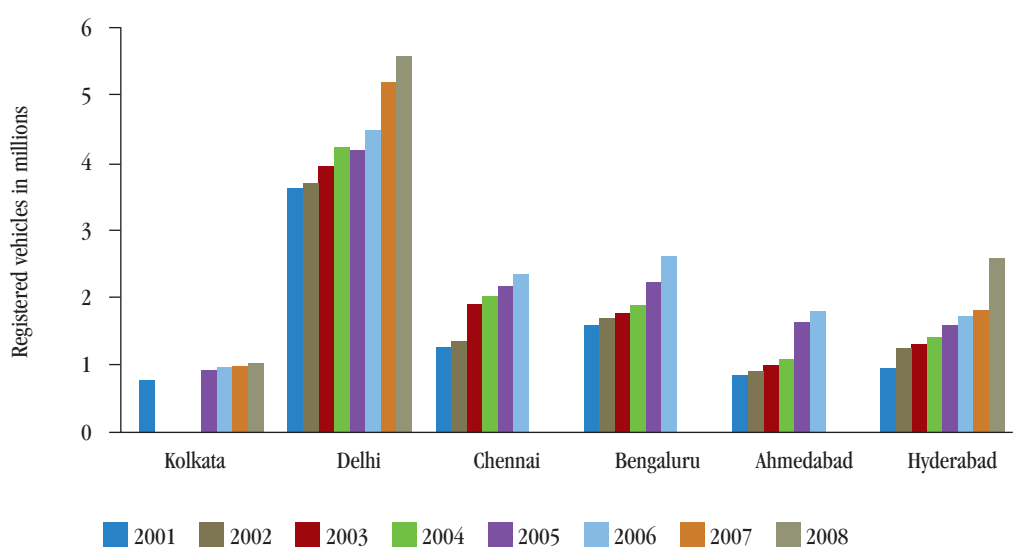
MOBILITY CRISIS HITS KOLKATA

Mobility crisis begins to build up in a city when a large share of daily trips is made by personal vehicles that occupy more road space but carry fewer people, pollute more, use more fuels and edge out walkers, bicycles, buses and intermediate public transport. There are sure signs of this crisis in Kolkata.

Dependence on personal vehicles rising: Kolkata has a clear advantage over other mega cities. It is very uniquely positioned. Compared to other mega cities the overall vehicle ownership is still very small (Graph 18: Vehicle registration in selected cities). This city has more than 1 million registered vehicles. But the definite trend towards increased car ownership is also sharp. Cars have recorded higher growth rate than two wheelers between 2001 and 2008 — 5.4 per cent 4.3 per cent respectively. Cars will dominate future rate of motorisation. The share of two-wheelers and cars are closing gaps. Two wheelers are about 44 percent of the fleet while cars are 39 per cent. Each new batch of vehicles though a little cleaner barely makes an impact on air quality as its rising volumes swamp the effect. This will change the pollution and congestion profile of the city in the coming years. Kolkata has a chance to take preventive action.

Restricted infrastructure limits car ownership: While income profile of the city and the lifestyle changes have a lot to do with car ownership, it is also true that the extent and nature of car infrastructure influences the car ownership. Kolkata is a very closely knit and densely built city. This has limited the amount of land area that can be put under roads and parking. The city has about 6 per cent of its land area under road network. This is in sharp contrast to 21 per cent in Delhi and 17 per cent in Mumbai. A great

Graph 18: Vehicle registration in selected cities



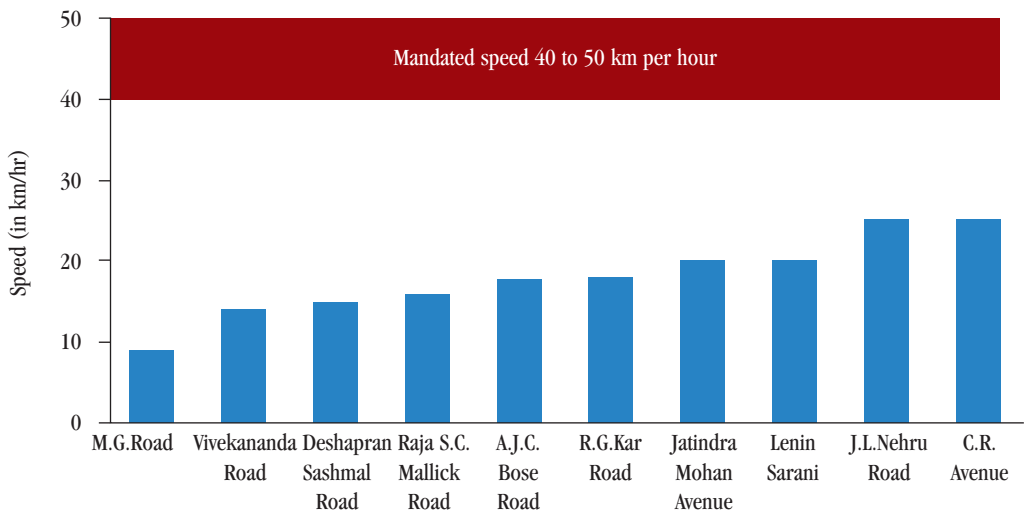
Source: Compiled from statistics by transport departments and Road transport year books of Ministry of road transport and highways, Delhi

part of Kolkata is also limited in terms of parking spaces. This is very similar to the experience of Hong Kong that is also limited in road and parking spaces. This has helped Hong Kong to push for alternative transport – public transport. This is the advantage that kolkata has.

Gridlocked: Given its typical urban form the city even with much smaller number of vehicles is gridlocked. Growing congestion is slowing down of peak hour traffic. The average speed in Kolkata has plummeted to 20 km/hour in more than 70 per cent of roads – even slower at some stretches. About 13 per cent of the total arterial roads in Kolkata Metropolitan Area are observed to have travel speed of more than 25 km per hour.[xxvi]According to the study carried out by the Wilbur Smith for the Union Ministry of Urban Development in 2008 the peak hour average journey speed in Kolkata is 18 km/hr which is as bad as Hyderabad, Chennai and Bangalore. Delhi and Mumbai are worse — at 16 km/hr. Studies also report that the traffic volume is on the verge of exceeding the designed capacity of many roads. Growing traffic will further slow down the journey speed.

Volume count survey shows that 65 per cent of the arterial roads in the Kolkata Metropolitan Area are congested that have a V/C ratio of more than 0.8, which does not meet the performance benchmark of Level of Services. Further assessment of road network in the city shows that the average road width for 4 lanes is 14 meters of which 3 meters on each side are being used for on-street parking leaving only 8 meters for vehicular traffic. [xxvii] According to Wilbur Smith report the congestion index in the city is comparable to that of Chennai, Bangalore and Hyderabad even though those cities have more road space. (See Graph 19: Peak hour traffic speed in selected cities). Definitely, increasing the road space further is not the answer but managing travel of 'people' rather than 'vehicles' can bring the change to reduce congestion.

Graph 19: Peak hour traffic speed in selected cities



Source: Based on Anon 2008, Comprehensive Mobility Plan, Kolkata Metropolitan Area, Infrastructure Development Finance Company Ltd., Superior Global Infrastructure Consulting Pvt Ltd., August

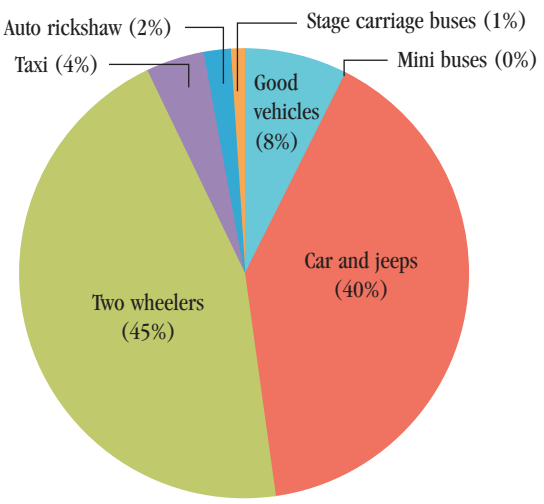
How people travel in Kolkata: The strength of Kolkata lies in its strong 'public transport travel culture'. People of all economic classes use public transport more than private vehicles. The key policy message stems from the fact that cars and two-wheelers are as much as 85 per cent of the vehicle fleet but they together carry less than 12 per cent of the trips. Cars

meet a miniscule of 8 per cent of the travel needs of the city. But buses that are 2 per cent of the vehicles carry 54 per cent of the travel trips.

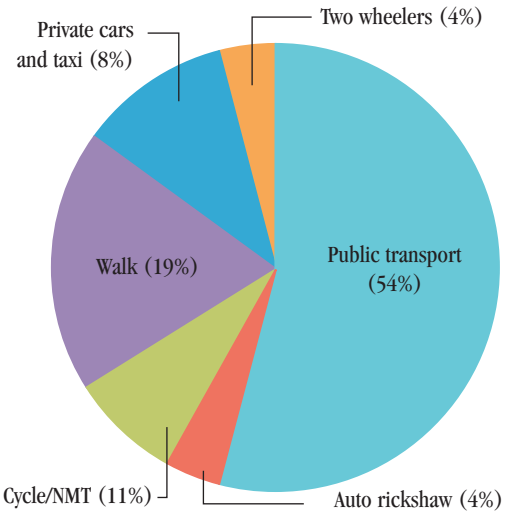
It is encouraging to note that the Comprehensive Mobility Plan prepared for the city has set a target of increasing the public transport ridership to 90 per cent of by 2025. But the city certainly needs a clear blue print and an enforceable legal mandate to achieve this goal. (Graph 20: The strength in public transport usage). The Comprehensive Mobility Plan for Kolkata

Graph 20: The strength in public transport usage
Cars and two-wheelers dominate the traffic but meet very small travel demand

Share of vehicle by categories in the total fleet
Cars and two-wheelers are 85 per cent of the fleet



Modal share of different modes of transport
But cars and two-wheelers meet only



Source: West Bengal Statistical Handbook
Source: Anon 2008, Study on traffic and transportation policies and strategies in urban areas in India, Ministry of Urban Development, Wilbur Smith Associates, May

states "This culture of public transport needs to be promoted further by improvising this mode of travel by providing better infrastructure and services in terms of frequency."

Kolkata is more advantageously positioned than the other big cities of India. The modal share of bus transport at 54 per cent is the highest

Esplanade Tram Terminus is reputed to be the busiest in Kolkata

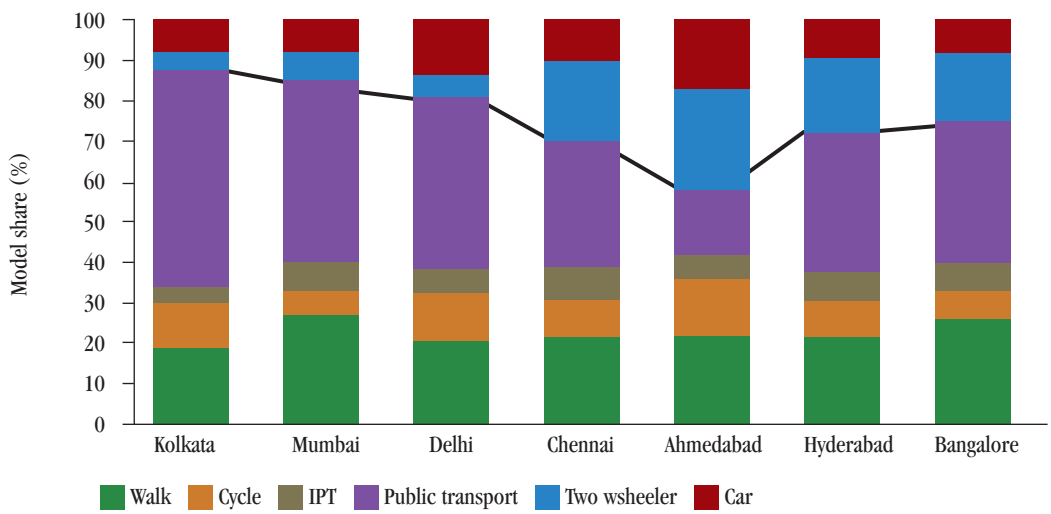
amongst cities. (See Graph 21: Overwhelming use of public transport in Kolkata). If public transport is combined with intermediate transport and walking the total share is as high as 88 per cent. This is highest among the key mega cities of the country. This is an overwhelming strength that the city needs to be proud of. This presents an enormous opportunity to keep the growth path clean, preventive and low carbon. This strength should not be neglected as a sign of underdevelopment.

Non-motorized transport neglected: Unfortunately, Kolkata is not conscious of its strength. Bicycles and cycle rickshaws – zero emissions mode of transport — have not found support in the city. Their share is steadily declining to make way for motorized transport. The policy perception is that non-motorised transport makes roads unsafe and cause congestion. These are being blamed for slow traffic.

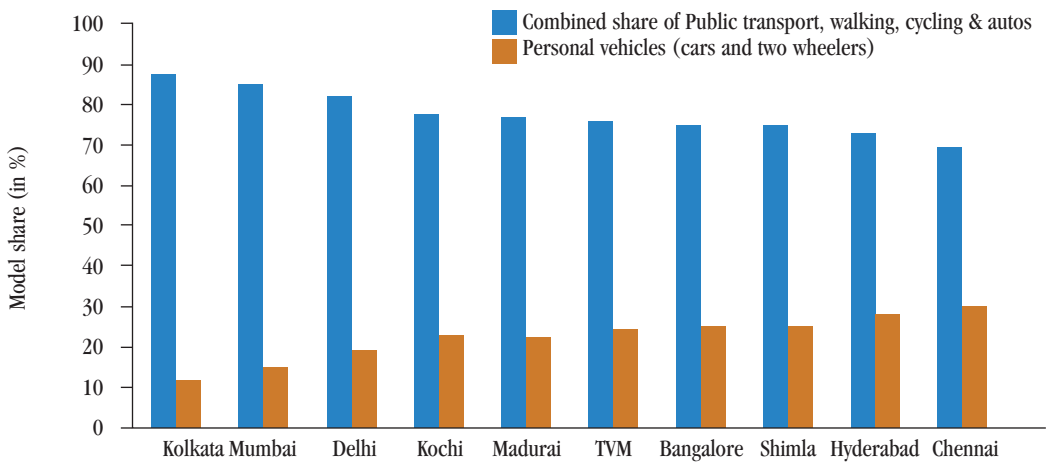
The Kolkata Police has issued a notification in 2008 to ban bicycles on 38

Graph 21: Overwhelming use of public transport in Kolkata

Understand Kolkata's strength -- Modal Share in Key Indian cities



Modal share in selected cities – Kolkata a winner in terms of total share of Public transport, IPT, walking and cycling

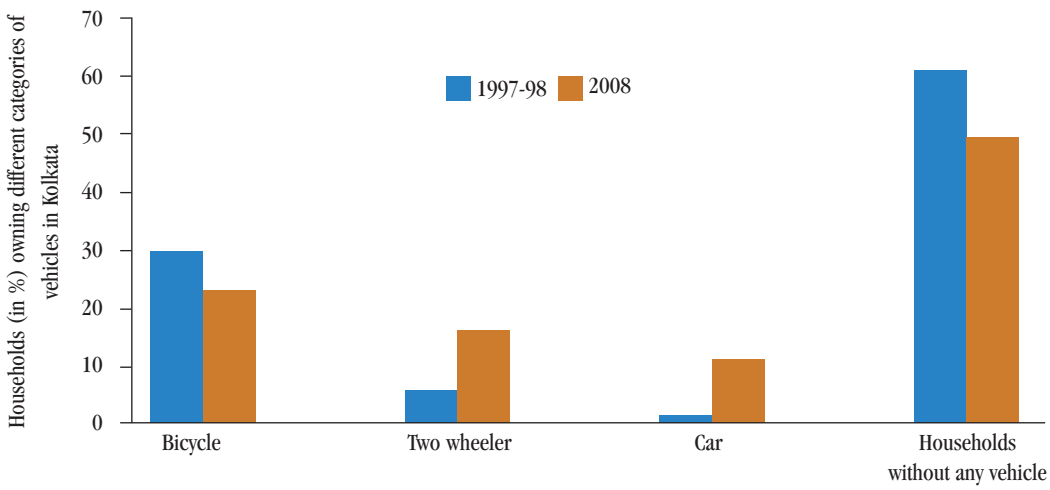


Source Beased on data available in the study -- Anon 2008, Study on traffic and transportation policies and strategies in urban areas in India, Ministry of Urban Development, Wilbur Smith Associates, May

roads to 'provide safe, uninterrupted movement of vehicular traffic'. This order states "no bicycle shall ply or remain even standing between 09.00 hrs and 19.00 hrs on all days". Bicycle ownership is steadily declining in the city whereas car ownership is increasing. There has not been any investment in bicycle infrastructure.

Surveys conducted in the city have shown that share of households owning bicycles are steadily declining, but household ownership of cars is increasing steadily. (See graph 22: Bicycle ownership fall coincides with sharp increase in car ownership). Growing dependence of personal vehicles is eroding non-motorised trips. It is ironical that while globally the industrialized cities are trying to bring back bicycles Indian cities even with a rich legacy of non-motorised transport are letting it decay. Copenhagen today has more bicycles than cars.

Graph 22: Bicycle ownership fall coincides with sharp increase in car ownership
Households owning cars is increasing. Bicycles are the victims



Sources: CSE compilation from the following sources
1. For 1997-98 data: Kolkata City Development Plan: Chapter on City Assessment: Analysis of The Existing Situation, page I-62
2. For 2008 data: Anon 2008, Comprehensive Mobility Plan, Kolkata Metropolitan Area, Infrastructure Development Finance Company Ltd., Superior Global Infrastructure Consulting Pvt Ltd., August

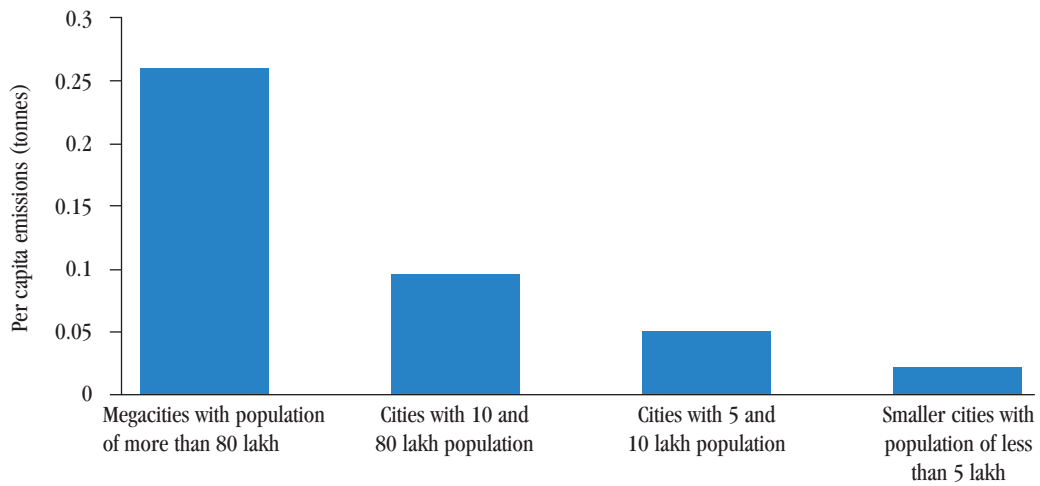
VEHICLES THREATEN ENERGY SECURITY

Widely different concerns have centred around vehicles and mobility – public health, energy guzzling and climate impacts. Even before the city could deal with public health impacts of toxic air, energy security and global warming imprints of transport have added to the complexity. Cities like Kolkata with high particulate emissions that are life threatening are also experiencing steady rise in carbon dioxide emissions that are heat trapping. This multiple burden of risks demands aggressive policy response, especially to protect the vulnerable in our cities.

Cities remain oblivious to the insidious link between motorisation and energy guzzling. At a time when energy security and climate change have taken the centre stage in national policies, the energy fallout of motorisation in cities will come under scanner. It is only the grassroot action in cities that can stave off the transport related energy crisis and help to strengthen climate mitigation action.

Bigger cities that have longer travel distances and also a much larger share of personal vehicles guzzle more fuels. Smaller cities with much less motorsied vehicles use less fuels. This shows up in the difference in per capita emissions of carbon dioxide – a warming gas that is directly related to the amount of fuel burnt — between big and small cities. (See Graph 23: Per capita CO_2 emissions vary according to the size of the city).

Graph 23: Per capita CO_2 emissions vary according to the size of the city



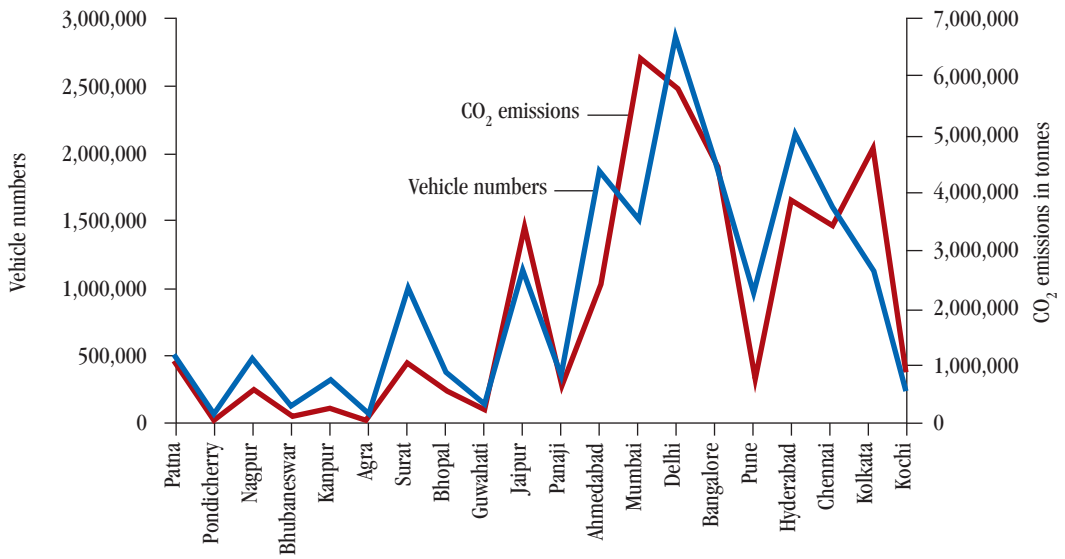
Source Based on Wilbur Smith

Predictably, cities with larger share of vehicle also have higher CO_2 emissions. (Graph 24: Vehicle of rich creates the heat trap). Smaller cities with small vehicle fleet show lower CO_2 emissions.

Motorisation will make Indian cities as well as the country more energy insecure. International Energy Agency has predicted that the future increase in energy demand in the transport sector of India will be largely driven by the increase in personal cars. Asian Development Bank has predicted that transport energy use will increase six times by 2020. This is ominous in a country where 80 per cent of the crude oil is imported. Energy imprint of motorization will have to be reduced in each city. Indian cities have the chance to plan their mobility differently and avert the oil guzzling.

Kolkata represents the same dilemma and challenge. There is little

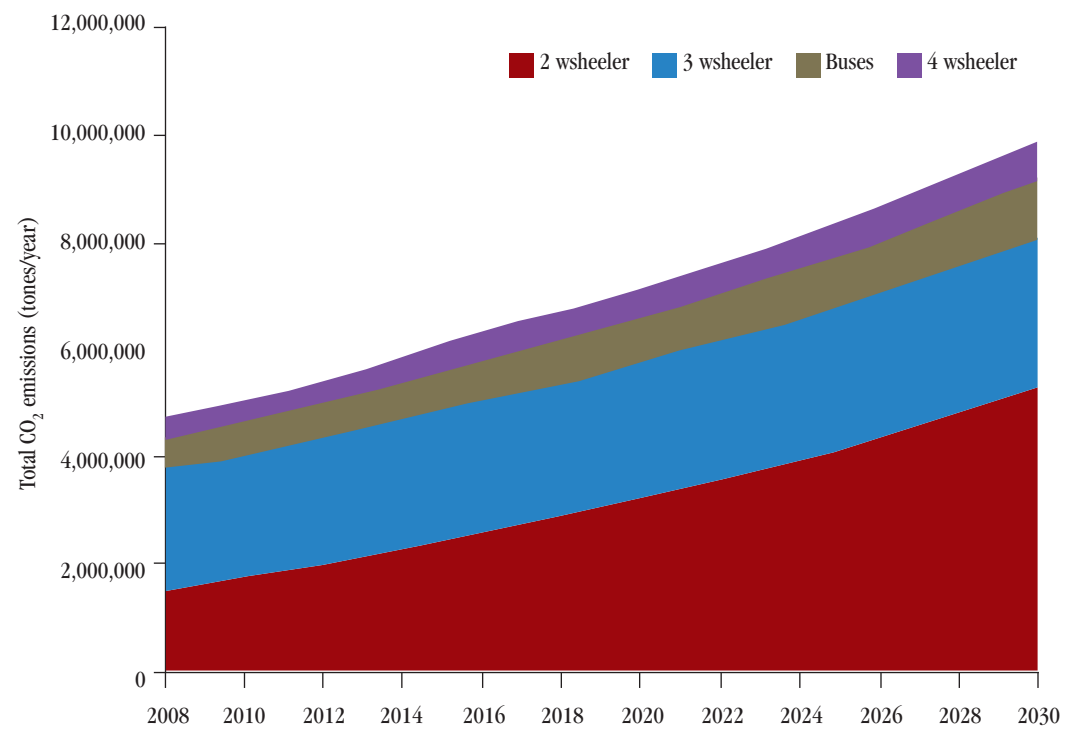
Graph 24: Vehicle of rich creates the heat trap



Source Centre for Science and Environment, 2010

information on the actual transport fuel consumption in the city. However, available studies show that in Kolkata the cars and two wheelers together already use up about 40 per cent of the total energy consumption of the city's road transport. If the dependence on personal vehicles continues to increase the oil consumption will increase three times by 2030 with largest increase from four wheelers. The total transport energy consumption in Kolkata is about 1.6 MTOE in 2008 which is about 60 per cent of that of Delhi. This has been borne out by the SIM Air study of 2009. (See Graph 25: Total vehicular CO_2 emissions by categories in Kolkata).

Graph 25: Total vehicular CO_2 emissions by categories in Kolkata



Source: SIM Air

If energy use increases the emissions of heat trapping carbon dioxide that cause global warming will also increase. The SIM Air study projections for 2030 shows that the transport related CO_2 emissions will increase substantially from four wheelers – as much as 3 times in Kolkata. This essentially bears out that the city will bear high energy costs as well as high environmental costs on account of luxury consumption of cars.

WAY AHEAD ON TRANSPORT ENERGY USAGE

Composite strategies are needed to reduce both local air pollution as well as transportation energy usage and the warming impacts of motorisation. The principle of co-benefits will have to be built into all the strategies needed. The city needs to focus on the key priority action for public transportation, travel demand management strategies, and funding approaches that in combination can make the most effective impact.

Both national as well as state level policies have a role in energy management of transportation. The national fuel economy standards for cars are in the making and should be implemented at the earliest to make the new fleet more fuel efficient. At the same time there is need for strong local action to change the travel pattern in cities to reduce dependence on personal vehicles.

At the city level scaling up of public transport including bus transport modernization, and improving walking and cycling will be critical to achieve this goal. But these can enable modal shift only if combined with fiscal strategies and travel demand management measures to shift from personal cars.
Decision on the city design will also be critical to reduce travel distances. Active policies are needed to prevent sprawls and compact city design that enables public transport, walking and cycling trips. Transport infrastructure can lock up enormous carbon and energy if not designed for sustainability.

This report will detail out some of these strategies in the context of Kolkata.

05

PEOPLE WANT CHANGE

Set the terms of action

Centre for Science and Environment has carried out a rapid perception survey in Kolkata. This is part of its ongoing assessment to understand the local perception of the air pollution and mobility problems in the city. People of Kolkata have reflected on the core issues that must be looked into to define the next generation action agenda.

This perception survey is expected to catalyse a conversation in the city on the emerging challenges and solutions. This also provides a good feedback to the policy makers about what people think and want. Public opinion is often not clear and directly evident to the policy makers to be able to make the appropriate policy choices.

Often difficult policy decisions are staved off or avoided in a city as policy makers are not clear about the degree of public support that already exists for pollution control action. In fact, the voice of the urban majority who want change remains muted. This makes countering lobby pressure difficult.

This preliminary survey has brought out the sharp public understanding of the existing problems and the support for action. The evident public opinion is a right prognosis of what ails Kolkata's air, public health and the mobility crisis. Public verdict on the solutions needed in terms of scaling up of public transport, trams, non-motorised transport, and car restraint measures is sharp.

This mirrors public understanding and the need for change. This can enable and support more aggressive policy action.

- **The majority of Kolkata citizens have said air pollution is worsening.There is a strong recognition of public health impacts of air pollution.**

- **Majority of the respondents have said that the incidence of respiratory diseases, asthma, and eye irritation are on the rise.**

- **Many of them have identified congestion as a big problem in the city. Majority thinks that growing demand for parking of vehicles is leading to encroachment of footpaths and open spaces and congestion**

- **There is a thumping support for cycles and cycle rickshaws and the need for space for these vehicles.**

- **There is nearly unanimous support for improved public transport and nearly 60 percent have supported dedicated lanes for buses**

PUBLIC OPINION MATTERS

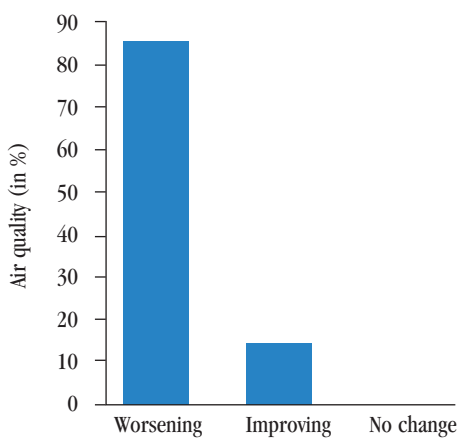
Change is possible only if people of the city demand change. How do people of Kolkata feel about the air pollution and mobility challenges? Centre for Science and Environment has initiated a rapid stakeholders' perception survey in the city. This is part of its ongoing assessment to understand the perception of the air pollution and mobility problems in the city and the emerging solutions.

The questions were grouped to assess their perception of the problem as well as the emerging solutions. The stakeholders were a mixed group of people representing professionals, students, industry, homemakers, and experts.

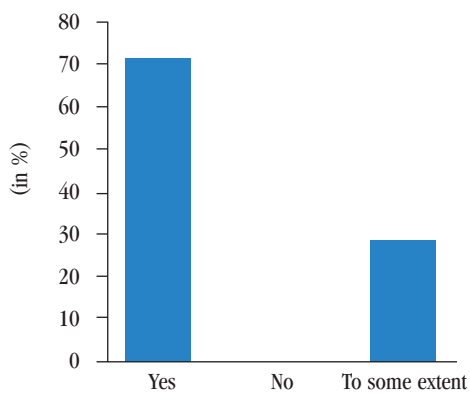
They have reflected on the core issues that must be looked into for making the next generation action agenda. Although the survey is ongoing a preliminary analysis of responses shows the following key highlights (See graphs 26 A-I: People's perception):

Graphs 26 A-I: People's perception

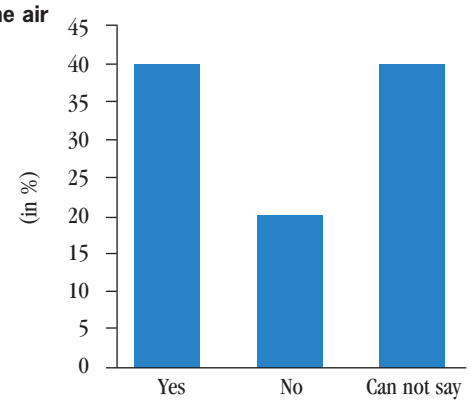
26.A Air quality perception: it's worsening



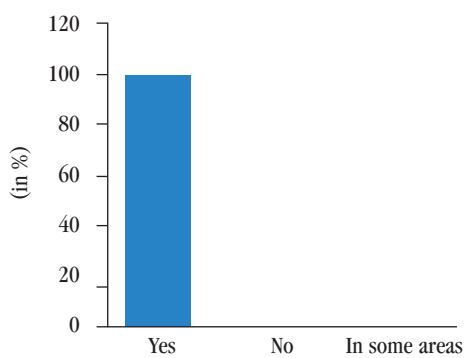
26.B Air quality and health: respiratory diseases are on the rise



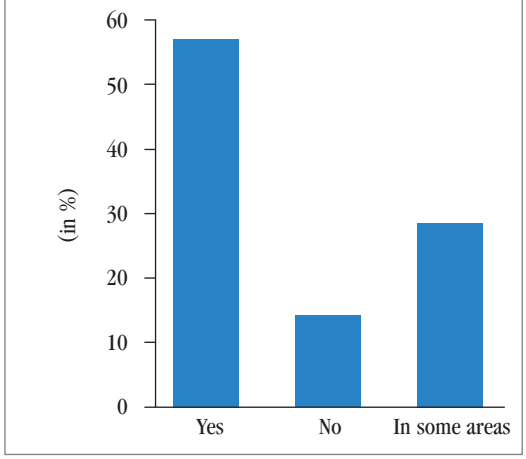
26.C LPG vehicle programme: It is cleaning up the air



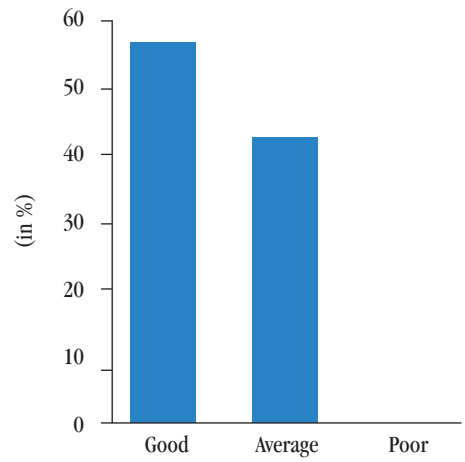
26.D Road congestion: During peak hours it's a big problem



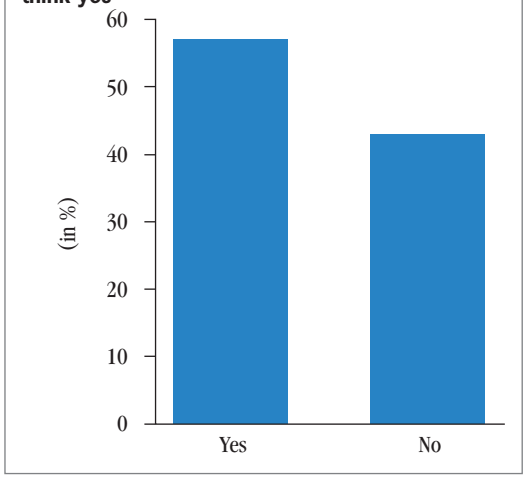
26.E. Cycles and cycle rickshaws: Should be given segregated space



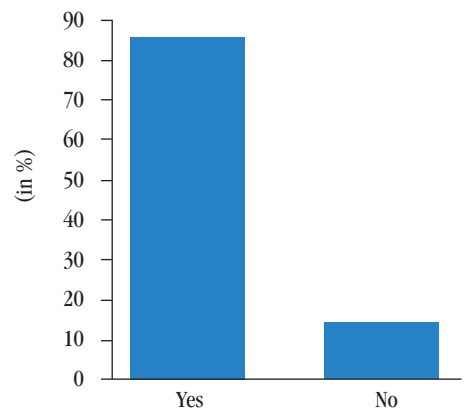
26.F Public transport: Rate the system



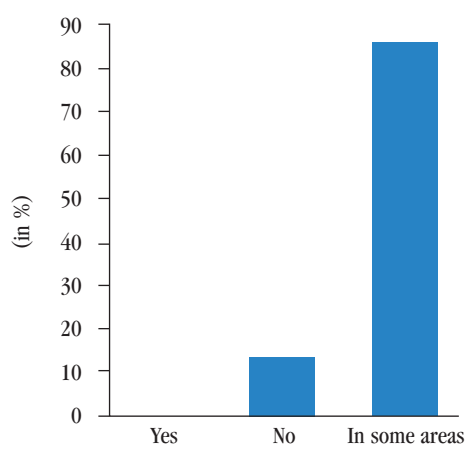
26.G Special dedicated lanes for buses: Majority think yes



26.H Parking eating away public land: Majority think in affirmation



26.I Footpaths: maintained and walkable only in some areas



- **Air pollution is worsening**: The majority – about 80 per cent of respondents have said air pollution is worsening. This is an overwhelming perception in the city.

- **Air pollution related health problems are on the rise**: About 70 per

cent of the respondents have said incidence of respiratory diseases, asthma, eye irritation are on the rise.

- **City is gridlocked**: Most respondents have identified congestion as a big problem in the city

- **Support for non-motorised transport**: About 60% respondents have said that cycles and cycle rickshaws are important and should be given space space

- **Mixed reaction to the state of public transport**: Nearly 60% have rated public transport services as good, 40% have rated city public transport services as average. Rating of the intermediate transports is also similar.

- **Strong demand for improved public transport**: There is nearly unanimous support for improved public transport. Interestingly, nearly 60 percent have supported dedicated lanes for buses

- **Parking blamed for encroachment and congestion**: Nearly 80 percent think that growing demand for parking of vehicles is leading to the problem of encroachment of footpaths and open spaces and congestion.

- **Disenchantment with walking infrastructure**: The majority find the walking infrastructure imepeded and poorly maintained. Respondents say that the footpaths only in some areas in the city are well maintained, clean and walk-able. This needs immediate attention as pedestrian traffic is the strength of the city.

- **Mixed reaction to the LPG programme:** While about 40 percent of the respondents have said that the newly implemented LPG programme has helped to clean up the air, nearly the equal number are not fully clear about its benefits.

Voices of Kolkata

On March 16, 2011 a City Dialogue on Air quality and transportation challenge: An agenda for action was jointly organized by the New Delhi-based research and advocacy organisation, Centre for Science and Environment (CSE) in partnership with the Kolkata Metropolitan Development Authority. The dialogue's focus was the challenge of urban air quality and mobility in Kolkata. The top official brass from kolkata as well as a wide range of city based stakeholders assembled in the public gathering to address the emerging issues related to air quality and transportation. The objective of this joint initiative has been to engage with all the relevant stakeholders and the citizens of the city to build public and policy awareness on clean air and public health as well as urban mobility for a liveable city. This collaborative workshop brought together the key regulators and policy makers from the city, experts, civil society groups and industry representatives who are involved with city governance, air pollution and transportation policies. This was also an opportunity to share the experiences and lessons from Delhi and other cities as well.

Setting the terms of the debate

DEBASHIS SEN, SECRETARY, Urban Development, West Bengal: Need holistic urban planning

"We seldom look beyond the immediate present. When air pollution crisis stares at our face on a daily basis and the threat of cancer effects on our lungs looms large, we rarely react to the crisis of pollution. We do not feel the urgency to act. This needs to change.

In the urban development department we are conducting studies. We are looking at ways to plan and transform our approaches to development. We are trying to devise plans to build our cities in a way that they can cater to the legitimate needs of growth but at the same time meet the environmental goals.

But there are challenges. For instance, we all know that we need to have better facilities for non-motorised transport. When I was in Hudco which has planned the new township in Rajarhaat, I had discussed the need for provisions of cycle tracks in the planning. But planners said that creating such facilities would reduce the amount of saleable plots, and that would impede financing of the township project. All hope of creating such facilities for non-motorised transport in Rajarhaat was lost.

While valuing the cost of land we only consider its immediate financial an economic values. But we do not take the entire gamut of economic, social and environmental benefits to the society. Considering the full range of economic as well as environmental benefits of development is essential for sustainable and clean cities."

R P S KAHLON, SECRETARY, Transport Department, West Bengal: Integrate land-use and transportation plans

We need to plan for accessibility — plan for moving people and goods rather than moving vehicles. Cities today are finding it difficult to provide solutions to off set the impact of rising number of private vehicles. We have to understand peoples' need for travel and how that can be met with environmental friendly clean transport. Demand management strategies are needed, such as increasing the parking fee. Clearly, each city has its strength and unique problems. Kolkata has to build on its strength of high public transport usage and non-motorised means of travel. But it is important that we implement the inter-modal connectivity in the city. In most countries the rapid transit systems such as metro is seen as a solution. But we must assess the travel demand and need and the economic viability of such projects.

We need integrated planning that considers both land-use and transportation needs of the city. Around Kolkata, the new townships and the satellite towns are being planned without paying much attention to transportation needs. We are putting the cart before the horse. Land-use development and transportation solutions are being planned separately. The transport corridors planning have to begin by assessment of the demand and how well they integrate.

VIVEK BHARADWAJ, CEO, Kolkata Metropolitan development Authority: Need coordinated planning

Through the development control regulations we need to ensure that our towns have sustainability feature. Somehow, over the years town planning has not received the kind of attention it needs. We hope

Continue.....

Voices of Kolkata

that West Bengal will have several new towns and with our efforts we will meet the transportation challenges in our cities in a sustainable manner. The Kolkata Metropolitan development Authority is now working on a variety of measures that will have bearing on the sustainability of transportation. We have finalized the parking policy for Kolkata metropolitan region. We are also in the process of finalizing the advertisement policy. The City Mobility Plan is in place. We will have a clear blueprint to build a sustainable city. This will need coordinated action and an integrated approach.

Discussions

City in grip of public health crisis: **DR MANAS RANJAN RAY**, CNCI: Health impact of air pollution in Kolkata:
Chittaranjan National Cancer Research Institute (CNCI) has carried out a cross sectional study with matched controls in Kolkata Metropolitan Area and rural West Bengal. About 1040 adults and 865 children from Kolkata and 632 adults and 552 children in rural areas have participated in this study. The study has revealed severe health impact of air pollution. The impacts range from high prevalence of respiratory illness in citizens of the city compared to the people in rural areas. The findings also indicate high concentration of biomarkers which are defense cells. We noticed lower lung function in about 39 percent of individuals in the city compared to 19 percent in rural area. The studies by CNCI also indicate that air pollution alters immunity, causes hematological changes, it impacts cardiovascular system, increases prevalence of hypertension, causes genotoxicity, and chromosomal damages. Air pollutants trigger changes in the lung cells that can lead to cancer. They trigger production of tissue-degrading enzymes in the lungs, causing chronic obstructive lung disease. They injure air tube walls, obstruct the airway and infect it, reducing lung function. Air pollution also alters the neurotransmitter levels and it is linked with depression as well.

Air quality challenges in Kolkata: **UJJAL MUKHOPADHYAY**, West Bengal Pollution Control Board:
West Bengal State Pollution Control Board operates 18 manual stations throughout the year in the city. The stations are equipped to monitor total suspended particulate matter, respirable particulate matter, sulphur dioxide, and nitrogen oxide. The board's studies have revealed that most particles in the air are less than 3.3 micron. They are about 74 percent of the respirable particles. The smaller particles mostly come from exhausts of automobiles especially diesel driven vehicles. The toxic emission from diesel vehicles includes particulates (carbon soot), nitrogen oxides, toxic hydrocarbons (3 - nitrobenzanthrone, 1,8 - dinitropyrene etc.).

On a global scale particulate matter has a positive correlation with mortality and hospitalization because of respiratory problems. About 40,000 Indians are dying early every year because of air pollution including 7,500 in Delhi, 5,700 in Mumbai and 4,500 in Kolkata and it has been estimated that these deaths can be avoided by reducing PM10 levels. Recent studies of WBPCB show what havoc the poor air quality can cause. The elemental analysis of dusts deposited over leaf from polluted site has shown the presence of toxic elements arsenic (As) and mercury (Hg). Elements detected such as magnesium (Mg), aluminium (Al), silicon (Si), chlorine (Cl), potassium (K), calcium (Ca), iron, nickel (Ni), copper and zinc are component of dusts found over leaf surfaces in polluted sites. The control strategy must include improved transit system among others to reduce the harmful effects of automobile emissions.

Kolkata comprehensive mobility plan: **T K MITRA**, Kolkata Metropolitan Development Authority:
The Ministry of Urban Development has mandated all major cities to prepare City Mobility Plan that is compliant with National Urban Transport Policy (NUTP). The NUTP demands focus on mobility of people rather than vehicles. The priority should be given to public transport, intermediate public transport, integrated land use and transport planning and non-motorised transport and pedestrianisation.

Agenda for improvement of transportation system and air quality in Kolkata Metropolitan Area includes measures such as introduction of bus rapid transit system on selected corridors, improved suburban rail services with higher frequency of train services and higher capacity trains, improved accessibility and dispersal facilities of suburban rail stations, exclusive lanes for bicycles, cycle rickshaws etc. This also includes improving the operation of the tram and metro rail services, conversion of buses and autorickshaws to CNG or LPG, and application of renewable energy options for street lighting. Other

Continue.....

Voices of Kolkata

strategies include traffic operation improvement in congested locations/stretches, widening of existing highways and arterial roads, construction of flyovers, bridges and missing links. Banning of on-street parking, restriction of commercial and slow moving vehicles in peak periods, phasing out old vehicles, enforcing emission standards on all categories of vehicles, improving the public transport services – increasing, the number of routes and area coverage, and induction of vehicles with updated technology.

The long term measures are wide ranging. These include extension of the metrorail, suburban rail and light rail network, construction of highways and arterial roads bypassing the congested and core areas, relocation of wholesale trading centres and railway goods, terminals from the core areas to the periphery, construction of truck terminals near the highway nodes at the periphery, construction of railway dispersal links and lines for passenger as well as goods movement, promote the development of planned new towns and settlement areas as per the metropolitan structure plan to ensure the balanced distribution of population and activities within Kolkata Metropolitan Area.

Parking policy for Kolkata Metropolitan Area: **S DATTA AND P DASGUPTA**, Metropolitan Development Authority:
The comprehensive parking plans by the urban local bodies will detail out the actions to be taken by the concerned authorities. This is needed for i) Provision of adequate off-street parking facilities within the individual premises as well as in the off-street parking lots to meet the increasing demand of various categories of vehicular traffic. ii) Adoption of appropriate development control measures with incentives in F.A.R. to ensure and encourage the generation of off-street parking facilities. iii) Formulation of rules and regulations for pricing, management and enforcement of parking facilities. iv) Involvement of private sector in generation, management and enforcement of parking facilities along with the public sector. v) Minimisation of parking demand for personalised vehicles by extension and augmentation of mass transit facilities and minimisation of parking demand for goods vehicles within the congested urban areas by relocation of wholesale trading centers from the core areas to the periphery with the construction of truck terminals alongside.

We need to generate off-street parking facilities in built-up areas and at locations of major vehicular and pedestrian concentrations. We need to devise strategies for rational use of existing parking spaces through a pricing mechanism. Parking fee schedule should be prepared by the urban local bodies in consultation with police authority. Parking fee should be revised after every three years. The goal of the parking policy is to ensure the concerted effort of all the stakeholders to generate parking facilities for all categories of vehicles in a sustainable manner; minimize traffic disruptions due to on-street and uncontrolled parking.

06

AGENDA FOR ACTION

Improve access for all

It is not clear to many why Kolkata where more than 88 pent of the commuting needs are met by the public transport, cycles, and walking should suffer such crippling congestion and pollution. The answer is clear. The compact and dense urban form of the city that helps to keep trip distances short, walkable, and public transport oriented is under stress without clear planning priority.

Kolkata like many other Indian cities is not designed for cars. But misplaced investments in car oriented infrastructure – cars meet only 8 per cent of the commuting needs in Kolkata – can change the face and the form of a city permanently. This can harm the majority commuters who use bus, walk or cycle. Cars can never meet the commuting needs of the urban majority. But majority interest can be compromised if car centric infrastructure investments become the priority.

Kolkata is at the cross roads because the city is framing new policies and investment plans to improve and create new infrastructure under state led initiatives with central government support for urban renewal schemes. But the analysis of the spending under the Jawaharlal National Urban Renewal Mission shows that the bulk of the spending is on bridges, flyovers and sub-ways. There is barely any spending on public transport and non-motorised infrastructure.

This also bears out the importance of having state level urban transport policy to influence the state level expenditure on transport and land-use planning.

- **The urban transport infrastructure funding under the JNNURM programme in Kolkata is heavily biased towards road infrastructure. As much as 73 percent of project cost is dedicated to flyovers and roads.**

- **The City Development Plan has estimated Rs 2723 crore for improving the traffic and transport in the city. But the entire investment plan is dominated by proposals for roads, bridges and flyovers with a few related to pedestrian underpasses and bus terminals.**

- **The urban renewal plan has neglected the improvement needs of the tramways. It is also silent on plans to augment and improve the non-motorised transport facilities and cycle lanes and walkways in the city.**

- **Investments must escalate for the urban majority. As much as 88 percent of daily commuting trips in Kolkata are by the public transport, intermediate para-transit, cycle, and walking.**

- **The City Mobility Plan ignores the most critical principle of pedestrian planning that pedestrians need to be at grade. It recommends "16 Pedestrian underpass and walkways" and elevated pedestrian corridors. This will disable a large section of the walking population.**

REINVENT MOBILITY MANAGEMENT

Why Kolkata that still boasts of 88 percent of the daily travel trips by public transport, bicycles, and walking — suffer such crippling congestion and killer pollution? This is the crucial policy question that haunts the city today.

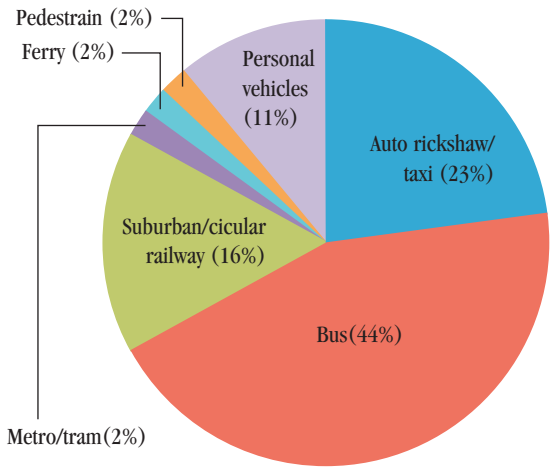
Kolkata needs urgent reforms to build on its strength. Further deterioration can happen if the city does not protect its public transport ridership and non-motorised traffic. Those who use public transport, walk or cycle are the urban majority in Kolkata. The urban transportation and investment plans need to be inclusive and support the urban majority and not the car owning minority. This large captive ridership is an asset for the city. Its erosion will magnify pollution and congestion in the city.

Even though the motorization trend is the reflection of the income levels and the changing lifestyle in the city –associated with the rise of the middle class – urban form and infrastructure design can also influence this trend. Compared to many other mega cities Kolkata has an advantage in its closely built, high density urban form. About 60 per cent of the total travel trips generated in the Kolkata Metropolitan Area have an average distance of less than 3-4 kms. This makes the city very walkable and makes low occupancy, high frequency para transit and cycling very attractive, comfortable and affordable. High density and high ridership improves economic efficiency of the public transport investment in the city. In the Kolkata metropolitan region the population density is as much as 7,978 persons per sq. km as opposed to 1,227 persons per sq. km in Delhi.[xxviii]

Cities need to redesign their existing space and travel pattern to provide the majority of the people affordable and efficient mode of transport that can be an alternative to personal vehicles. Compact city reduces travel distances and fosters low emissions and low carbon transport like walking, bicycling, para-transit and bus-based transport. Kolkata can make a massive transition to a clean and a liveable city just by modernising and improving its walkways and non-motorised transport and public transport systems. In fact, the Comprehensive Mobility Plan of Kolkata sets the goal of achieving public transport ridership share at 90 per cent of the total passenger volume by the year 2025.

Trip distribution data indicates that Kolkata relies heavily on road based transportation. About 20 percent of the trips are non road based. Experts point out that since the road density cannot be increased to meet the growing demand in the existing urban environment, the other feasible option is also to develop non road based mass transit system.[xxix] (Graph 27: Trip distribution in Kolkata Metropolitan Area in 2008). The city is now looking at ferry transport even though its modal share is still a miniscule 2 per cent.

Graph 27: Trip distribution in Kolkata Metropolitan Area in 2008



Source: based on City Mobility Plan

HOW TO CHANGE THE PRACTICE?

Kolkata is at cross roads. Massive interventions in the city transport sector have begun. Both state led as well as central infrastructure development funds are flowing in for urban renewal schemes. In any city expenditure on transportation is quite substantial. A review of city budgets carried out by the New Delhi based TRIPP has shown that the share of transport in total budget expenditure varies between 30-45 per cent. This is quite substantial. But the CSE analysis in Delhi has also shown that while the transport sector allocation is increasing over the years the share spent in public transport has declined. Cities are spending more on infrastructure for motorized vehicles including cars to allow them seamless speed through construction of bridges, flyovers and sub-ways. This hogs large share of expenditure. But this disadvantages the public transport, public transport users and walkers who are the bulk of the commuting traffic.

The detailed trends in Kolkata transport budget are not available in the public domain. However, the pattern of central government spending conjoined with the matching grant from the state government under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) shows an overwhelming interest in road centric spending. Even though the National Urban Transport Policy's guiding principles emphasizes on moving people and not vehicles, it does not get translated into real action. The spending continues to tilt heavily towards car-oriented projects. The one big public transport infrastructure that has happened independently is the metro system that has expanded in phases.

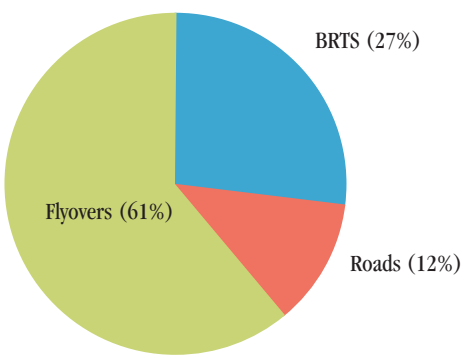
The investment plans under JNNURM were originally guided by the City Development Plan (CDP) that were mandated by the central government to identify city's priority infrastructure projects to source funding under JNNURM. The City Development Plan for Kolkata has estimated the total fund requirement at Rs 2723 crore for improving the traffic and transport in the city. The entire city investment plan is dominated by proposals for roads, bridges and flyovers with some mention of projects related to construction of pedestrian underpasses and bus terminals. While there are some legitimate road infrastructure deficits and need augmentation, the urban renewal plan has completely missed out the improvement needs of the tramways, bus ways, non-motorised transport facilities and cycles lanes

and walkways. Almost 90 per cent of the estimated costs is tied to plan for roads and flyovers. The city will also need a rapid scale up of public transport as 88 percent use bus, walk and cycle in Kolkata.

Roads and flyovers have dominated the JNNURM urban infrastructure spending in Kolkata Metropolitan Area – at 73 per cent. Only one project of bus rapid transit system in a small stretch has been proposed. There is barely any investment in pedestrian and bicycle infrastructure. (See Graph 28: JNNURM funding – Maximum money for roads and flyovers). On the contrary, active policies are being followed to restrict bicycle usage in the city. Bicycles have been banned on key arterial roads for smooth movement of motorised traffic. The city has started reviving the bus fleet, but it has not adequately spent on the bus infrastructure. (Table 3: Roads and flyover dominate the JNNURM Urban Infrastructure & Governance projects in Kolkata Metropolitan Area)

To counter the scathing criticism of road and fly over driven funding some of the road-widening projects nation-wide were converted into bus rapid transit systems by the Union ministry pf urban development during 2008-09. Accordingly, a 15 km Bus Rapid Transit System from Ultadanga to Goria was planned and sanctioned in Kolkata. BRT's further expansion and construction of more corridors remains uncertain as the city is already taking away the right of way from Trams. The unique feature and strength

Graph 28: JNNURM funding – Maximum money for roads and flyovers



Source: Prepared on the basis of (2010) Project cost in lakhs, JNNURM Urban Infrastructure & Governance in Kolkata Metropolitan Area, MOUD

Table 3: Roads and flyover dominate the JNNURM Urban Infrastructure & Governance projects in Kolkata Metropolitan Area

Project Name	Project Cost (Rs. in Lakh)	Physical Progress (%)
Construction of flyover between E.M. Bypass and Kazi Nazrul Islam Sarani	3802	100.00
Vivekananda Road Flyover (Ph - I) from Howrah Bridge to CR Avenue	15360	20.22
Construction of Flyover at Nagerbazar on Jessore Road	4809	31.71
Flyover from Parama to Park Circus	29166.14	10.54
Construction of E.M Bye-pass connector from Padmapukur to Kamalgazi, Kolkata	5309.87	71.91
Construction of left turning North Bound off-Ramp at Beckbagan connecting AJC Bose Road Flyover	1806.15	58.54
Construction of Interchange at Dunlop Junction ,Kolkata	3756.25	37.13
BRTS from Ultadanga to Goria in Kolkata Metropolitan Area	25291.00	
Construction of fly over at eastern railway main line along with approach road, Chandannagar	3257.00	

Source: KMDA

of Kolkata the tramways based on the same design principle as that of BRTs, have dwindled across the city. From 29 routes in 2003-04 it now runs on only 11 routes (as on 2007-08). The total passenger carrying capacity has fallen drastically from 479 lakh in 2003-04 to 283 lakh in 2007-08. The city is also not certain about balancing the metro project with BRT project. The possible BRT lines are also being eyed for a metro project making the future of BRT more uncertain.

This trend is not specific to Kolkata but is reflected in the overall JNNURM spending nation-wide. This has already drawn a lot of flak from the transport community. This kind of project based funding is beset with risks as this does not allow a comprehensive programmatic approach taking into account all aspects of mobility. In fact, as a mid course correction the Union Ministry of Urban Development has now mandated the JNNURM cities to frame a Comprehensive Mobility Plan that will look at all aspects of mobility management and requirements instead of focusing only on the project based development.

It may help to put a caveat here that this report takes cognizance of the important role that metro system plays in augmenting the public transport services in the city. But this report has not analysed this system for the simple reason that the metro system has already drawn a lot of focus and policy attention from both the state and the central government. Requisite policy and financial plans have been drawn up at both the central and the state levels to enable its implementation nationwide. This report has focussed on the others and more diverse forms of public and intermediate public transport systems that are needed to serve the entire city effectively to improve the overall access of the community.

HAS CITY MOBILITY PLAN HELPED TO FOCUS?

Kolkata has framed a comprehensive mobility plan (CMP). But is this a step forward? A quick review shows that it has improved only to the extent that this is relatively more comprehensive in its analysis of the existing transportation situation, and has attempted to identify the reasons for mobility crisis in the city. But it remains plagued with the old myopic bias.

The CMP proposes to establish an integrated transportation system to meet the future demand of 27 million trips per day by 2025. It does state as it's goal — "develop a balanced, integrated and multi-modal transportation system which provides equity, accessibility and mobility to all users, thereby serving the existing and future needs of the Kolkata Metropolitan Area in a sustainable manner", yielding the greatest good, not only from a transportation standpoint but also for the overall quality of life for the users and residents. This is expected to "Reduce Congestion, Improve Air Quality, Enhance Safety and Energy Security". It has identified two key strategies, first, reduce growth of motor vehicle use and second, reduce emissions per vehicle – km.

To reduce congestion in the core city the CMP suggests effective utilisation of the by-passes and connecting roads and traffic management strategies like restricting the movement of vehicular traffic in specific areas in the CBD during specific hours of the day; banning entry of cars to bring down the congestion level. This action would be supplemented with high frequency transit services in the area and provision of parking facilities in the periphery of the restricted zones. Higher parking fees on the existing parking facilities will discourage the vehicular traffic. The report has recommended 320 kilometers of new roads and 380 kilometers of road widening, 48 new Bus Terminals, 16 new Freight Terminals, 16 Pedestrian underpass and walkways among others.

IS THIS CMP ALIGNED WITH THE NATIONAL URBAN TRANSPORT POLICY?

Fuzzy on public transport: The public transportation strategy mentions increase in number of buses and introduction of high capacity buses and extension of routes. But it is not explicit on the bus operational reforms, route rationalization, service level improvement, for improved efficiency of the bus deployment to make the system more attractive. It also shies away from mentioning that city needs to allocate more dedicated spaces to buses for high frequency and speed to make it effectively attractive and competitive with other modes to enable modal shift. Bus Rapid Transit system has not been actively promoted.

Similarly, there is poor recognition of its inherent strength the tram ways. CMP interchangeably uses tram and LRT. It does not take cognizance of the fact that there is already an extensive dedicated network and space for trams that the city has inherited which is based on the principles of keeping the tram users and walkers at grade, the hallmark of good public transport. The CMP needs to be more explicit on protection of the at-grade Right of Way of trams from motorized traffic. The CMP has not given plans for utilizing and revamping the existing system to the fullest and improving its operations. There is however a proposal for new tramways. It recommends LRT system within Rajarhaat and 36 kilometers of new tram alignment. But the report fails to give a plan to remove the present bottlenecks to improving the existing tramways to increase its ridership in the city. It also requires much stronger focus on multi-modal integration.

Over emphasis on formal public transport. Small informal inter-mediate public transport neglected: The CMP is overtly focused on the formal high end public transport system. It does not recognize the merit of improving informal para transit transport systems, the autos and taxis that provide a sizeable bulk of the public transport services in the city today. These also provide the most crucial last mile connectivity. It has not mentioned auto-rickshaws and cycle-rickshaws services in Kolkata. CMP recommends ULSD use and hybrid engine buses and phase out of existing auto rickshaws with “electric powered cabs”. CMP fails to recognize that in Indian cities the auto-rickshaws are so effective because of their easy availability, affordability, flexibility, and fast and frequent services. Replacing them entirely with high cost “cabs” is not be the right answer. However, the efforts can be made to also deploy electric auto in addition to LPG autos. High cost of transport reforms only based on formal system will fail in the city where two-third of trips are within 3 kms, and a sizeable section of the population have poor affordability. Low cost high frequency modes are very important to reduce dependence on personal modes. These will have to be planned as good feeders to the formal public transport system.

Approach towards cycling and pedestrian infrastructure remains flawed: Instead of at-grade facilities the CMP recommends construction of elevated pedestrian corridor connecting Howrah station, Sealdah station and BBD Bagh. It is well known that foot over bridges is not pedestrian friendly. Planners promote them not to facilitate pedestrian movement but to ease vehicular speed. But the strategy should be to give priority to pedestrians over vehicles. It is certainly not suitable for railway station oriented pedestrians who are also expected to carry some luggage. The CMP says that “wherever possible pedestrian and bicycle paths would be provided”. But it ignores the most critical principle that pedestrians need to be at grade. Instead it recommends construction of “16 Pedestrian underpass and walkways”. This can be highly disabling for a large number of people.

The report recommends tidal one way traffic flow system all over the KMA.

But according to the experts the one way systems actually harm non-motorised movement and walking as it increases distances for walking and cycling. This also increases the vehicular volume on roads. This also increases distances for motorised traffic and locks up more energy and carbon. The report prioritizes vehicles over people by recommending: "Installation of pedestrian guard rails on footpaths and on medians at selected locations for the restricting the pedestrian interferences to the vehicular traffic flow." Therefore, its other suggestion to delineate pedestrian zones stands in isolation with no linkage with pedestrian network and public transport linkages. This will have to rectified.

Heavily biased towards parking supply that can induce more car usage and ownership: The CMP is still obsessed with the conventional approach of increasing parking supply instead of demand management measure. The CMP recommends multi level parking facility. It also recommends setting aside a part of the parking structure for other commercial uses for financial feasibility of the project; construction of underground parking lots and parking provision under "parks". It has not pushed for travel demand management measure in terms of parking caps, effective pricing etc. Even though Kolkata has taken the lead in reforming parking pricing this has not found proper reflection in the report. In fact, this part has ignored the NUTP principle that states that parking pricing should be linked with the value of the urban land to promote usage of alternatives to cars.

New approaches of transit oriented development without policy focus: The CMP has taken cognizance of the transit oriented development to maximize use of public transport. It says, "The mobility in KMA would be enhanced by having Transit Oriented Development (TOD) around 'Points of Interchange' of the mass transit modes, i.e. higher density mixed–use around transport nodes". CMP has identified Transit Oriented Development in some 200 nodes within the Kolkata Metropolitan Area with more than 40 having high potential. This is an important principle.

The CMP has also proposed this with an emphasis only on the strategy to liberalise the building bye laws and increase floor area ratio within the area of influence of the transit corridors to allow more development and built up area. It has not stated how this will ensure more density of people and transit oriented community. It is a good principle but beset with risks if the policy is not properly designed taking into account the local conditions.

This proposal has not come backed with policy guidelines to give direction to its implementation. Only liberal building bye laws may not give the desired density. It has not assessed the existing density pattern in the city to identify the low density areas for targeted development. A city like Kolkata already has very high density. The current informality of its structure has helped to maintain not only high density but also transit oriented community as this also allows people of low and medium income to live in the city core. This may get undermined with new development that will price out the public transport dependent community. Only FAR relaxation cannot guarantee high density. The redeveloped areas may even push out the public transport users if not backed by strong travel demand management principles like parking caps, high parking pricing etc. There is a serious risk of public transport projects becoming high cost real estate driven development projects with no real mobility benefits in the name of densification. Real estate driven TOD cannot lead to major shift from cars to public transport. TOD policy will have to specify targeted density and also ensure affordable housing is not compromised.

The city needs to prevent increased dependence on personal vehicles and

provide affordable, comfortable and attractive alternatives for mobility to the majority of the city dwellers. Redistribute road space according to the users not vehicles,

In any case, in the larger context, the whole process of CMP will have to be revisited not only at the state level but also at the national level. Even though the CMP is a little improved document than the CDP and comprehensively looks at the transportation issues it has no legal backing. It is still a way of identifying projects for sourcing central government funds for specific projects. Cities need one single land-use based transport plan that is notified under an Act like an Master Plan to make it legally binidng. There has to be one blue print with sub plans to guide implementation and urban planning at the city level to meet the target of 80:20 public transport ratio by 2020.

CHANCE FOR REFORMS

There is a chance of dramatic change now. While the state government is framing its own policies on transportation, the JNNURM framework is also an opportunity for reforms. The key question is if the the reforms are on right direction?

To assess the preparedness of the city, this report has reviewed the status of some of the reforms that are already underway especially those catalysed by the JNNURM reform agenda. In 2009, the Ministry of Urban Development had framed a bus stimulus package to counter the recession. One time grant was made to JNNURM cities to buy buses. But this grant was tied to conditional reforms in the transportation sector. Under this scheme Kolkata has been one of the biggest beneficiary that received a reform based grant to purchase 1200 buses.

To access this fund the city governments are needed to initiate institutional reforms for public transport management and implementation including formation of Unified Metropolitan Transport Authority; Create urban transport funds from revenues from a variety of heads including higher taxes on personal vehicles and diesel cars and advertisement revenue; implement parking policy as a car restraint measure; Reform bus sector for more efficient delivery; etc. Kolkata like other Indian cities is now expected to implement the reforms to protect the green commuting and move away from car-centric infrastructure development.

Due to the urgency of the stimulus package buses have been bought even before the reforms could be implemented. As a result, the conditional reforms have not been implemented. Only a small beginning has been made.

However, the brief review as discussed in the later sections has also shown that only top down reform agenda from the central government is not sufficient to catalyse change in a city. The city needs state level policies and legal mandate to guide the reforms and implementation. This report will focus on some strategic reforms in the city – bus, walking and parking.

07

BUS AND TRAMS

Affordable and accessible transport

Kolkata leads Indian cities with the highest bus ridership. More than 54 percent of the daily trips are carried by the buses – the highest in the country. By strengthening and upscaling the bus system the city can make a significant difference to its mobility paradigm.

Bus is the most affordable and space efficient public transport that links all neighbourhoods effectively. But bus transport is a victim of poor management, inefficiency and lack of vision. The transit agencies need to recover from economic and operational inefficiencies that plague their performance.

The JNNURM bus fleet has been an opportunity for reforms. But buses have arrived without the real institutional and organizational reforms in place. The roadmap for bus sector must include improved operational efficiency, bus procurement policy, improved economic efficiency, tax rationalization, and a multi-modal integration strategy.

Both bus and the tramways -- unique heritage of Kolkata needs priority attention. The gross neglect of the tramways is a serious loss to the city as well as to the nation. Tramway is the only instance in the country where traditionally the original compact city-design and land-use have been fully integrated with an extensive mass transport network. This is a unique example of a dedicated network which is within easy access from most residential and commercial areas that it serves. This is the model that other cities are trying to imbibe today. But Kolkata is letting it die.

- **Bus fleet utilization of Calcutta State Transport Corporation is as dismal as 54 per cent. The crawling speed in congested roads affects as buses lose time completing trips.**

- **The state run bus corporation's inefficiencies and losses is a major concern. Profits are running into negatives.**

- **State government has ordered a special audit into the earnings, expenditure and disposal of assets of five corporations. They get huge subsidies, run into huge losses but meet small bus travel demand.**

- **1200 JNNURM buses have improved fleet renewal but these are also plagued by the ills of the unorganized private bus operations**

- **The sign of Tram's slow death is visible in many ways. The tram fleet has dwindled. There has been 10 times drop in the number of passengers since the 1970s. Trams are the classic victims of motorisation.**

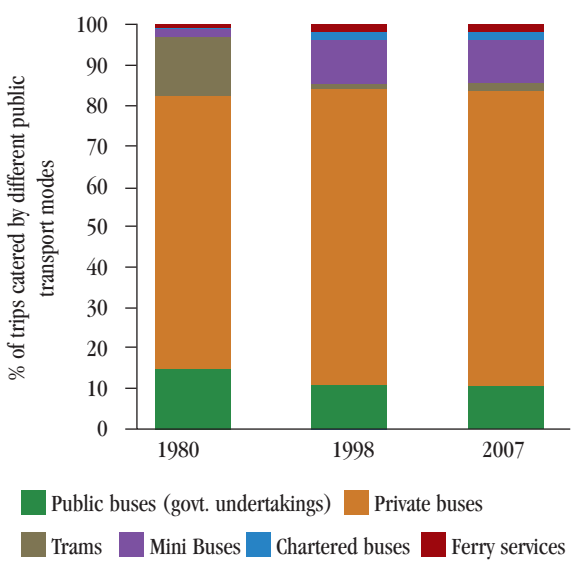
TAKE THE BUS

Buses provide more than half of the transport services in Kolkata, the highest among the cities in India. Bus with all its variation is cheap, effective, space efficient and with maximum flexible outreach and permeability. Improving its system efficiency and scale has a great potential to engineer a transition.

Bus reorganization is a complex reform challenge in any city. Local uniqueness in institutional structure and operations add to the complexity. The bus service in Kolkata is uniquely organised. It is a hybrid system in which both state and private agencies provide the bus services. There are many providers of bus service in the city. According to the Comprehensive Mobility Plan the key state transport agencies that provide the bus services are Calcutta State Transport Corporation (CSTC); Calcutta Tramways Company (CTC); West Bengal Surface Transport Corporation (WBSTC); South Bengal State Transport Corporation (SBSTC); North Bengal State Transport Corporation (NBSTC). In the private sector, there are a large number of passenger bus and minibus operators with a small fleet each (often one or two buses each) plying on routes as specified by the Transport Department. Besides these, chartered buses carry a large number of passengers in the metropolitan area.

Private operations of buses cater to the maximum number of trips (See Graph 29: Bus carry high share of trips). Their share is much higher than the state operated services. According to the city mobility plan the private agencies carry 85 lakh trips as opposed to only 12.5 lakh trips by all state government undertakings. Between 1980 and 2007 the share of private bus

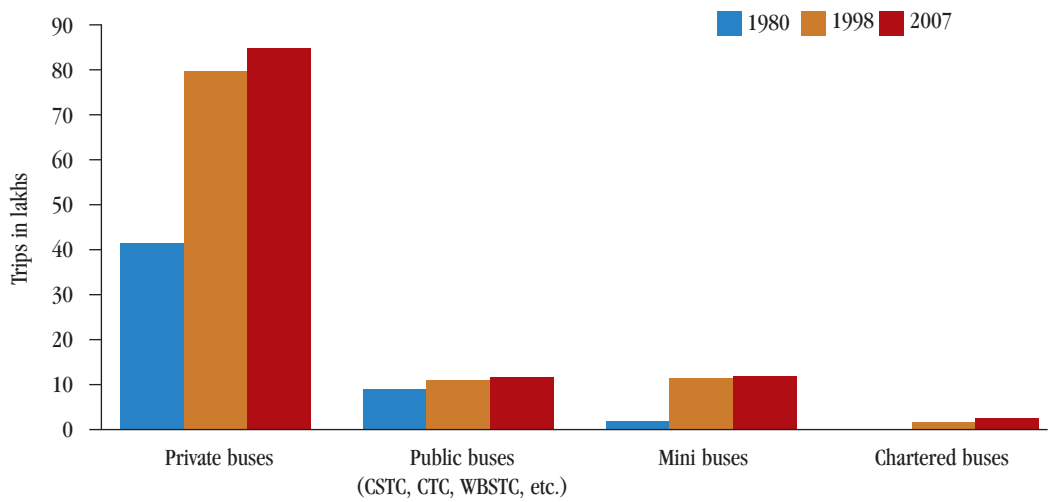
Graph 29: Bus carry high share of trips
Private bus operators make maximum bus transport trips



Source: Based on CMP

operations and their carrying capacity has more than doubled (See Graph 30: Trend in bus trips under different agencies (in lakhs between 1980 and 2007). The informal private system includes a large number of small operators and it is difficult to make them amenable to stricter regulations and service level benchmarking. Experiences from other cities show that there is often resistance to improving quality of services at affordable rates. Consolidating them into transit companies or cooperatives is a challenge.

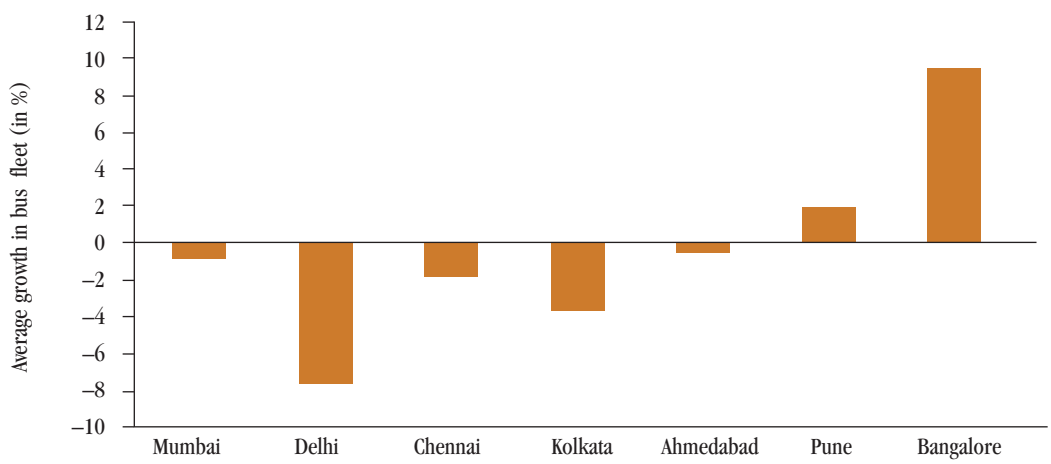
Graph 30: Trend in bus trips under different agencies (in lakhs between 1980 and 2007)



Source: Anon 2008, Study on traffic and transportation policies and Strategies in Urban Areas in India, MOUD

On the whole there is severe adverse pressure on bus transport. There is very little information on the performance of the private bus services except for the fact that the informal private sector has drawn investments. But in the hybrid system the state investment has remained minimal. Even the rolling stock of buses shows a negative growth like most other state transit agencies during the early part of the last decade. (See Graph 31: The Annual Average Growth in percentage in STU Bus Fleet). It is only after the implementation of the bus stimulus package under the JNNURM programme in 2009 that the bus rolling stock has shown some improvement. Poor state level investments have a serious implication.

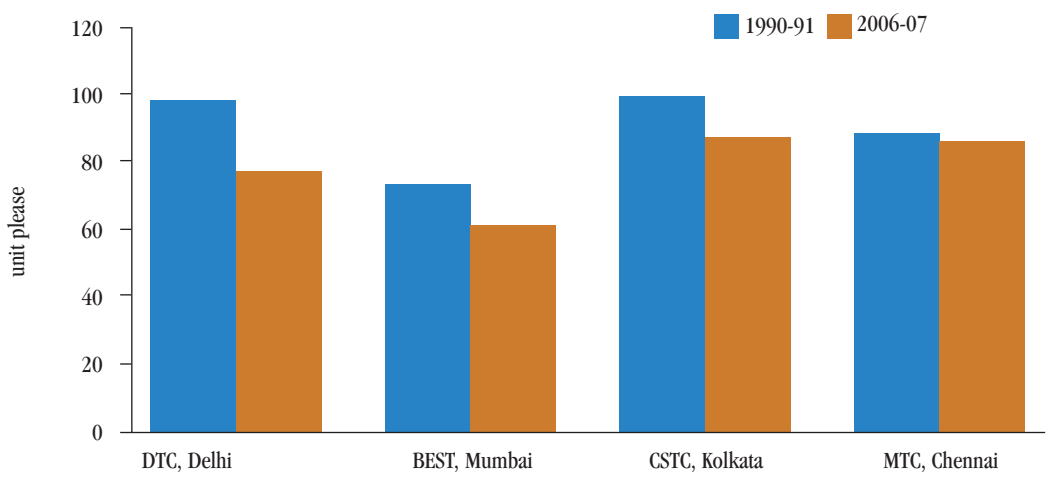
Graph 31: The Annual Average Growth in % in STU Bus Fleet (2000 to 2007)



Source: Anon 2008, Study on traffic and transportation policies and Strategies in Urban Areas in India, MOUD

The state transport undertaking buses are running on huge subsidies from the government but these are also blamed for inefficiency and poor services. The crisis is showing up in the falling passenger volumes like many other state transit agencies (See Graph 32: Falling load factor in mega cities). This shows that state transit agencies are plagued with inefficiency and mismanagement. Despite the growing travel demand their load factor is falling. Between 2000 and 2007 the load factor of buses has declined substantially. The earnings from the passenger volumes per bus per day are also declining steadily.

Graph 32: Falling load factor in mega cities



Source: Anon 2008, Study on traffic and transportation policies and Strategies in Urban Areas in India, MOUD

Fleet utilization of Calcutta State Transport Corporation, that operates buses inside the city, is as dismal as 54 per cent. The crawling speed in congested roads affects the daily number of trips as buses lose time completing trips. At a given point of time only 54 per cent of the buses owned by the agency are operated (See Table 4: Performance Parameters of State Transport Undertakings of the Government of West Bengal).

Table 4: Performance Parameters of State Transport Undertakings of the Government of West Bengal (2009)

	Calcutta State Transport Corporation (CSTC)	Bus service of Calcutta Tramways Company (1978) Ltd. (CTC)	Tram service of Calcutta Tramways Company (1978) Ltd. (CTC)
1. No. of buses purchased during the year (fit for operation after body building)	150	33	Nil
2. No. of serviceable buses at the end of the year	999	311	269 trams
3. Utilisation:			
(a) Total earning km. for the fleet (in lakh)	438.00	196.98	21.83
(b) Percentage of buses on road to the average fleet held	54	65	36
(c) Vehicle productivity :			
i) Km. per day per bus (on average fleet operated)	215.83	242	62
ii) Km. per day per bus (on average fleet held)	116.61	157	19
4. Load factor (per cent)	59.39	67	47
5. Ratio of Staff and Bus			
i) On average fleet operated	12.06	9.74	48
6. Staff productivity (km. per worker per day)	17.88	24.86	1.29
7. No. of Depots	11	Bus: 5; tram: 5; common for bus & tram: 4	

Source: Economic Review 2009-2010, Development and Planning Department Government of West Bengal

The state run bus corporation's inefficiencies and losses is a major concern. Profits are running into negatives. The Calcutta State Transport Corporation (CSTC) operates buses in Kolkata and suburbs, — on 209 routes in and around Kolkata as well as on long distance routes. According to the available estimates during the year 2008-09, the passenger fare collection was Rs.7023.00 lakh that was a drop from Rs.7214.00 lakh during 2007-08. About 67 per cent of the total cost was spent towards salary of the staff. The passenger fare collection contributed Rs.1344.00 lakh towards recovery of staff cost after meeting other operating expenses. The operating loss for the year 2008-09 was Rs.101.74 crore, — about Rs.2.57 crore less from that in 2007-08. Inefficiencies are showing up in the financial performance. According to the official sources the agencies can recover even less than half of their total operational costs from fare box collection.

It is of course not possible or even desirable to recover costs from fares as this will affect the affordability of bus transport. The city therefore requires other fiscal strategies and reforms to make the bus operations financially viable.

Calcutta State Transport Corporation: Highlights of its performance

A survey, 'Review of the performance of state road transport undertakings' released by the Ministry of Road Transport and Highways is 2007 shows that only Bangalore Metropolitan Transport Corporation in Bangalore make profit. All other city transit companies make losses. Calcutta State Transport Corporation (CSTC) makes Rs 9 lakh loss per bus. Kolkata has lowest vehicle productivity amongst all the bus corporations surveyed. (See Table 5: City bus corporations: In the red)

Table 5: City bus corporations: In the red

Bus company	Fleet size	Average (years)	Fuel efficiency	Staff/ bus ratio	Vehicle productivity (km/bus/day	Total revenue (Rs crore)	Total costs (Rs crore)	Net profit profit/loss (Rs crore)
Kolkata	1,144	6.4	3.70	6.65	124	72	177	–105
Mumbai BEST	3,391	5.56	3.31	10.11	194	850	1,088	–238
Chennai Metro	2,773	8.39	3.77	6.40	209	472	557	–85
Delhi DTC	3,467	4.70	2.99*	8.21	205	464	1,267	–803
Bangalore MTC	3,977	4.47	4.66	4.78	218	687	574	+113
Ahmedabad MTS	685	11	–	5.72	172	76	99	–23

*Runs on CNG, and price has not increased, so costs of fuel are under control

Source: Review of the performance of state road transport undertakings, Ministry of Shipping, Road Transport and Highways, Government of India, 2007

The survey also shows falling load factor an indicator of occupancy of buses. A more recent compilation of state urban transport undetaking's bus corporations for cities show very poor fleet utilization in Kolkata, — just 55.47 percent. (See Table 6: Fleet wise performance status of state road transport undertakings (2008). This is inexplicable in a city where travel demand and needs are constantly growing. It also has the highest over age buses.

Table 6: Fleet wise performance status of state road transport undertakings (2008)

Corporations	Average fleet held	Average fleet operated	Fleet utilization (%)	Average age of fleet	Percentage of overaged vehicles to total fleet of buses
BEST Undertaking	3449	3090	89.59	5.61	0
Pune MT	1186	903	76.14	6.20	0.09
Calcutta CSTC	1087	603	55.47	7.06	31.78
Delhi DTC	3439	2836	82.47	6.80	8.45

Source: Anon, performance of state road transport undertakings, year ending March 2007 and March 2008, Ministry of Road Transport and Highways

Calcutta State Transport Corporation: Highlights of its performance

However, CSTC staff bus ratio is better than even BEST and DTC (See Table 7: Productivity indicators). It is about 6.41 staff per bus as opposed to 9.46 in BEST and 8.27 in DTC. But CSTS records lowest bus productivity amongst the all corporations surveyed. It is as low as 121.51 km/bus/day compared to 179.37km/bus/day for BEST. (See Table 7: Productivity indicators)

Table 7: Productivity indicators

Corporations	Revenue earning KMS (lakhs)	Staff per Bus (ratio)	Vehicle productivity (Km/bus/day)	Occupancy ratio (%)	Passengers carried per bus per day
BEST Undertaking	2264.30	9.46	179.37	67.01	1230.26
Pune MT	814.43	7.43	187.62	64.32	677.99
Calcutta CSTC	483.43	6.41	121.51	86.70	475.16
Delhi DTC	1833.84	8.27	145.70	80.40	698.93

Source: Anon, performance of state road transport undertakings, year ending March 2007 and March 2008, Ministry of Road Transport and Highways

CSTC's per KM revenue generation is much less than DTC and BEST. However, the cost per km is highest for DTC which is leading to loss as high as Rs 56.5 per km. (See Table 8: Financial indicators)

Table 8: Financial indicators

Corporations	Loss (Rs Lakhs)	Revenue per km (in Rs)	Cost per km (in Rs)	Loss/km (in Rs)	Revenue/ bus/day (Rs)	Cost/bus/ day (Rs)
BEST Undertaking	-24,267.88	39.59	50.31	-14.5	7101.58	9024.04
Pune MT	–	–	–	–	–	–
Calcutta CSTC	-11,597.08	15.23	39.21	-23.9	1850.09	4765.09
Delhi DTC	-103,676.98	21.61	78.15	-56.5	3149.44	11,386.44

Source: Anon, performance of state road transport undertakings, year ending March 2007 and March 2008, Ministry of Road Transport and Highways

The staff cost of CSTC is about 60 percent of the total costs which is highest amongst the selected corporations. Also it has the higher fuel and lubricant cost than BEST in Mumbai. (Table 9: Cost indicators: At what cost?)

Table 9: Cost indicators: At what cost?

Corporations	Total cost (Rs Lakhs)	Staff cost as % of total cost	Fuel & lubricant cost as % of total cost	Tyres and tubes cost as % of total cost	Spares costs as % of total cost	Interest cost as % of total cost	Depre-ciation cost as % of total cost	Tax cost as % of total cost	Other costs as % of total cost
BEST Undertaking	113913.48	57.68	21.08	1.40	2.15	3.07	4.53	4.43	5.67
Pune MT	–	–	–	–	–	–	–	–	–
Calcutta CSTC	18957.51	60.71	25.69	1.61	2.38	3.50	4.22	0.00	1.89
Delhi DTC	143318.11	34.10	9.65	1.17	2.35	43.29	4.75	1.46	3.23

Source: Anon, performance of state road transport undertakings, year ending March 2007 and March 2008, Ministry of Road Transport and Highways

Clearly, the institutions that are responsible for providing the bus services will have to be reformed and reorganised. The state run bus corporation's inefficiencies and losses have hogged official attention. The state government doles out huge sum of money as subsidy. But these corporations cater to a marginal share of overall trips. It has been reported that the ruling Trinamul Congress-led state government has ordered a special audit into the earnings, expenditure and disposal of assets of five corporations which have been under the administrative control of the Transport department for the past three financial years. The objective is to assess why these bodies, the Calcutta State Transport Corporation (CSTC), the North Bengal State Transport Corporation (NBSTC), the South Bengal State Transport Corporation (SBSTC), the Surface Transport Corporation (STC) and the Calcutta Tramways Co (CTC), are incurring huge losses and need a subsidy of about Rs 600 crore every year to sustain themselves. These five corporations employ around 23,000 people.

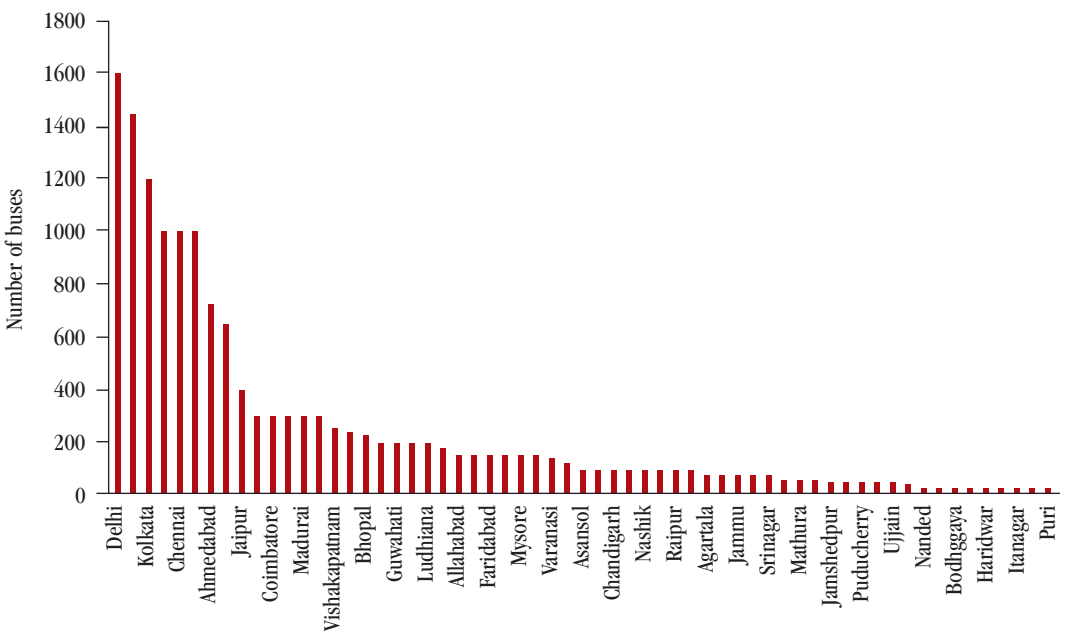
Private agencies may appear to be relatively more efficient. But this need not necessarily mean that they are offering more quality services. The private operators are more efficient in fleet utilization than the government run corporations, but there are serious concerns over the quality of services. Their profitability will have to be understood with riders. They select the most profitable routes, pay low wages to staff, poorer job security and less fringe benefits. Despite guidelines issued as part of the licensing are not followed with diligence. Unplanned, uncoordinated and ill governed privatization can be unproductive.

The Kolkata City Mobility Plan and other evaluations have identified many ills that ail the bus system: — lack of coordination between operating agencies; unorganised large number of small time operators; obsolete and poorly maintained fleet; routes not rationalized; poor level of service; and lack of performance and service standards. It is within this framework with all its inherent limitations and constraint that the JNNURM led bus reforms have taken off in the city.

JNNURM BOOST TO BUSES

To counter recession the National government had mooted a bus stimulus package in 2009 in which a one time grant was given to cities to buy buses. Kolkata is one of the largest beneficiaries of this scheme. It has acquired 1200 new buses since the implementation of this scheme in 2009. (See Graph 33: Bus fleet allocation to mission cities under JNNURM and Graph 34: Top ten cities with maximum number of low floor buses). Under the bus upgrade policy it has also got the maximum number of low floor buses.

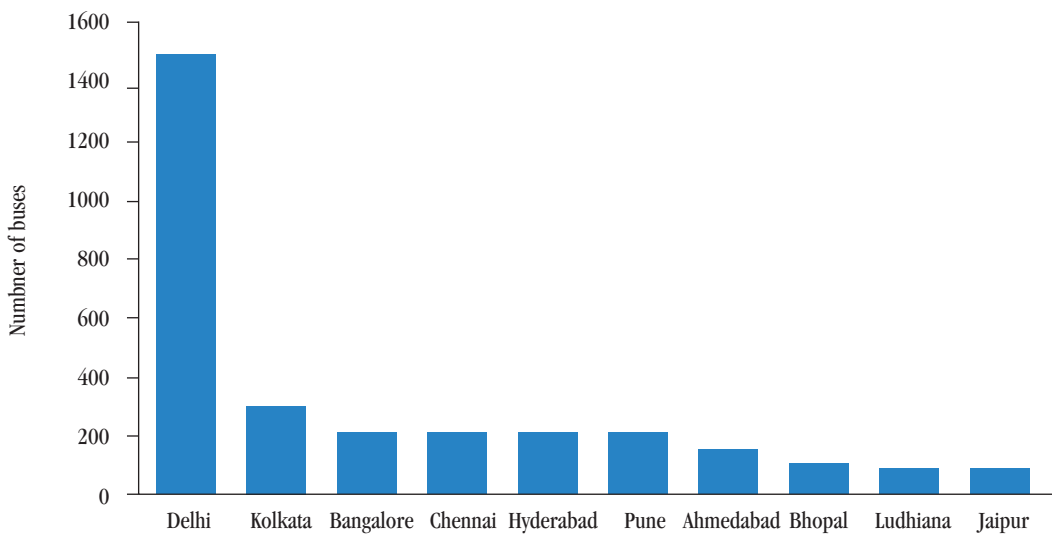
Graph 33: Bus fleet allocation to mission cities under JNNURM



Source: Based on data provided in http//jnnurm.nic.in

Graph 34: Top ten cities with maximum number of low floor buses

The mega cities including Kolkata dominates



Source: Based on data provided in http//jnnurm.nic.in

The deployment strategy for the new buses had to be organized within the current hybrid framework in which the bulk of the services are provided by the private bus operators. The state government has entrusted the responsibility of operating a sizeable number of new buses to the private bus operators. This decision was also triggered by the 2009 Calcutta High Court order that had directed phase out of old commercial vehicles from Kolkata including old buses. Many of the private bus operators that held very old buses – pre-1993 models – were offered the new buses as a replacement of the old to ease the transition. In fact, contrary to one of the conditions linked with the JNNURM that a single corporation would be instituted to run the new buses, the city government has distributed most of the buses among private operators. The private operators are running the buses as franchisee. Some buses are yet to be inducted into the fleet as there are payment standoffs due to non-completion of reforms and conditionality.

The transport department entered into a PPP arrangement with the private bus operators for 630 JNNNURM buses. Under the new incentive scheme the bus owners who replaced their vehicles with JNNURM buses got Rs 50,000. Their monthly contract payment was also reduced from Rs 26,000 to Rs 22,000. Franchise operators were required to pay Rs 2 lakh as one-time security deposit and service tax as well as other taxes every month for eight years. The state government is the guarantor of the loans secured by the franchisees.

This system has run into rough weather. The deployment of JNNURM buses through franchisee scheme has created financial crisis for the state government. Nearly all the 600 franchisees have recently stopped paying the monthly installments resulting in outstanding liabilities amounting to Rs 110 crore. Bus operators claim that they cannot make these payments from their commercial earnings.

This brings out one of the serious lacunae in JNNURM approach. Both state and the central government need to understand that only buying buses will not help. Cities need a public transport plan, route planning and integration, fare policy and efficient management model and service delivery system. Kolkata has brought in the new buses without clear roadmap for reforming the system. Multiplicity of the operators is undermining service level improvement. The city is in dire need to reorganize the bus sector to devise strategy to remove unhealthy competition and improve quality of services.

Privatisation will require strict regulations, performance standards that are regularly monitored. Ministry of Urban Development has issued indicators for service level benchmarking in cities. But there is very poor documentation and data generation in the private sector to give credence to this initiative. CSE's effort to find data on these indicators was futile. CSTC and CTC refused to share the operational statistics which are otherrwise routinely available from other state transport corporations. There is need for state led performance indicators and verification and evaluation of the bus transport system for both private bus operators as well as state corporations.

City needs a strategy to improve efficiency and operational and service quality. If this is left unattended for too long there will be strong and entrenched business interest and resistance to regulations and service level benchmarking from the informal bus sector. This will lead to more unfair practices, and undermine the negotiating power of the regulator to improve the existing systems.

Recently, the West Bengal government has begun to push the bus corporations to take a close look at their earnings, expenditure and disposal of assets and prodding them to explore ways to become financially more self-sustainable. The corporations like CSTC, NBSTC, SBSTC, STC and CTC incur huge losses and need a subsidy of about Rs 600 crore every year to sustain themselves.

The City Mobility Plan for Kolkata has set the goal of achieving a modal share of 90 per cent for public transport by 2025. Bus transport will play a very important part in attainment of this goal. It is projected that even in 2025, among all prominent public transport modes like metro, bus and ferry — buses will meet more than half of all demands. But buses will need a major revamp. In addition to that buses will require more dedicated space for better frequency and speed and comfort. Public transport cannot be successful in mixed traffic. Kolkata will have to reorganise its road space more equitably amongst all users and accord priority to public transport, walkers and users of non-motorised transport.

Due to the urgency of the stimulus package buses have been bought even before the transport sector reforms that were tagged with the bus funding could be implemented. As a result, cities have got the buses without a composite public transport plan.

Rationalise tax regime to lower the tax burden on buses: Analysis of many city level taxation regime has shown that buses bear huge tax burden. Metro is exempted from many of these taxes. Buses pay tax according to ridership which is a very perverse disincentive. Bus agencies pay property, excise, customs, road tax, VAT, motor vehicle tax, advertisement tax among others. If such tax obligations are reduced and waived off, it will certainly help to improve the overall economic efficiency of the operations. Details on these for Kolkata are not available. But a rapid assessment of road tax shows that in Kolkata a standard bus running as stage carriage pays Rs. 31.25 per quarter for each seat and additional tax of 10 percent on this quarterly amount is also charged. This can amount to a total of about Rs 7,000 per annum tax if we consider 50 seats in a bus. In comparison, a car pays one time road tax for 5 years as per the engine sizes ranging from 'upto 900cc' to 'beyond 2500cc'. The total tax ranges from Rs 14,550 to Rs 45,000 which effectively means for total tax of Rs 3,000 per annum to Rs 9,000 per annum. This means a bus pays more than a small car every year. Globally, cities are desperate to free up road space from cars. They are making car parking prohibitive; adding high premium to car ownership; exacting dues for entering prime busy areas; only allowing a fraction of them on roads at a time; or just not allowing them in the city centre. They are also giving people more options to cars. But Indian cities charge a pittance for road usage and for parking.

TRAMS: VICTIMS OF NEGLECT

Sheer indifference to the Tamways in Kolkata – one of the most exemplary public transport systems in the country—is a criminal national neglect. This heritage of extensive and dedicated public transport network in the core city area that is also very well integrated with the at-grade pedestrian and other feeder systems is the right model for any mass transit system that global cities are aspiring to achieve. This is also a unique example of integration of public transport with the city planning. The network penetrates deep into the compact city core and is within easy accessible reach from most residential and commercial areas that it serves.

Tram system has already given a heads up to Kolkata in road design that

gives the dedicated right of way to public transport to keep the system out of congestion and unobstructed. This is exactly the principle that guides the bus rapid transit system. The city must not be allowed to destroy this unique and effective solution.

The sign of its slow death is visible in many ways. The tram fleet has dwindled in Kolkata. There has been 10 times drop in the number of passengers since the 1970s. Trams are the classic victims of motorisation. Already, in some parts of the city, tram lines have been dug up to make way for motorized traffic. The Calcutta Tramways Company (1978) Ltd. provides tram and bus services in Kolkata and adjacent districts. At present, out of 29 scheduled tram routes, 13 routes are operational. Tram operations in 16 routes are under suspension due to concretization work and underground sewage work taken up by Kolkata Municipal Corporation. At present, the company is out-shedding approximately 70 tram cars daily. The company's target is to out-shade 150 tram cars daily. The daily traffic revenue at present is only Rs.2.20 lakh.

There has been some rudimentary effort to touch up the system. The company has remodeled 10 tram cars into new look tram cars that drew a lot of public appreciation. Programme has been taken to remodel other tram cars into new look trams in a phased manner. Some resource was injected into this system from the World Bank support almost a decade ago. But since then very little has been done to revamp the system.

The share of tramways is consistently falling in the city due to de-reserving of the right of way of tramways, lack of expansion, and lack of technology improvement. The serious setback is the curtailment of the tram network. It has been ripped off in some places. The islands that were created for alighting and boarding have shrunk as these have been chipped off to create more space for the motorized traffic. Flyovers have been constructed that have disrupted the line alignments. Despite promises these have not been restored in many parts.

Given the constraint of limited road network that does not have much scope for further expansion, enhancing the carrying capacity of a mass transit like trams with its dedicated infrastructure will be a very important cost-effective and affordable solution. Due to policy neglect trams meet a miniscule modal share of 2 per cent in the city. In comparison, the expensive metro, with all its patronage and resource support, also meets only 5 per cent.

Therefore, instead of letting different public transport modes — the metro, trams and buses — get caught in an unfair competition and undermine each other, Kolkata needs a multi-modal integration plan to cap motorisation. The tram will have to be the part of the vision and solution in Kolkata.

It is also unfortunate that when the national government is spending crores on metro systems and other transportation related infrastructure across the country it has ignored this viable, feasible, and an operating mass transit system. Tramways need a status of national heritage and a unique example in the country. The City Mobility Plan has proposed redevelopment of the existing tram system, linking of it with the circular rail corridor to establish connectivity within the metropolitan area. It remains to be seen if these recommendations will be cosmetic or work. The experience with the bus rapid transit system in other cities has shown how difficult it is to reclaim road space from private vehicles. Therefore, the road space that has already been given to public transport needs protection.

NEED ROADMAP FOR BUS AND TRAM TRANSPORT

Implement multi-modal integration: Kolkata has an enormous advantage in its elaborate public transport infrastructure including, trams, suburban rail, bus system and also metro. An immediate multi-modal integration of all these systems can be the permanent solution to its congestion and pollution problems. The city requires modal integration plans including physical design integration, common ticketing and institutional integration. This will also require planning of feeders and orientation of the autos and taxis to maximize the usage and access to different modes. The use of public transport systems can remain sub-optimal if they are not well integrated to allow easy transfers, good feeders and a good walking network for last mile connectivity. Bus reorganization will also need GPS assisted public information system.

Improve organizational and operational efficiency: The fuzzy part of the bus reform discussion in the city is the institutional reforms. While some discussions have begun on reforming the state transit companies, there is little clarity about the informal private sector that provides the bulk of the public transport services. There are references to cooperative model to reorganize the individual bus operators. But there is no roadmap yet. Unplanned privatization is attracting small time investors and also leading to unproductive competition between state agencies and private operators. This reform will certainly be challenging given the presence of such a numerous bus operators. There will be strong political resistance to phasing out of the informal sector the way it has been done in Delhi. The state government will have to set strict regulations, performance standards, and overall coordination to ensure and integrated network of services. The small businesses will have to be reorganized on cooperative or corporate lines. The state government needs to set up a coordinating and a regulatory body to immediately decide the bus transport network structure, service quality criteria, pricing and fare structure, safeguards for poor, and regulatory instrument to manage private operators.

Financing model for buses: Financing of bus transport is a challenging issue. In a hybrid system a great part of the bus transport is state funded. Cash strapped state government resist investments in rolling stock and bus revamp. Other than the JNNURM led financial mechanism and the proposal to set up an urban transport fund the state government has not come up with any specific scheme to stimulate investment in bus transport. Public transport has to compete hugely with the public fund especially given the revenue deficit at the state level. Bus transport depends almost entirely on the state government funds. In the way the Metro system is evolving its financing mechanism, a similar thrust will have to be on the mechanism for the bus transport.

Financing of bus transport is emerging as one of the biggest barrier to upscaling of bus transport. A range of fiscal strategies are possible for gap financing as well as targeted subsidies for service level improvement and support for low income groups. Kolkata is looking at the ways to create the urban transport fund. But this should be addressed immediately. The city needs a finance plan. This will require multi-pronged strategy. -- including rationalisation of the budgetary allocation, tax rationalisation to reduce tax burden on buses; tap revenues from advertisement, parking etc, tax revenues from travel demand management measures (higher taxes on personal vehicles etc), cross subsidy from other sectors etc. The city will also have to look at the non-conventional sources of revenue. These include tapping property rental along transit corridors, land monetisation,commercial development in the terminals, depots etc without

compromising the core function of maintenance of bus fleet,parking of buses, workshops etc

The financing model will have to lower the taxation burden on buses. Currently, the metro system enjoys tax concession from both central and state governments. Comparatively, the buses pay a much higher share of taxes. Taxes can be a quarter of the bus operations and capital costs. These will have to be rationalized and lowered to reduce the the overall costs. At the same time subsidies will have to made more targeted linked to service quality and to support low income groups and not to cover operational inefficiencies.

Develop performance monitoring of bus operations and services: Effective improvement in services will be possible only with a rigorous monitoring of service quality and assessment of user satisfaction. Periodic audits and surveys are needed to track performance. Transit agencies should be made responsible for generating and reporting this information and data. This will also need third party audit.

Need urban transport policy with adequate legal back-up to guide action on sustainable transport: JNNURM programme as well as state government action has already created opportunities for organization of the bus sector. Also the string of JNNURM reform menu including Unified Metropolitan Transport Authority, Urban Transport Funds, tax reforms, etc are a chance to make a difference. But a composite action is possible if the state government frames its own transport policy based on the sustainable guiding principles.

08

WALK AND CYCLE

Make city walkable and liveable

Insatiable demand for space for motorized vehicles is leading to arbitrary surrender of walking space in most cities. Even laws cannot prevent usurpation of walking space. Such erosion of pedestrian space can increasingly make cities unliveable and compromise use of public transport as each and every journey and especially public transport trips begin and end with walk trips.

Kolkata has a strong advantage in its closely built design, in high population density and highly dense street network that makes the city immensely permeable. Majority of journey trips in the city have an average distance of about 3-4 km. This enables pedestrian and cycle traffic.

Kolkata is in fact better off than many other mega cities. Its new footpath design displays improved features including appropriate width, height, and surface design. But the pedestrian movement is still highly impeded in many parts. City-wide pedestrian infrastructure will also need renewal and redevelopment.

Car centric infrastructure for seamless, signal free travel through flyovers, expressways and elevated ways, is severing urban landscape, disrupting direct shortest routes of the walkers and increasing distances and travel time for walkers. Pedestrians and cyclists are the largest victims of road accident in Kolkata. Hostile policies have also reduced cycle traffic.

- **An astounding 60 percent of the daily travel trips generated in Kolkata have a distance range of less than 4 km that makes Kolkata attractive for walking and cycling.**

- **Traffic volume counts carried out at major traffic corridors in Kolkata Metropolitan Area has shown that about 60 per cent of roads in the city have high share of non-motorised trips — at least 35 per cent of the total traffic.**

- **Ranking of cities in terms of road safety by the Wilbur Smith Associates shows Kolkata has the worst accident risks for pedestrians among the big cities – as high as 64 percent.**

- **In south and central Kolkata some major streets have well paved pavements of appropriate height and width. The perception survey of Wilbur Smith study shows that pedestrian opinion of pedestrian facilities is better than most other cities.**

- **Close to quarter of households own bicycles – more than those who own cars. But its use is steadily declining. Policies are not encouraging bicycles. Notification in 2008 has banned bicycles on selected roads to provide 'safe, uninterrupted movement of vehicular traffic'.**

KEEP KOLKATA WALKABLE

An astounding 60 percent of the daily travel trips generated in Kolkata have a distance range of less than 4 km that makes Kolkata attractive for walking and cycling. This is already evident in the fact that the walk only trips are nearly 20 percent of daily travel trips in Kolkata which is much higher than the car trips that are a mere 8 per cent. This means people who commute by walking and cycling together outnumber those who use personal vehicles. High density, mixed land use, and narrow streets have made walking for work and recreation comfortable, feasible and popular in this city.

Also as Kolkata begins to scale up public transport systems efficient pedestrian network will be necessary to allow mass of people to move through the public transport network with ease. Each and every public transport trip begins and ends as walk trip. Walking is also the most important crucial link for last mile connectivity. If pedestrian traffic is compromised public transport usage will deteriorate to sub-optimal level. Even 50 per cent increase in kilometer traveled by public transport can lead to massive increases in walking. Roads will have to be planned with well designed sidewalks and safe cross walks to accommodate and facilitate this pedestrian volume.

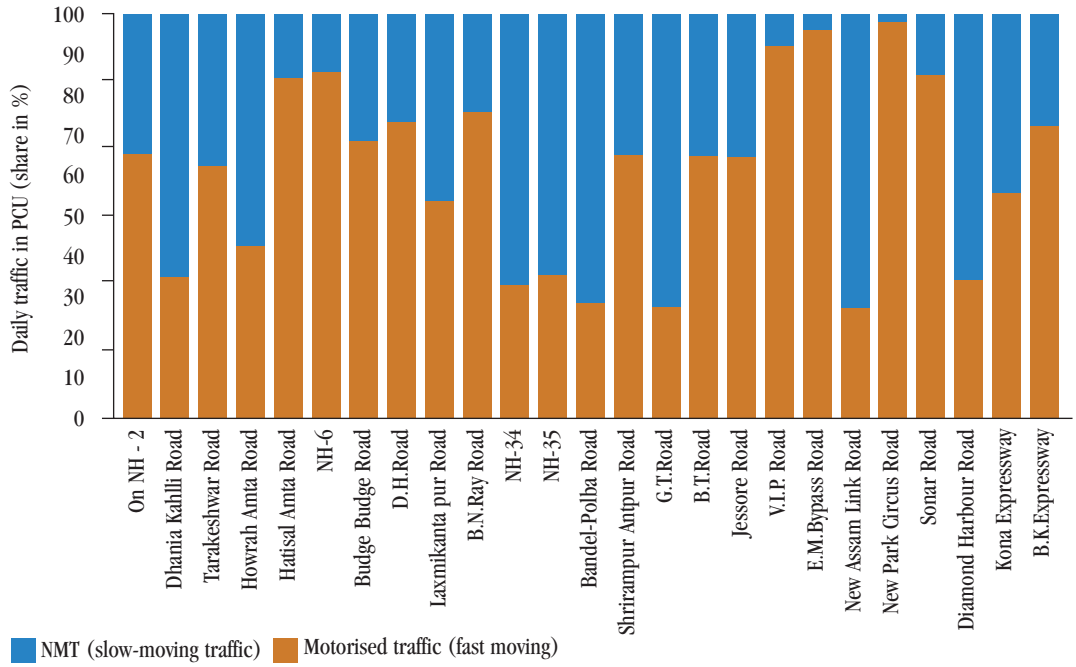
Reorganisation of urban space to make it more closely knit and walkable is the pre-condition to promoting sustainable transportation modes. Therefore, the city has to plan the pedestrian infrastructure to cater to the present and future demand for walking in the city. This demands policies that will facilitate pedestrian and bicycle movement and improvement of the mass transit systems.[xxx].

In many parts of the city the share of non-motorised traffic is also high. Traffic volume counts carried out at major traffic corridors in Kolkata Metropolitan Area has shown that about 60 per cent of roads in the city have high share of non-motorised trips — at least 35 per cent of the total traffic. In nine corridors including Dhania Kahlli Road, Howrah Amta Road, Laxmikanta Pur Road, NH-34, NH-35, Bandel-Polba Road, G.T.Road, New Assam Link Road and Diamond Harbour Road 50-70 percent of the traffic is non-motorised (See Graph 35: Traffic volume counts (daily PCU's % share) on the major corridors of KMA). This bears out the potential of developing a non-motorised transport infrastructure.

Neglect, disdain and hostile traffic conditions have made walking and cycling very unsafe in the city. Share of bicycles and pedestrians involved in road accidents is very high. (See Graph 36: Share of Bicycles and pedestrians in road accidents). Ranking of cities in terms of road safety by the Wilbur Smith Associates shows Kolkata has the worst accident risks for pedestrians among the big cities – as high as 64 percent. (See Graph 37: Road safety index).

Also hostile policies are threatening cycling in the city. Studies carried out during 2007-2008 indicate that about 23 per cent of households have

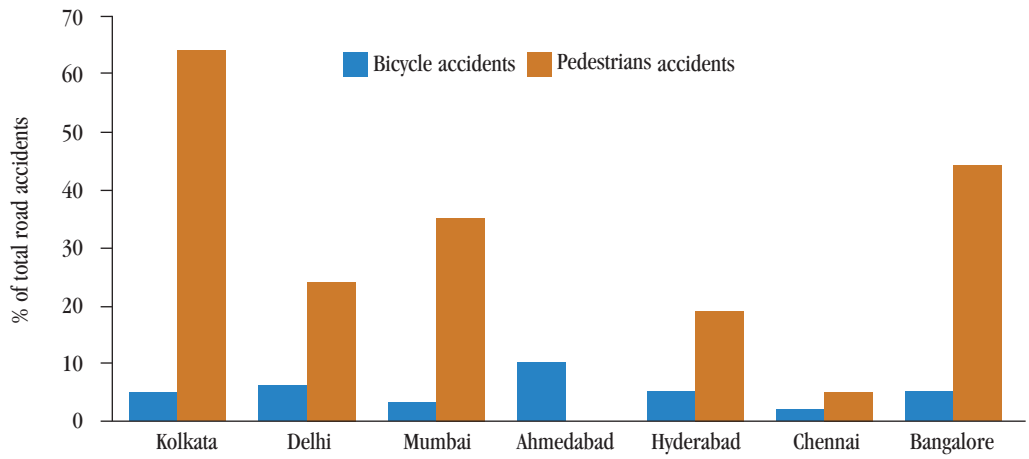
Graph 35: Traffic volume counts (daily PCU's % share) on the major corridors of KMA



Source: City mobility plan

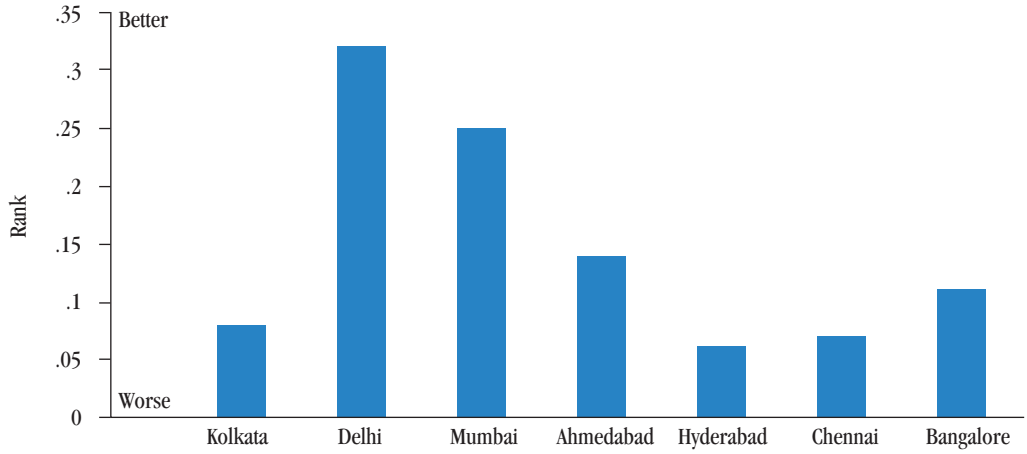
Graph 36: Share of Bicycles and pedestrians in road accidents

Kolkata has highest pedestrian accidents amongst the big cities



Source: MOUD

Graph 37: Road safety index
Kolkata as comparatively low rank

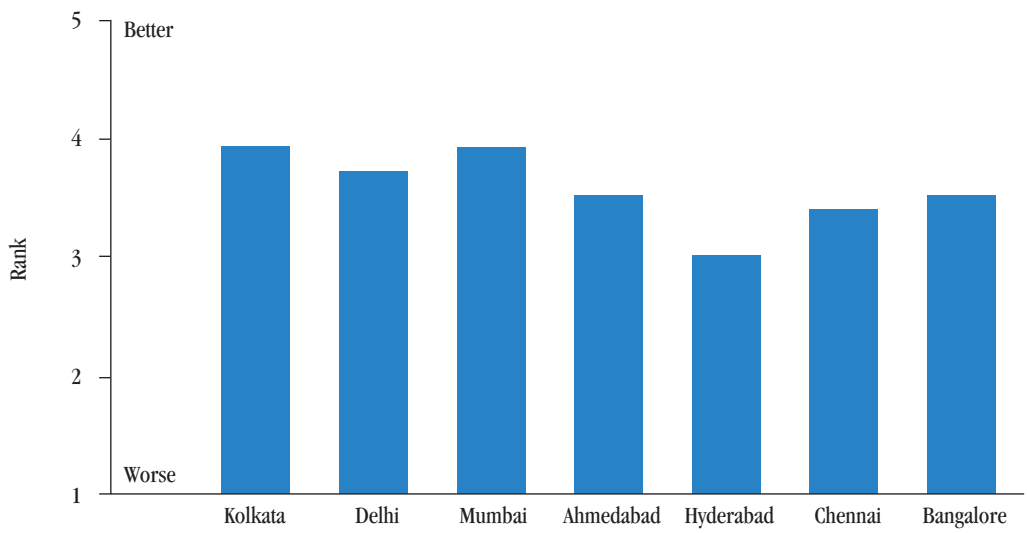


Source: Ministry of Urban Development and Wilbur Smith Associates 2008

bicycles and this share is declining. Bicycles have been the dominant mode of travel in the metropolitan area particularly for the lower income groups. For shorter trips bicycles are a popular mode of travel in the core area as well as in the Kolkata Metropolitan Area. [xxxi]

Overall there is heavy pedestrian volume on major roads and streets of Kolkata. A random and a cursory review of the pavement design in Kolkata actually shows more improved design compared to most parts of Delhi. In South and Central Kolkata major streets have well paved pavements of appropriate height and width. In fact the perception survey carried out by the Wilbur Smith study shows that pedestrian opinion of pedestrian facilities is better than most other cities. (See Graph 38: Pedestrian opinion on pedestrian facilities). But walk can be highly impeded due to obstruction and especially car parking.

Graph 38: Pedestrian opinion on pedestrian facilities
Compared to metros the pedestrian facilities in Kolkata have higher rank



Source: Ministry of Urban Development and Wilbur Smith Associates 2008

Contrary to belief India does have a plethora of laws and bye laws related to road safety, road infrastructure, pedestrian protection, and urban planning that have bearing on pedestrians. But laws are fragmented and do not add up to an integrated framework to promote pedestrianisation or protect pedestrians and pedestrian rights. The national framework is outlined by the National Urban Transport Policy has incorporated the principle that pedestrians and pedestrian infrastructure need special focus in transport planning. But the guidelines of the JNNURM do not make explicit reference to pedestrian and bicycle infrastructure. This is one of the weakest links. Even though the City Development Plans have referred to pedestrian infrastructure it has not influenced the spending decisions.

At the national level there are rules for motorist under the Central Motor Vehicles Act to prevent them from causing accidents and cause harm to pedestrians. This Act even bars motorists from entering pedestrian space but this is rarely enforced. Motorists are liable to punishable offence, yet it is not enforced as a strong enough deterrent. Existing engineering guidelines from the Indian Road congress are also inadequate and do not meet the full range of pedestrian needs. These are being modified now.

The city needs to adopt a composite pedestrian policy. Experience from round the world shows that the legal framework for walking evolves through a series of executive orders targeting several aspects of pedestrianisation. Increasingly laws are providing for captive use of zones for pedestrians, improvement of overall environment of the streetscape, laws targeting traffic calming measures, restriction of traffic flow in targeted areas, and laws related to pedestrian safety. But Indian laws lack this integrated approach and even the policy conviction that pedestrianisation will require strong legal back up and enforcement strategies.

Placing of vendors in footpaths is always a contentious issue but a very legitimate issue as this is a very important livelihood source in cities with a very large share of urban poor. But it is possible to provide for vending and hawkers in walkways through design interventions. Though vending may create obstruction on the through route of the pedestrians it is an important street function as these provide the basic public amenities like drinking water, street food etc. This informal sector supplies a range of services and also their presence on the roads make people feel secured especially at bus stops. The vendors and hawkers on the streets are protected by the Urban Street Vendor Policy, Delhi and the National Capital Territory of Delhi Laws (Special Provisions) Act, 2007 vide which all hawkers are protected from evacuation from the streets till December 2008. But this has not led to any concise policy to create proper zone for hawkers that does not impede pedestrian access. The policy was formed following a Supreme Court diktat and it outlines the planning norms for demarcating vending zones and clusters where and when needed.

The policy outlines quantitative and qualitative guidelines for vending zones. The quantitative guidelines include the area to be allocated for vending and the qualitative guidelines specify the kind of facilities that have to be present in the vending zones. These zones need to be provided with solid waste disposal facilities, street lighting, aesthetically designed mobile shops, push carts, cleanliness and public toilets by the civic authorities. Traditionally vendors are licensed but the policy suggests the registration of vendors for accessing public spaces based upon planning norms and standards. The policy also includes other aspects like monitoring of hawking activity, rehabilitation and relocation etc.

Bicycles: Currently, active policies are being followed to discourage bicycles in the city. The city government has issued a notification in 2008 banning bicycles on selected roads to provide "safe, uninterrupted movement of vehicular traffic". The order states no bicycle shall ply or remain even "standing" between 09.00 hrs and 19.00 hrs on all days on about 38 roads. The city that once had a very good share of bicycle ridership is losing this zero emissions sustainable usage rapidly. Bicycles require policy protection and support. These can be a good feeder to the public transport systems that are being scaled up in the city as well as function is independent modes. The city needs to take a careful look at the emerging programme in other cities as well as the emerging national programme on public bike sharing as feeder to public transport systems, metro and BRT and also to link up the neighbourhoods. Local asessment of the potential of such programes is important.

THE WAY AHEAD ON PEDESTRIAN POLICY

Need pedestrian plan for the city: The city has to plan the pedestrian infrastructure to cater to the present and future demand for walking. The city can further improve the street design guidelines to promote well designed pedestrian facilities. All new roads must have well and appropriately designed pedestrian ways that makes walking safe, comfortable and convenient. The city requires street network planning that provides the shortest direct route to destinations with adequate and proper walk ways and facilities.

Need walkability audits: The draft national habitat mission standards that have been proposed by the Ministry of Urban Development have included periodic walkability audits in cities. This is a crucial tool to ensure that the pedestrian infrastructure design for side walks and cross walks meet the walkability principles and guidelines. The standards actively discourage pedestrian subways and foot over bridges as these are very inappropriate for walkers. Kolkata can also adopt composite street design guidelines that consider all aspects of street design and walkability parameters. Delhi has

recently adopted similar guidelines that the basis of clearance to road projects. Normally, all urban local bodies and road development agencies follow the Indian Road Congress guidelines, but these – though under review — are still not holistic. It is important for the city develop its own holistic guidelines.

Need environment impact assessment of road infrastructure: When large projects on road infrastructure including road widening, flyovers and road elevation are planned in a city there is no provision of environment impact assessment. Even the municipal laws do not require consultation with the local residents in cities. EIA is required only for highways more than 30km and that need land acquisition for road widening of more than 20 meter. Therefore, in a city pedestrians do not count in the decision on walk space. Even with the plethora of laws and regulations pedestrian space cannot be protected legally. However, all big development projects including building complexes in cities require traffic impact assessment and mitigation measures as part of the EIA clearance process. This should be implemented with adequate stringency.

Need bicycle plan: Currently, wrong policies are discouraging non-motorized transport in the city. Conventional traffic planning is obsessed with "speed" and they categorise the traffic volumes in terms of "slow" and "fast" moving. This way of assessment and planning can overlook the strength of NMT traffic and their environmental and social imperatives in our cities. Active policies are being followed in Kolkata to ban bicycles and cycle rickshaws from the key arterial roads to make way for the fast traffic. This is detrimental. Globally, the focus is on lowering of the speed of the motorized traffic and not to increase it and provide more space for public transport and non-motorised transport. At a national level the Ministry of Urban Development is now preparing a public bike share scheme for cities in which the numerous bike stations will be set up for rental for short distance or feeder commuting. This will require infrastructure, stations and a deployment strategy with dedicated fleet of cycles for the public. The city should take a proactive step to enable this.

09

PARKING

Urban space has other valuable uses

Globally, policy focus is shifting towards car restraints to free up road and urban space and encourage alternatives. While a variety of tools are being applied to restrain cars including congestion pricing, and higher taxes, the most common first generation action is a reformed parking policy.

This operates on the simple principle that limited parking infrastructure and high parking prices can dampen car usage and also reduce demand for parking. Parking can be innovatively designed to encourage park and ride and park and walk to further reduce traffic pressure.

National Urban Transport Policy has recommended linking parking charges to value of the land to discourage personal vehicle usage and promote public transport. The JNNURM reform package includes parking reforms. Many cities including Kolkata have already begun to frame new parking policy.

Kolkata's new policy is still quite heavily biased towards augmenting parking supply through the provision of more parking structures. The travel demand management principle has to get stronger. Kolkata is in an advantageous position to do so as its limited parking infrastructure has damped car ownership to some extent. Kolkata has also taken the lead to impose one of the highest parking charges in the country. This needs to be strengthened further. Parking demand is insatiable and devours valuable and scarce urban space.

- **On-street parking on major roads reduces the available road width to a mere 6 to 7 meters from 9 to 12 meters. About 30-40 percent of the road space in Kolkata are lost to parking. This leads to congestion.**

- **Roads surrounding Kolkata central business districts like A.J.C.B. road, A.P.C road and K.K. Tagore road have 4 lane without any median. These roads and many others often get grid locked in the peak hour due to on-street parking.**

- **The on-street parking is aggressively encroaching upon the sidewalks. On street parking has reduced footpath space by as much as 50-70 percent. Parking violations account for 70 per cent of the total traffic violations in the city.**

- **Surface parking charges in Kolkata are among the highest in the country. These are equal to the minimum charged in multilevel parking structures in Kolkata.**

- **The new parking policy advocates incentives of more floor area ratio to encourage more off-street parking facilities. But without parking caps and pricing car usage and ownership will only increase.**

PARKING POLICY TO REDUCE CAR USAGE

Parking policy can address mobility crisis in Indian cities where cars are edging out public transport, walking and cycling and adding to killer pollution and energy guzzling. In fact, parking policy is included in the transportation reforms mandated under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM). But it is not clear to the cities, what parking policy is expected to do?

In the conventional planning process, parking policy continuously satisfies the growing demand for parking as vehicles grow in numbers. But, as global experience shows, parking policy can actually help to reduce dependence on personal vehicles and encourage alternative modes. There is a tacit recognition now – at least in the National Urban Transport Policy – that there is limit to such an approach. With the help of parking policy it is possible to arrest and reverse car dependency. It is possible to design parking policy in a way that it dampens demand for parking, and encourages people to shift from personal modes to public transport and non-motorised transport.

WHAT AILS THE CURRENT PARKING PARADIGM?

Parking demand is insatiable, entails enormous cost as cars aggressively encroach upon urban space. In Delhi parking devours close to 10 percent of urban land in Delhi; daily addition of cars creates additional demand for land bigger than 300 football fields. Can any city afford this? This also raises concerns regarding equity in urban land-use. More land is allotted for one car parking in a multilevel parking structure than to a low cost housing scheme for poor people. A car needs about 23 sq m to be comfortably parked. But a very poor family in Delhi gets a plot of just 18-25 sq.m. A city can never have enough land for parking but it is under pressure to divert land away from other important uses.

Disproportionately high share of urban land is devoted to parking when in Kolkata only 8 per cent of the daily travel trips are carried by cars. Free and under priced parking spaces is a hidden subsidy to car owners. Parking incentives induce more traffic.

Kolkata is debating this issue as well. Parking demand is increasingly becoming insatiable and land is coming under intense pressure. The Comprehensive Mobility Plan of Kolkata has put a spotlight on parking woes in the city. It has described the crisis as not enough designated parking spaces in the Kolkata Metropolitan Area. This has led to congested roads around the activity centers. Ad hoc and unplanned parking and inappropriate parking fee structure have added to the traffic chaos.[xxxii] There have been several complaints regarding illegal parking lots and on street parking in non-designated areas leading to congestion.[xxxiii]

On-street parking has eroded carrying capacity of the road network. All major roads have on-street parking which reduces the effective carriageway width for traffic movement. Comprehensive Mobility Plan for

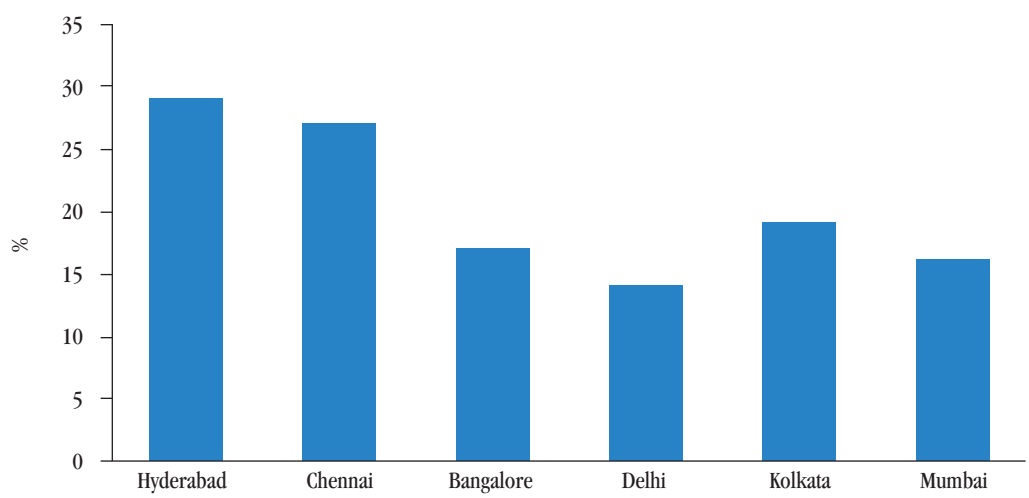
Kolkata mentions that on-street parking on the major roads has drastically reduced the available road space. Space availability on roads with road width of 9 to 12 meters is effectively reduced to 6 to 7 meters. Thus, 30-40 percent of the road space is occupied with parking. The average road width for 4 lanes is 14 meters of which 3 meters on each side are being used for on-street parking leaving only 8 meters for vehicular traffic on many roads. This adversely affects the speed of the traffic and leads to congestion. The roads surrounding the Kolkata central business districts like A.J.C.B. road, A.P.C road and K.K. Tagore road have 4 lanes but without any median. These roads grid locked during the peak hour due to on-road parking. The on-street parking has led to the encroachment of the sidewalks.

On-street parking has reduced footpaths by as much as 50-70 percent. Wherever the roads have been widened to accommodate more cars, it has been encroached upon by on-street parking. The maximum off-street parking accumulation is observed near Vidyasagar Setu (towards Kolkata) (2000 vehicles) followed by Howrah Railway Station, Jawaharlal Nehru and Curzon Park (1000 vehicles). The peak period of accumulation varies between 0900 to 1200 and 1700 hrs to 2000 hrs. Kolkata C.B.D. area does not have parking facility, except in the BBD Bagh area. Few buildings in this area have their own parking facilities within their premises. Those that exist are also limited.

The assessment by Wilbur Smith for the Union Ministry of Urban Development shows that the problem of on-street parking is turning out to be a major problem. Misuse of parking spaces for other purposes in commercial areas, vehicle spillovers and on street and free parking have led to haphazard parking and slow traffic movement (See Graph 39: On-street parking on major road corridors). In Delhi, Kolkata and Mumbai road length used for parking is 14 per cent, 19 per cent and 16 per cent respectively.

The Kolkata Municipal Corporation deals with the management and enforcement aspects of parking. There are 312 official parking zones in the city that can accommodate about 7,510 equivalent car spaces a day, according to an official statement issued by the Kolkata Municipal Corporation car parking department. This is considered to be a major

Graph 39: On-street parking on major road corridors



Source: MOUD Report

shortfall in parking supply in view of the rising number of private cars in the city. “This makes the fake car parking agencies thrive. We don’t have the mechanism to check the actual number of cars getting accommodated in the illegal car parking lots,” a Kolkata Municipal Corporation official said. To contain the problem, the Kolkata Municipal Corporation has decided to open fresh areas for car parking. [xxxiv] The parking department that is in charge of managing parking in the city provides identity cards to authorized collectors through their “fee car parking societies”. The official parking charges are mentioned in the rate board charts that are put up at all locations. This includes day and night parking charges for different categories of vehicles.

The majority of the traffic violations relate to parking, traffic signals and U-turn violation. These account for 70 per cent of the total traffic rules violations.[xxxv] Due to lack of designated parking spaces, on-street parking is widespread in the municipal area. The on-street parking encroaches on sidewalks blocking pedestrian ways. Cars are the biggest encroachers in Kolkata. 30-40 per cent of the roads in Kolkata are used for parking; 50-70 per cent of the walkway space is reduced due to on-street parking.

If the road and urban infrastructure is already so burdened with parking pressure the future rise in parking demand from the ever burgeoning car numbers will only exacerbate the crisis. Parking demand is insatiable. But urban space is limited. The city can never find enough land to meet the ever growing parking demand. On the contrary, the other more important use of urban space for larger public good can be seriously compromised if the city decides to lock up more urban space for parking. It is a very important decision that the city will have to take about its land use.

Kolkata is reforming parking policy: The blue print has come from the City Mobility Plan and the new proposal that Kolkata Metropolitan Development Authority has developed. The new parking policy seeks to generate parking facilities for all categories of vehicles in a sustainable manner; minimize traffic disruptions and congestions due to the on-street and uncontrolled parking of vehicles; and planned approach of the urban local bodies to meet the parking problems in their respective areas.

The policy has outlined the enforcement strategy for parking. In order to minimize disruptions and congestion it seeks to regulate on-street parking with special attention to maximizing effective width of carriageway; selection of location of on-street parking space; selection of location of on-street parking lots on major arterial roads and transit corridors; and demarcation of on-street parking lots with proper traffic signs and road markings; and provision of parking facilities for different categories of vehicles. Also commercial areas and market centres are to provide minimum amount of parking facilities for goods vehicles.

To improve the management system of the off street and on-street parking it seeks to provide different parking zones for different categories of vehicles; proper parking guidance and information system; appropriate system for charging and collection of parking fees; proper controlling of traffic movements to and from the parking lots, efficient monitoring and enforcement of regulation system. This enforcement strategy will be critical to deal with the parking and traffic chaos and should be implemented with discipline.

It states that the provision of parking facilities for transit and para-transit vehicles on a land owned by government or local authority should be planned by the local authority at nodal locations. To ensure parking facility

for para-transit vehicles it proposes widening of adjoining roads at specified nodal locations. Balancing the parking needs of different vehicle segments especially buses and para transit will be a challenge.

Parking pricing reforms: It is important to note that even though a lot more needs to be done with parking pricing reforms in Kolkata, the city has moved ahead of other cities in parking pricing. Parking charges have been raised in Kolkata and is among the highest in the country. This is a credible step forward. It has been reported that the Kolkata Municipal Corporation has retained the parking fee rates and the 16 designated parking zones fixed by the previous board. In all classes of parking areas the uniform rates of Rs 10 will be charged every hour for cars. This effectively means that In Kolkata a car pay Rs 80 for eight hours. This is same as what only some areas and multi-level car park lots are charging in Delhi. Other cities charge even less. This is an important best practice in Kolkata and has a replication potential in other cities.

Table 10: Kolkata Municipal Corporation (day) parking charges (2010-2011)

Category of parking space	Rate in Rs/ hour or part thereof, for first hour (in Rs.)*	
	Two wheelers	Cars and vans
A	3	7
B	2.5	6
C	2.25	5

Note: *additional charge at ½ of the rate will be levied for every additional 30 minutes after the 1st hour.
Source: Kolkata Municipal Corporation

Table 11: Kolkata takes the lead by hiking parking charges -- Rate Chart for Day Parking

Category of parking space	Previous parking rates rate/hour or part thereof, for first hour (in Rs)*		Revised parking rates effective from 1st August, 2011 rate/hour or part thereof (in Rs)*	
	Two wheelers	Cars/vans	Two wheelers	Cars/vans
A	3	7	5	10
B	2.5	6	5	10
C	2.25	5	5	10

Source: ICCT 2009, Innovative Transport Solutions (iTrans) Pvt. Ltd., TBIU, IIT Delhi, New Delhi., For: International Council for Clean Transportation (ICCT) & The Institute for Transport and Development Policy (ITDP)

The new draft parking policy also proposes that parking fee should be revised after every three years. To ensure maximum return from the public parking spaces there should be differential rates for different categories of vehicles according to the duration of parking for CBD and outer areas depending on for peak hour and off-peak hour. Parking fee schedule should be prepared by the ULBs in consultation with police authority.

Comprehensive Mobility Plan for Kolkata Metropolitan Area has also recommended increase in parking fees from Rs. 600 per month to Rs. 5000 per month or more.

Table 12: Guidelines for Provision of Parking Facilities In Buildings Of Different Occupancy

Residential	1 Two-wheeler Parking Space for units of covered area < 75 Sqm. + 1 Car Parking Space for units of 75 sqm. Covered area (C. A.)
Residential Complex of > 200 Tenements/ 1500 sqm. covered area	1 Car Parking Space (C.P.S.) for every 75 sqm. covered area + 5% of the Plot area to be free gifted to U.L.B. for Public Parking Space
Business	1 Car Parking Space for every 75 sqm. of covered area
Business Bldg. of covered area > 5000 sqm	1 Car Parking Space for every 75 sqm. covered area + 5% of the Plot area to be free gifted to U.L.B. for Public Parking Space
Mercantile (Retail)	1 Car Parking Space for every 50 sqm. of covered area
Mercantile Bldg. of Covered area > 5000 sqm	1 Car Parking Space for every 50 sqm. covered area + Plot area equivalent to 10 % of the covered area to be free gifted to the U.L.B. for Public Parking Space
Assembly (Eating House, Restaurants, Bars, Clubs etc.)	1 For Covered Area of > 100 sqm. 1 car parking space for every 50 sqm. Covered area
Hotel, Boarding House	Minimum 2 car parking space
(General Category)	1 car parking space for every 10 guest rooms
Hotels, Serviced Apartments	2 c.p.s.for every 100 sqm. of covered area/part thereof
Theatre, Cinema, City Hall, Dance Hall, Auditorium, Seminar Hall etc.	1 Car Parking Space for every 50 sqm. Covered area + plot area equivalent to 10 % of the covered area to be free gifted to the U.L.B. for Public Parking Space.
Institutional - Hospital, Nursing Hm. & similar use	1 c.p.s. for every 50 sqm. of covered area/part thereof
Institutional- Same use with > 200 Beds	1 c.p.s. for every 50 sqm. c.a.+ plot area eqv. to 10 % of the c.a. to be free gifted to the U.L.B. for P.P.Space
Educational (Primary Schl.)	1 c.p.s. for every 100 sqm. of c.a.+ space for 1 Bus
Senior Secondary Schools	1 c.p.s. for every 100 sqm. of c.a.+ space for 2 Buses
College, University, Trng Inst. on land area>10,0000sqm.	1 c.p.s. for every 100 sqm. Of c.a.+ plot area eqv. To 10 % of the C. A. to be free gifted to the U.L.B. for Public Parking Space
Industrial Storage- Wholesale Trading	For c.a. over 100 sqm. - 1 c.p.s. for every 100 sqm. c.a. + 1 Truck Parking Space for every 200 sqm. of c.a.

Source: Parking Policy In Kolkata Metropolitan Area, KMDA, 2011

NEED RESTRAINT

The policy thrust of the City Mobility Plan and the new draft parking policy remains supply driven. The overall policy thrust is still on increasing parking supply indefinitely. The demand management principle is not as strong. It has proposed off-street car parking facilities for all categories of new development. It hopes to provide for "appropriate number of car parking facilities in a building. It wants to promote incentives for additional car parking facilities to be used as public car parking facility." It proposes introduction of incentive in a particular plot in the form of additional floor space with the provision of minimum 10-15 numbers. It provides for free

gifting of the parking space to the ULBs/civic authorities. It seeks to encourage the provision of parking facilities for long duration in commercial, business and assembly buildings with the introduction of incentive in the form of additional floor space and it is to be adopted with the concurrence of the ULBs.

It proposes generation of off-street parking facilities in already built-up areas at locations of major vehicular and pedestrian concentrations with provision of underground parking in nearest parks/public open spaces and construction of multistoried parking structures having commercial activities. It asks for mandatory provision of public parking facilities in the development control regulations for redevelopment of existing structures and should be supplemented with the introduction of incentives in floor area ratio. It also asks for construction of additional building on existing plots; redevelopment of markets, sub-urban station areas etc; Immediate provision of car parking facilities in the CBD areas of Kolkata and Howrah; provision of public parking facilities by the side of the highways /expressways at an interval of 3-4 km. if Possible it should be integrated with the petrol pumps. There is also provision of parking facilities in Kolkata port area and nscb airport area.

The recommendations of the City Mobility Plan thus give out mixed signals. At one level it has taken on board the principle of user pay principle and has asked for rationalization of parking charges as a demand management tool. It has stated that the low parking fee structure should be immediately dealt with and there should be substantial hike in the parking fee, to deter people from using personal vehicles and to recover economic value of the parking lots, they could be clubbed with market places, malls etc.. It has also said that the on-street parking should not be encouraged and should completely do away with.

It also states that the present value of land in Kolkata Metropolitan Area varies between Rs 1000 per ft to Rs 3000 per sq ft. But car parking that uses up such expensive land pays pittance for it. Increase in the parking fee is the right step to discourage car ownership. The parking fee in Kolkata Metropolitan Area is significantly low (Rs 3 to 14 per hour) considering the present value of land in Kolkata Metropolitan Corporation, starting from Rs.1000 per sq. ft to Rs. 3000 per sq. ft., and significantly low parking fees it was found that in KMC parking lots are the least fiscally productive of all other land uses. Thus, the opportunity costs of the parking lots in KMA are high and these lands can be brought under economic importance.

But the policy has also put a lot of emphasis on parking supply. It states that the demand for parking space will go up exponentially, with just 6 per cent road space available to the city. KMDA has also proposed provision of adequate off-street parking facilities within the individual premises as well as in the off-street parking lots to meet the increasing demand. The Comprehensive Mobility Plan for Kolkata Metropolitan Area also recommends construction of 13 new off-street parking sites.[xxxvi] Some need based augmentation may happen. But over emphasis on incentives in FAR to ensure and encourage generation of off-street parking facilities, among others creates strong incentive to stimulate parking supply and detract from the NUTP principle that parking policy should be a demand management strategy.

THE WAY AHEAD

The National Urban Transport Policy endorses travel demand management principles. When combined with priced parking, limit on parking space and improved access through other modes of transport, parking strategies can help to switch to alternative modes of travel and restrain car usage.

Manage parking well: The first step is always about managing on-road and off-road parking to reduce traffic chaos. International experience shows that efficient utilisation of legal parking lots can increase parking capacity by atleast 20-40 percent. It prevents illegal parking and frees up space. Cities like Delhi and Pune have begun to demarcate legal parking areas to improve enforcement. The draft parking policy in Kolkata has highlighted important aspects of on-ground implementation. The city is looking at designating on-street parking areas, efficient utilisation of parking lots – valet parking, upgradation of metering, IT application, improved user information, and management for spill over. Strict penalty for violation of parking rules, illegal parking and walkway encroachment are important. It needs strict penalty for violation of rules. Tokyo and other Japanese cities have successfully implemented stringent penalty for parking violation that has pushed up the marginal cost for car owners.

For the multi-level car parks the policies often make the assumption that more off-street parking can curtail on-street parking and congestion. But global reviews show that it is erroneous to think that plentiful off-street parking can automatically reduce on-street parking. This can happen only if parking is banned in selected areas. On-street parking always remains attractive as it is most convenient. Additional measures are needed to discourage on-street parking and parking overall.

Free parking should be allowed only to non-motorised transport – cycles and cycle rickshaws. Parking rates should be higher for bigger cars and SUVs. Control roadside parking. Protect footpaths/ pavements from parked cars.

How much parking is enough? Cities have adopted parking standards for different land uses and building types but without a common matrix for defining norms. Delhi specifies parking slots per 100 sqm; Kolkata and Pune per 75 sq meters; Hyderabad specifies a percentage of a built up area for parking and so on. However, Indian cities specify minimum parking needed. Norms allow individual and private parking that cannot be shared with others. These spaces are not counted towards the allowable floor area.

The rigid standards have the risk of creating over capacity in areas that are well connected with public transport. But globally, governments are setting maximum allowable standards. This caps the number of available parking lots. In Hong Kong, the office buildings in the central business district can have zero parking as these areas are very well connected with other modes. Residential parking requirements also vary with accessibility of an area. In Netherlands parking standards vary based on the accessibility of each location.

Indian cities must account for the changes in parking demand with improvement in public transport and accessibility. For instance, — In Connaught Place in Delhi, parking demand has dropped by 10 percent after coming of metro. Kolkata has also prepared a template for improved public transport networks. This is expected to reduce parking demand in they targeted areas. It is therefore prudent to consider that in planning avoid creation of over capacity.

More cars do not necessarily mean provision of more parking. Delhi with 115 cars per 1000 people allows 3 parking slots per 100 sqm in commercial areas. In contrast Tokyo with 400 cars per 1000 persons allows only 0.5 parking slots per 100 sqm in central business district.

Parking should be – as far as possible — common and shared and not serve each building individually. This is being done in Tokyo, Taipei etc. This will also help to reduce development cost of buildings.

It must also be noted that Aizawl in north east has made parking availability conditional to car ownership and purchase. Tokyo experience shows that a combination of low parking requirement, parking pricing and putting the onus of finding parking space on car owners can reduce parking demand effectively.

Before city authorities get generous with parking spaces they must assess other potential uses of the urban space for school, affordable housing, or public green spaces. Also neighbourhoods with public parking can just park, pay and walk!

Price parking adequately to eliminate hidden subsidies: Indian cities need to price parking effectively to reduce car usage. Global experience shows that appropriately priced parking can reduce automobile commuting by 10-30 per cent especially if linked with transportation choices. In Shenzhen, China for instance, hike in parking fees during peak hours led to 30 percent drop in the parking demand.

Indian cities need to move towards full cost pricing. The NUTP has said land is valuable and parking occupies a large part of it; levy high parking fee linked to the value of the land to make public transport more attractive. An assessment of the multi-level car park in Delhi shows that the parking charges should be as high as Rs 39-40 per hour to recover the capital costs of the structures. But the actual rates are as low as Rs 10 per hour.

But it is improbable that city governments can ever fix parking fees to recover the land cost, capital costs and maintenance costs of the parking spaces. Politics will push for populist brownie points and continue to cap the parking rates. But parking pricing like the rent need to be market driven. It is not government's obligation to regulate and subsidise parking fees nor is this the legal right of car users to demand so. The onus should be on the parking operators to recover their costs and profits. The market will find its own level, price will respond to demand and be fixed at a level above the floor price that optimizes the use of the parking area, ensures that at least 85 percent of the parking is full during the peak hours.

Introduce variable parking rates according to peak hour, duration of stay etc. The intelligent parking system through card readers which automatically note down the check-in and check-out timings of the vehicles at the parking lots and deduct the charges from the pre-paid cards cash balance for the used time has been found to be yielding good results and resultant parking discipline has considerably improved. However it should be coupled with high charges so that people prefer to visit commercial areas in public transport.

This will force government to improve connectivity of the locations. Bogota has removed limit on the fees that private parking companies can charge. The increased revenue is used for road maintenance and public transit improvement.

Parking revenue for public good: The NUTP has stated that revenue from parking should be used for public transport betterment. This is one of the potential revenue sources for creating dedicated urban transport funds under the JNNURM programme. The government can decide the terms of parking lease and through periodic license renewal help to enhance revenue.

The parking spaces should be taxed at the same rate if the land was used for other developments. This will also help to offset revenue losses from the other potential uses of the land. Well managed parking and increased/free pricing can help to augment the returns and also maximize the revenue gains to fund other sustainable practices. Parking revenue can be used for other congestion reduction strategies

Parking for multimodal integration: Parking can be creatively deployed for multimodal integration of – buses, cycling and walking. Cities like Delhi are developing guidelines for transit oriented development and integration of interchange points. These guidelines are expected to prioritise parking needs of buses, inter-mediate transport and cycles followed by car in the influence zone of mass transit network and terminals. Global experience shows that car parks for park and ride on high value land near mass transit stations do not make economic sense and are wasteful especially in dense city core of Indian cities that are served well by good public transport systems.

FAR relaxation can over supply parking with a eye on commercial real estate gains. This strategy should be reviewed. Use multilevel parking as much as possible for integrating public transport modes (buses, trains etc) and pedestrianisation of city centres and remote parking. City core however will not require car feeders to public transport. People can park their personal vehicles in these parking structures and use public transport or walk. Indian cities already have dense mixed land use planning. This is an opportunity to keep our travel distances short and more amenable to using public transport, cycling, walking etc. Policies should continue to encourage mixed land-use growth and prevent sprawls that increase car dependence.

GLOBAL ACTION: CHANGE IS POSSIBLE

Leading global cities are using efficient parking management and the travel demand principles to make cities livable. Even in the car centric US, Boston that was unable to meet the clean air standards, froze their parking requirements at a level that is only 10 per cent higher than the 1973 level. This has helped Boston to meet the federal clean air standards. In New York very high parking fees and limited parking supply have lowered car ownership far below the average rates in other US cities. Portland, Oregon has set an overall cap of parking spaces downtown. This has increased public transport usage from 20-25 per cent in the 1970s to 48 per cent in mid 1990s. In Bremen, there is no free parking in city centre. Parking charges are higher than public transport cost. Globally, customers agree to pay high parking charges if they get good shopping and pedestrian environment. This also improves business.

Need parking strategy for residential and mixed land use areas: Develop common parking, link parking with car ownership, monthly permits for on-street parking on residential areas etc.

PUBLIC SUPPORT

The biggest disconnect is poor understanding of the multiple goals of a parking policy. The benefits of parking as a travel demand management tool for both car owners and non-car users and environment are not well understood. There is strong resistance to priced parking as evident from the recent High Court case on shop keepers opposing priced parking in the upmarket area of Khan Market in Delhi.

With improved parking management, car users can have more reliable information about availability of parking spaces and reduce cruising time. Efficient billing makes payment more transparent and accurate. This decreases traffic chaos. Smoother parking reduces social tension, road rage and law and order incidences rampant in cities.

This can also protect footpaths and allow barrier free walking and cycling, play grounds and improves access to metro/bus-stops. This improves road safety. It can be easier for emergency vehicles like ambulances, fire trucks, police, etc. to reach all homes, offices, and buildings. Walkable neighbourhood fosters mixed use, improves green areas, recreational spaces and overall environment.

Global experience shows that when parking policy is designed as a travel demand management tool it reduces car usage and congestion, air emissions as well as fuel use.

Global initiatives on parking policy

Use this as an instrument to reduce pollution and congestion

Leading cities around the world are using more efficient parking management and the travel demand principles to address multiple problems and create more livable, and therefore attractive and economically vibrant, urban environments. Some key examples:

Portland: Oregon set an overall cap of 40,000 parking spaces downtown. This increased public transport usage from 20-25 per cent in the 1970s to 48 per cent in mid 1990s.

Seattle allows a maximum of one parking space per 100 square metres at downtown office

San Francisco limits parking to seven per cent of a downtown building's floor area

New York: Very high parking fees and limited parking supply lowers car ownership far below the average rates in other US cities.

Boston has frozen parking requirements at 10 per cent higher than the 1973 levels. This has helped Boston to meet the federal clean air standards.

Bogota has removed limit on the fees that private parking companies can charge. The revenue is dedicated to road maintenance and public transit improvement.

Shenzhen: Hike in parking fees during peak hours leads to 30% drop in the parking demand.

Tokyo: Enforcement against parking violations cuts congestion drastically . Private firms allowed to issue tickets for parking violations. This makes on-street parking expensive.

Bremen: No free parking in city centre. Parking charges higher than public transport cost.

Globally, customers agree to pay high parking charges if they get good shopping and pedestrian environment. This also improves business.

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