Report:

Second Generation Reforms for Air Pollution Control in Delhi:

Examination of the issues raised in the IA 179 submitted by the *Amicus Curiae*

In Response to the Hon'ble Supreme Court Order Dated February 14, 2003

(**In the matter of W.P.(C) No.13029 of 1985; M.C. Mehta v/s UOI & others**)

April 2003

Environment Pollution (Prevention & Control) Authority
for the National Capital Region

Executive Summary

EPCA's mandate

The Hon'ble Supreme Court in its order dated February 14, 2003 has given the following direction to the Environment Pollution (Prevention and Control) Authority (EPCA):

"I.A No. 179: The Bhure Lal Committee is requested to submit a report within four weeks. List this I.A. after the report is received."

This order was passed in response to the intervener application (IA 179) filed by the *Amicus Curiae* for the ongoing public interest litigation on air pollution in the National Capital Region of Delhi to the Hon'ble Supreme Court on 15 July 2002. In this IA *Amicus Curiae* had raised the following issues and sought appropriate directions from the Hon'ble Court:

Traffic congestion

"The Hon'ble Court had passed various orders from time to time to deal with the problem of abatement of air pollution in the city, *inter alia* by directing the authorities to take various steps to reduce congestion in traffic. It cannot be denied that congestion is one of the major contributors to the problem of air pollution caused by vehicles. It, apart from causing a waste of precious resources of fossil fuels, leads to increase danger of accidents." "To deal with these problems this Hon'ble Court had directed on November 20th, 1997, and further on Dec 16th 1997, the authorities including the Delhi police to take various steps directed towards addressing the traffic problems in the city. The Delhi police had initially filed status reports, but has now stopped doing so."

Number of three-wheelers

"One of the specific directions which had been issued to the transport department was a freeze on the number of three wheeler – this Hon'ble Court had directed on 16.12.97 that no permits for three wheelers would be issued – only a replacement of an existing three wheeler with a new three wheeler would be permitted."

"It has been reported that there has been a significant increase in number of three wheelers despite the order of this Hon'ble Court. It is therefore, necessary to direct the Delhi transport department to file a status report in relation to the number of three wheelers on the roads, and the steps taken by them to implement the order."

Interstate bus terminus

"The Hon'ble Court had by its order dated July 28th 1998 *inter alia* directed the setting up of interstate bus terminals so as to ensure that the buses do not enter the city. It is important direct a status report on the compliance of this order since it has been reported that the terminals have not as yet been set in place."

By-pass goods vehicles

"By the order dated 6.12. 2001, this Hon'ble Court had directed that on and from 16th January, 2002, no heavy, medium, and light good vehicles would be permitted entry into the city unless they were carrying goods for delivery elsewhere. … only those goods vehicles paying octroi/toll tax to carry goods to or from Delhi would be allowed to ply. Current newspaper reports suggest that even this order has not yet been fully complied with. It is submitted to obtain from the Delhi government a status report in this matter."

New and in-use norms for two-wheelers

"It has been pointed out in certain reports that the future emissions standards for two wheelers are not commensurate with the needs of the city. International standards cannot be blindly adopted and applied as these two wheelers are a particular Asian problem. Therefore, we have to evolve emissions standards for new vehicles as well as in-use vehicles keeping in mind the

ecology of the city. Bhure Lal Committee should be directed to examine the question of appropriate future standards for new two wheelers, current norms for in-use two-wheelers and their inspection system and also directed to recommend other measures including phasing out of old two-wheelers (if feasible) by evolving a suitable scheme for their replacement/buy back."

Pollution under control certificate
It has also been reported that the "pollution under check" system being operated by the Delhi transport department leave much to be desired. It is submitted that Bure Lal committee be directed to examine the system, define the in-use emissions norms and to direct any improvements it considers appropriate."

Safety inspection of CNG buses
The ministry of road transport and highways had issued a notification (no GSR 853 (E) which codifies the safety code of practice AIS – 028, on November 19, 2001. This notification came about as the Honb'e Court's concern about emissions norms and safety standards. However, it has been learnt that that this critical notification will only come into effect on November 16, 2002. Therefore, all buses new and converted, which are currently coming on to Delhi roads do not meet the norms, safety standards and inspection procedures laid out in this notification."

On the basis of this the *Amicus Curiae* had sought the following directions on the matters listed above from the Hon'ble Court:

(a) "Direct the Delhi Police and the Delhi Transport Department to file a status report as to the compliance of the orders from this Hon'ble Court dated November 20th 1997, Dec 16th 1997 and July 28th 1998 indicating the extent of compliance and in particular clarifying the matter relating to the number of three wheelers that have been permitted to operate and the establishment of the interstate bus terminals."

(b) "Direct the Delhi transport department to and the Delhi police to file a status report in relation to the compliance of the order of this Hon court dated 6.12.2001 relating to the restriction on entry of light, medium and heavy good vehicles into Delhi for purpose of transit alone."

(c) "Direct the Bhure Lal Committee to examine the matter is referred to in para 6 and 7 of this petition and submitted its report thereon." (pertain to two-wheelers and PUC).

(d) "Direct the immediate implementation of the aforementioned notification (No. GSR 853 (E)), alongwith the appended safety code of practice (AIS-028)"

(e) "Direct the Delhi Government to set up immediately an effective inspection system to enforce the notification and safety code of conduct."

(f) "Grant such other and further relief as may in the interest of justice be considered necessary…."

The Hon'ble Court has directed EPCA to specifically respond to the following issues listed in the IA 179:

- New and in-use norms for two-wheelers
- Pollution under control certificate

With regard to the following issues the Hon'ble Court has directed the implementing agencies to file a status report.

- Traffic congestion

- Number of three-wheelers
- Interstate bus terminus
- By-pass goods vehicles
- Safety inspection of CNG buses

Summary recommendations

EPCA has therefore divided this report in two parts:

Part I: In this part EPCA has conducted detailed examination of the two specific issues on which the Honb'le Court has given specific direction to EPCA: I) Pollution Under Control (PUC) certificate programme and ways to improve vehicle inspection programme in Delhi and, ii) Assessment of the proposed and in-use norms for two wheelers.

Part II: Keeping in view the larger mandate of the EPCA that of monitoring progress of all orders passed by the Hon'ble Court, EPCA has deemed it fit to give a report on other matters listed in the IA 179 to provide a comprehensive status on these matters and indicate ways in which strategies can be further developed and refined to address these problems.

EPCA is of the view that IA 179 opens up a much broader perspective on vehicular pollution problem and its control in the national capital region of Delhi and provides an opportunity for more holistic intervention to set the future roadmap for a cleaner Delhi.

Significant improvements have already been made in Delhi to control vehicular emissions under the aegis of the Hon'ble Court. So far the transition has come about due to the Hon'ble Court's intervention, which forwarded Euro II emissions standards for new vehicles, lowered sulphur content in diesel and petrol to 500 ppm, mandated clean fuels like CNG for public transport, and phased-out 15 year old commercial vehicles. The Court ruled for better inspection and maintenance programme for in-use vehicles, strengthening of air quality monitoring and checking adulteration. These first generation reforms have made significant impact on the city's air and are even setting the agenda for other cities as well.

But these gains can be frittered away easily if the future roadmap is not set immediately to keep up the momentum. This is a serious challenge in a city, which already has more than three million vehicles and is adding more than 100,000 vehicles every year. For all its efforts the Court action have just about stabilized the run away pollution. But a lot more would have to be done to substantially lower it to meet the air quality standards to protect public health in the city. EPCA notes with great concern that the air pollution levels especially particulate levels have once again shown high trend in the recent months. In view of this EPCA would like to state that there cannot be any let up in the city's effort. There is need for consistent, sustained, and aggressive strategy to lower emissions from vehicles in the city.

EPCA recognizes that implementing the first generation reforms comprehensively directed by the Hon'ble Court in its July 28, 1998 order and supplemented by a series of subsequent orders till date has helped to stabilise pollution. It is now time to frame the second set of composite reforms that can be initiated immediately to keep up the momentum in Delhi and control air pollution. The guiding principles for second generation reforms would include the following:

- Leapfrogging strategy to advance fuel quality norms and emissions standards to phase in clean vehicle technology as fast as possible. Though following the Supreme Court intervention Delhi has been able to reduce the time lag in implementing the European mass emissions standards to 5 years, it is still too lax and decisions should be taken to catch up with the latest and the current European standards by at least 2005.

- Prevent high in-use emissions with improved vehicles inspection programme and more realistic and representative test procedures and greater manufacturers accountability. Only this an ensure that vehicles will remain clean during their useful life on road. Durability of engines and emissions control components cannot be tested without a rigorous inspection system.

- Need strong non-technical measures like transport plan to control number and usage of vehicles to address the problem of high pollution level in the city. All technical gains from technological improvements can be easily swamped if transportation plans are not effectively linked to air pollution abatement programmes.

EPCA now foresees that the **second-generation reforms** would be technically more complex and require very strong institutional and regulatory capacity to carry these forward. This poses serious challenge to the regulatory capacity of the government. The future action agenda would be much more difficult to implement than those achieved already.

Nonetheless, it is important to underscore that there are now wide technical and non-technical choices available but the task is to define priority actions and develop composite strategies to implement them. While efforts must be on to phase-in clean vehicle technology and fuels and leap ahead to catch up with the best standards, for most effective impact efforts would also be needed to reduce the number of vehicles on road. The future road map would have to be shaped up on the basis of an optimum combination of strategies for advanced vehicle technologies and a composite transportation plan that controls numbers and usage of vehicles in the city. This would require time bound implementation of hard decisions to reduce health cost of air pollution in the city.

From this perspective EPCA is of the view that IA 179 opens up the opportunity to look at a wide range of issues more comprehensively and design composite set of directions that the Hon'ble Court may consider. On this basis the following summary recommendations and a short statement of the problems and key issues which have detailed out in the subsequent sections of the report have been made in the key areas of intervention as listed in the IA 179.

Part I

A. Two-wheelers

Key issues

As IA 179 points out two-wheelers are a uniquely Asian problem. In Europe and the US these vehicles are very small in numbers and contribute very little to the total air pollution load. But two wheelers are the dominant and a very polluting mode of transport in Indian cities. Therefore, technological solution to this problem will have to emerge from within Asia and more so in countries like India that are the major producers of two–wheelers. These vehicles should be the focus of intense research and development to leapfrog them to near zero to zero emission levels as fast as possible in a given time frame. It is therefore, important to have technology forcing standards to accelerate technology development. EPCA recognises the unique features of this vehicle segment that primarily targets low to middle income classes in Indian cities and is extremely price sensitive. This would require a fiscal strategy to cushion the cost of improvement.

The Supreme Court has rightly drawn attention to the issue of two-wheeled vehicles in the NCR, largely driven by two-stroke engines, for these have been identified as an increasing source of air pollution in the region. Two strokes have special problems as inefficient combustion, allows fresh fuel charge to go out unburned and lead to high emissions of unburned hydrocarbons. Traditionally, these vehicles have been associated with high hydrocarbon and carbon monoxide

emissions and so only these pollutants in addition to nitrogen oxides are regulated from these vehicles. But what has been ignored so far is the very high level of particulate emissions and other toxics like benzene from two-stroke engines. If these technologies are still being produced it is important that these emissions become the focus of regulation.

Moreover, the immediate cause of concern is the very large fleet of old and ageing two-wheelers predominantly powered by two-stroke engines. Fast fleet renewal is therefore critical to meet the air quality objectives in the city.

EPCA therefore recommends the following:

1. New mass emissions standards

a. Union of India specifically Ministry of Finance be directed to implement emissions based tax for early introduction of new norms:

Ministry of Road Transport and Highways (MRTH) has issued the draft notification on the new mass emissions standards for two wheelers to be implemented from 2005. EPCA has reviewed this draft. Keeping in view the need for fast acceleration of technology development in this sector EPCA recommends emissions based taxation that allows tax credits and incentive to the industry to meet the new emissions norms before time. This will be more meaningful if emissions standards for 2005 and 2008 are announced together and linked to fiscal incentive to make industry meet those norms in advance. The Auto Fuel Policy has already recommended the next batch of emissions standards for 2008. This is very important keeping in view the fact that even after meeting the tighter norms – 1.5 gm/km for CO in 2005 a new two-wheeler would emit more CO compared to a Euro IV compliant car in Europe (1 gm/km).

Only this can help to clear the uncertainties over the future road map and help in early introduction of advanced technology. In this context EPCA would like to mention that a similar recommendation was made by EPCA earlier in its report of October 1999 on the same matter which stated: “In order that manufacturers see benefit in early tightening of the emission norms, and their possible advancement for Delhi and the NCR, an emissions tax may be suggested. This could be of two types – the one by the Central Government to manufacturers, that is linked to the emission norms, being lower on vehicles conforming to the tighter norms, and higher the older the vehicle gets, and providing incentive to the manufacturers to hasten technology changes and the introduction of vehicles based on future norms.”

EPCA also understands that Indian manufacturers have developed alternative fuelled two-wheelers like LPG etc. Announcement of tighter norms in advance will provide opportunity to this segment to develop fast and have an advantage in meeting tighter standards within a tighter time frame.

b. Ministry of Road Transport and Highways be directed to set particulate emissions standards for two-stroke two-wheelers to be enforced from 2005: Studies from the across the world and also from ARAI, Pune have shown how particulate emissions from two-stroke powered vehicles are emerging as a key concern. EPCA would therefore recommend regulation of the PM emissions from these vehicles and set PM standards. Therefore, develop methodology for measuring particulate matter emissions from two-stroke engines and set PM standards for these vehicles and enforce them by 2005.

It is important to mention here that current efforts are not sufficient to address the problem particulate emissions from two-stroke engines. For instance, pre-mixing of lube and fuel has been made mandatory to check misuse of lubricants to control smoke emissions. But it is not clear how effectively this has been able to prevent misuse of lube oil available loose in the market. If a

blanket ban is not a practical approach to deal with two-stroke engines, it is more important to have PM emissions standards. EPCA notices that already with tighter emissions norms in force share of four-stroke engines is steadily increasing over the years. Currently the share of the four-stroke two-wheeler sale is estimated to be more than 60 percent of the new sales. Technology forcing standards is therefore critical in eliminating the technologies that don't transform keeping pace with the air quality objectives.

c) Direct ministry of petroleum and natural gas to regulate total aromatics immediately in addition to 1 percent benzene already in place to reduce high toxic emissions from two-stroke two-wheelers: High scavenging losses from two-stroke powered vehicles results in very high unburnt hydrocarbon emissions. As a result, even the unregulated emissions like benzene could be very high. Hon'ble Supreme Court has already directed lowering of benzene to one percent in the NCT Delhi. But total aromatic in petrol is still not regulated. This also contributes to the formation of benzene during combustion. Thus, commensurate fuel quality improvements along with engine design improvements are urgently needed to control unregulated emissions like benzene. EPCA is recommending a fuel quality strategy as there is hardly any information available on regulating these emissions from vehicles.

2. In-use standards for two-wheelers:

The recommendations on in-use standards for two-wheelers should be read in conjunction with the section on PUC in this report that discusses in detail the limitations of the current PUC test procedures and standards and the scope for further improvement. EPCA would like to point out that upgradation of vehicle inspection system and norms would require considerable detailing with regard to technical and institutional requirements that cannot be included in totality in this report. EPCA has highlighted key issues of concern and findings in this report. But comprehensive technical assessments of the current PUC programmes are now available from independent sources - World Bank and Centre for Science and Environment (CSE) that are appended to this report. MRTH should take note of the findings and make a composite plan to improve the vehicles inspection test procedures and standards to meet the objective of these programmes effectively. EPCA would however highlight some key recommendations in this regard to set as a benchmark for upgrading the current system.

In its recommendations EPCA would like to mention that in addition to upgrading the current PUC system which is already on the official agenda a more advanced vehicle inspection programme be initiated on a pilot basis in Delhi that can become the basis for replication in other cities as well. But the beginning would have to be made in Delhi right away. To enable establishment of pilot project in Delhi MRTH would have to notify appropriate test procedures and norms under the Central Motor Vehicles Act and rules for I) upgrading the current PUC programme and ii) adoption of more advanced test methods and norms for phasing in centralised inspection programme. With introduction of tighter mass emissions standards and better fuel quality and an extensive CNG programme in place Delhi would require a more advanced vehicle inspection system to match the diverse levels of technology on road.

Ministry of Road Transport and Highways (MRTH) be directed to:

a. Notify effective and tighter PUC norms for two-wheelers immediately. MRTH is currently reviewing the PUC norms for two-wheelers along with other vehicle segments. As discussed in the main report the proposed norms are too lenient to make an impact. Technical review of the proposed norms as available from the World Bank and CSE technical studies show that the proposed idle HC norms of 9000 ppm for two-stroke engines for instance is very lax and will rarely ever fail any vehicle. In view of this tighter norms should be notified according to technology levels of vehicles on road to target gross polluters effectively (normally 20 percent of the fleet at a given time). In addition to this smoke opacity test should be adopted for two-

wheelers under the current PUC programme. Upgrade the PUC test methods to ensure accuracy and integrity of tests conducted (like dilution control through measurement of carbon dioxide and oxygen in the exhaust, lambda control etc). This issue has been discussed in greater detail in the PUC section.

b. Notify simultaneously commensurate test procedures and norms for in-use two-wheelers to implement advanced inspection test procedures to replace PUC in a phased manner: MRTH be directed to develop advanced test procedures for two wheelers to phase in enhanced inspection and maintenance programme in Delhi. EPCA has been informed that ARAI is developing a simple roll test on a dynamometer for two wheelers. This should be urgently expedited and applied under the new inspection system.

It is important to mention here that advanced inspection procedures are required for two-wheelers especially in view of the influx of new two-stroke engines fitted with oxidation catalyst with 30,000 km durability. Only effective inspection can detect the efficiency status of these devices and enable their long-term management in terms of periodic replacement if needed.

3. Emissions warranty

Poor durability of engine and emissions control equipment like catalytic converters are serious problems and therefore establishing the principle of manufacturers' responsibility for on-road performance is of critical importance. It is important to note that though voluntary emissions warranty has been offered collectively by the two-wheeler industry in India it cannot be implemented effectively under the current PUC system. To implement emissions warranty more advanced vehicle inspection system will have to be adopted. This would also require a comprehensive legal framework for enforcement. This should be defined as early as possible.

4. Fiscal measures to renew the old fleet and also control explosive increase in two-wheeler numbers in the long run:

The Delhi government be directed to design fiscal measures to renew old fleet of vehicles and further control increase in their numbers in the city. EPCA agrees with IA 179 that fast renewal of the on-road fleet is urgently needed to replace the older vehicles with new vehicles meeting more stringent norms. Originally, the Ministry of Environment and Forests (MEF) had recommended phase-out plan for two-stroke engines in the city based on the age of vehicles. But this could not be enforced. Instead of waiting for the old ones to die out and be replaced slowly by new vehicles with controlled emissions will take unacceptably long time. In view of this EPCA would like to propose a combination of meaningful and effective fiscal measures that will encourage and force fast replacement of old fleet. It is very important to target the older fleet with the following fiscal measures that can discourage their ownership and usage.

The combination of fiscal measures can include the Following:

Impose periodic taxes on two-wheelers to make ownership and usage of old vehicles more expensive: This should be more frequent and higher for the older age groups. Currently, only commercial vehicles are required to pay an annual registration fee but private vehicles are not yet covered. This anomaly should be corrected.

Periodic taxes can be imposed according to the mass emissions standards these vehicles meet. This recommendation has already been made by EPCA in its October 1999 report. EPCA would like to reiterate the same point once again. The report had then stated, "Tax imposed on existing on-road vehicles, linked again to the emissions, getting higher for the older vehicle, and based on the age or the broader distinction of pre- and post- the various emission norms. Thus, a vehicle 20 years old could pay more tax than a vehicle 15 years old; alternatively, the pre-1991 could pay higher tax than one post-1991, and that higher than the post-1996 one." Such a

scheme of taxation linked to emissions of the vehicle would encourage both manufacturers and owners to move to advanced technology fast.

EPCA has already recommended a buy-back plan in its 1999 report -- an incentive scheme from the manufacturers and the government that reduces taxes/prices on vehicles bought in replacement of old vehicles, so as to make the replacement attractive to the owner. EPCA is of the view that instead of keeping the strategy confined to one such scheme it is important to design a composite tax policy that will incentivise fast renewal of old fleet.

5. Improve public transport to discourage ownership and usage of tow-wheelers: Controlling further increase in the numbers and usage of two-wheelers will be effective and possible only if a composite transport policy is framed to improve public transport in the city to meet the mobility demand. This is yet another recommendation that the EPCA had made in its October 1999 report stating "Only when this is done, and done efficiently, will it be able to provide commuters with a viable option to using their own vehicles, and thereby reduce the congestion of vehicles on the road. Although we have said this before, we cannot forbear from reiterating it, so important do we think this measure is to the orderly planning for traffic and air quality management of the city."

5. Improve public transport to discourage ownership and usage of two-wheelers: Controlling further increase in the numbers and usage of two-wheelers will be effective and possible only if a composite transport policy is framed to improve public transport in the city to meet the mobility demand. This is yet another recommendation that the EPCA had made in its October 1999 report stating "Only when this is done, and done efficiently, will it be able to provide commuters with a viable option to using their own vehicles, and thereby reduce the congestion of vehicles on the road. Although we have said this before, we cannot forbear from reiterating it, so important do we think this measure is to the orderly planning for traffic and air quality management of the city." It reiterates this recommendation and in this respect would like to draw the attention of the court to the recent efforts of the Delhi government to draw up a comprehensive public transport policy. These efforts need to be supported, endorsed and urgently implemented.

B. Pollution Under Control system

Significant measures with regard to improvement in fuel quality, vehicle emissions standards and introduction of cleaner fuels like CNG have been implemented to control vehicular pollution in the NCT Delhi under the aegis of the Apex Court. As a result of these changes the mix of vehicle technologies and vintage is very different in Delhi from that of many other cities of India. There are newer technologies and a uniquely large fleet of CNG vehicles in Delhi. The immediate issue therefore is how do we maintain their low emissions during their useful life on road and ensure that these meet the durability requirement.

This would require well designed vehicle inspection programmes matching different technology levels in the city. This poses serious challenge to designing an appropriate vehicle inspection programme for NCT Delhi. Delhi government has already been directed by the Hon'ble Supreme Court to establish a proper vehicle inspection system in Delhi by March 2000.

Currently, the only inspection system in place is pollution under control certificate programme (PUC). The main report details out the limitation of this programme and the ways to improve it. In the summary here EPCA would like to list out the key recommendations to improve the current vehicle inspection system. The recommendations are in two parts. I) Immediate improvement needed in the current PUC test procedures, norms, and institutional framework for auditing and supervision to make it more effective, and, ii) A phase-in plan to replace the decentralized PUC centers with centralized inspection only centres with more advanced test procedures and

commensurate norms and facilities. This will be done according to the priority order of vehicle categories. EPCA has taken into account the findings and observations of the two independent technical evaluations available from the World Bank and the Center for Science and Environment in this regard.

1. Improving the PUC system

1.1 Ministry of Road Transport and Highways be given the following direction

a. For petrol and CNG vehicles notify tighter PUC norms immediately:

EPCA has given a detailed assessment of the current and proposed PUC norms in the relevant sections. This shows how the current norms and test procedures are open to manipulation and allows all vehicles to pass. EPCA has been given to understand that MRTH is currently reviewing the PUC norms and is proposing to introduce idling hydrocarbon norms and revise the idling CO norms for petrol and CNG vehicles. **Technical reports discussed in the main report show that the proposed norms are too lenient to make an impact**. The current proposal of 1500 ppm of hydrocarbons for cars without catalytic converters and 750 ppm for cars with catalytic converters are too lax. Technical reports show that the comparable technology fitted with three-way catalytic converters in Europe cannot exceed 100 – 200 ppm.

Even if the norms should target in getting rid of the worst 20 percent or gross polluters from the fleet, from technical judgment as stated in the experts reports it appears that the proposed norms are too lenient for this. It is therefore, important to set meaningful and effective norms according to the levels of technologies (for example vehicles with and without catalytic converters etc). To meet the present and the future requirements of vehicle inspection programme appropriate test procedures and standards should be established immediately.

b. Upgrade the PUC test procedures for petrol vehicles

In addition to emissions tests it is important to monitor the additional testing parameters to ensure accuracy of tests and prevent manipulation of test results at the PUC centers. Since the MRTH is already reviewing the PUC norms and test procedures EPCA would like to state that the two technical reports on PUC system in Delhi have detailed out in great length the various technical improvements required in the current procedures. EPCA would like to recommend that the concerned agencies like MRTH, ARAI take note of the suggestions and recommendations in these reports and act on it to make the system more effective.

EPCA would like to highlight the key improvements needed to set the broad framework for inspection:

- For petrol vehicles shift to 4-Gas Analyzers calibrated and certified to measure idle CO, HC, carbon dioxide (CO_2), oxygen (O_2) for accurate testing. Measurement of CO2 and O2 as a dilution correction factor will eliminate the problem of tampering at the time of testing to dilute the exhaust by not putting the probe in the tail pipe correctly. Measurement of Lambda (actual air-to-fuel ratio compared to the stoichiometric ratio) should also be included.

- All the gas measuring equipment used must be controllable from the computer to ensure that automatic gas calibration and leak checks are being correctly performed every three days at a minimum and that “ambient and residual gas values are within limits before allowing the instruments to be zero referenced between tests. Computer control can lock out the instrument if any functional problem is detected.”

- Introduce both low and high idle measurements (emissions measurements at low and high speeds) for more accurate measurement immediately.

c. Upgrade PUC test procedures for diesel vehicles immediately

Need for improvement in smoke opacity test of diesel vehicles in PUC centres
Till the time more improved loaded test procedures are adopted for diesel vehicles it is important to further upgrade the smoke meters and test procedures in the PUC centers for accurate results. For instance: Such instruments must be provided to record smoke opacity, engine, lube oil temperature, ambient pressure and humidity. This would require a master reference table on recommended RPM and oil temperature for different engine models and software to store it.

MRTH be directed to notify loaded test procedures along with commensurate norms for different vehicle categories in bigger centralized centers to be set up in a phased manner in critically polluted cities like Delhi.

Assessment of the available information shows that even with improvements in the current PUC test procedures it will not be possible to measure other key pollutants of concern – particulate matter and nitrogen oxides from in-use vehicles. These pollutants cannot be measured under PUC system. To get more realistic test results for in-use vehicles that are representative of actual emissions on road it is important to introduce loaded mode tests on chassis dynamometer.

iv. Notify PM norms and test procedures for in-use diesel vehicles

PUC system has very limited value when it comes to measuring harmful emissions from diesel vehicles. Studies now conclusively show that smoke opacity test currently done under the PUC system has poor correlation with particulate emissions. It is therefore recommended that a short transient dynamometer test procedures for in-use diesel vehicles be defined and implemented in which both visible smoke and particulate matter are measured. MRTH will have to immediately notify loaded mode test procedures along with appropriate standards on a chassis dynamometer so that commercial vehicles (both diesel and CNG/LPG vehicles) can be introduced to improved I&M in Delhi.

It is important to emphasise that it is meaningless to have diesel in-use emissions test system that cannot monitor particulate emissions from these vehicles – that have very serious health consequences. Even after moving all buses to CNG, large number of light to medium duty diesel commercial vehicles are plying on the road. Even more worrying is the increasing trend in diesel car sales in the capital region. To allow such a large fleet of diesel vehicles to ply without appropriate and effective inspection can have serious implications for the particulate emissions that have been guiding all the Court rulings so far.

Notify improved in-use norms and test procedures for inspection of CNG vehicles

This issue has been discussed in some detail in the section on safety inspection for CNG buses in Part II of the report. But it is important to reiterate and highlight some special concerns regarding the emissions performance of the CNG vehicles. CNG is a clean technology that has been introduced to improve emissions levels drastically in the city. Maintaining the quality of the programme is therefore critical to get the full environmental benefit from it. But in the absence of effective vehicle inspection programme to check on road deterioration and durability, technology may deteriorate fast and nullify gains. It is important to note that while particulate emissions benefit of the CNG programme will always remain, other gaseous emissions may become unstable if rigorous inspection is not conducted. This may happen especially if emissions control technology like catalytic converters deteriorate fast.

The CSE technical report has stated that the idle CO emissions data for CNG buses available at Burari inspection center in Delhi are unacceptably high in the fleet that is relatively new**.** Statistics of 300 emissions measurements conducted at Burari during 2001 shows that 18 per cent of the tested buses had CO idle values of more than 3.0 per cent and about 60 per cent of the buses had CO values of more than 1.0 per cent. Experts noted that maximum idle CO of 3.0 per cent for CNG buses were too lenient, especially when all buses are equipped with catalytic converters. In the US a maximum of 0.5 per cent CO at idle is accepted for CNG buses, as compared to 3.0 per cent in India. According to the experts idle CO levels higher than 1 percent indicate that the catalytic converters are not working. It is advisable to reconsider the present limit value of 3.0 per cent. CSE technical report points out that in the absence of effective emissions inspection system, many CNG buses are coming in with after-treatment devices with poor durability. Catalytic converter is included in the exhaust emission control system by CNG engines manufacturers' in order to fulfill the standards for new vehicles/engines. But the performance warranty of converters is only 72,000 km. This should be compared with the European requirements for manufacturers' responsibility and warranty, which is eight years or up to 500,000 kms. The report states "what happens after this limit is unclear; according to our knowledge there is no requirement for changing the converter at specified driving distances and no specific control is carried out during the annual fitness check."

Apart from the CNG buses, it has also been brought to EPCA's notice that some three-wheelers plying on CNG are emitting excessive white smoke. EPCA has looked into this problem. Inferior quality piston ring that wears off fast leads to leakage and high consumption of lube oil that cause excessive smoke. Poor maintenance also compounds the problem. This problem can be addressed only if more improved standards both mass emissions and in-use emissions standards are notified and rigorous inspection initiated to accelerate technology development and discipline maintenance habits.

EPCA therefore would like to emphasise that both new and in-use emissions standards for CNG buses and other CNG vehicles be made tighter and inspection procedures made more rigorous to improve the quality of the CNG technology. The test procedure for emission measurement should be transient loaded mode test focusing on measurement of NOx. CNG vehicles would require NOx emissions tests that are possible only on dynamometers.

Emissions warranty and recall programme: As mentioned in the two-wheeler section vehicle inspection programme should be designed to enable fast implementation of emissions warranty and recall programme. More advanced vehicle inspection should be phased in on a priority basis so that emissions warranty as offered by the manufacturers already and a recall programme can be implemented effectively. Under the recall programme the government can conduct independent tests on batches of vehicles in the market to check compliance with emissions norms. If inherent technical defects are detected in the engine and emissions control components for which manufacturers are responsible, they would be asked to recall the entire batch of the vehicles and remedy the problem at their own costs. This is the only way manufacturer's can be held responsible for durability and emissions performance of their products. Auto Fuel policy also recommends implementation of this.

Improvement in the inspection infrastructure in Delhi

Setting up of the inspection infrastructure, supervision and auditing of the inspection system is the responsibility of the state government. Delhi government should be directed to develop a vehicle category-wise inspection programme for commercial vehicles with the requisite trained and skilled staff to undertake to execute such a programme.

The Hon'ble Supreme Court has already directed that I&M programme be started by the transport department and the private sector. EPCA has also recommended earlier to the Court to facilitate

private participation to undertake vehicle inspection. It is recommended that while actual physical inspection and setting up of inspection centers on build and operate basis can be contracted out to private parties the government focuses more on developing institutional capacity to supervise and audit the system. As and when privatization happens it should be done on the basis of open bidding process.

The following elements should be built into the improved inspection framework:

- A complete phase out plan of the numerous existing testing centers that are difficult to control and supervise must be scheduled. Even while upgrading the PUC system announce the plan to completely centralize the system in a given time frame. The bigger inspection only centres should be capable of testing large number of vehicles at a time.
- The sequence of introducing different categories of vehicle to the centralized inspection system should follow the order of priority with regard to most polluting categories. Move the commercial vehicles (diesel commercial vehicles and CNG buses, autos and taxis) first to centralised inspection centres where more advanced testing facilities are available. Since commercial vehicles already need to go through routine annual fitness check and emissions tests, the inspection center located at Burari in Delhi, should be immediately upgraded to meet the new requirements.
- Subsequently, phase-in all private vehicles within the ambit of centralised inspection with improved test procedures. Priority focus to be on two-wheelers and vehicles with advanced emissions control system like catalytic converters.
- For objective test results to be effective the test protocol must minimize the impact the test technician can have on the tests outcome. It is recommended that the test results not be made available to the test technician in the test lane until the computer has entered the results in the database. Otherwise, it is common practice for testers to prevent rejects from occurring by tampering with lane computer, test procedure or with the vehicle.
- Encourage privatisation of inspection centers with strong government supervision. Design strong regulatory frameworks for effective functioning of the private-public inspection centres.
- A lot of emphasis has been given on the role of strong government supervision and auditing of the entire inspection system to enhance credibility and reliability of the programme.
- Till the time the system is completely centralized improve the current PUC system (norms, test procedures and institutional framework for its enforcement).
- It is recommended that to ensure better quality of service and compliance, the periodicity of PUC certification for Delhi should be made every six months from the existing system of once every three months.

Computerise and rationalize vehicle registration system for effective enforcement of vehicle inspection programme: CSE report has pointed out that for an effective inspection programme a proper vehicle registration system should be put in place to record and reflect the actual numbers on road. For inspection and re-inspection of vehicles the registration officials must be able to trace problem vehicles and track their inspection status. The registration system should also detect vehicles that have not been inspected on time or have failed. It is important to rationalize and computerize the registration system to meet these objectives.

EPCA would like to summarise that the central government is only focusing on the basic PUC strategy for the whole country as the minimum national requirement. It has ignored the principle that has already been established by the Hon'ble Supreme Court with regard to mass emissions standards that critically polluted cities like Delhi would require more advanced action. While the PUC programme should be modified immediately along the lines discussed, more advanced inspection test procedures and norms should be developed alongside that can be introduced on a pilot basis in Delhi (for instance, loaded mode test on chassis dynamometer to enable more representative measurements of emissions). Even the proposed Auto Fuel Policy has

recommended adoption of short test for effective implementation of the inspection and maintenance programme which will measure mass emissions of in-use vehicles under transient cycle. ARAI and other concerned testing agencies have been asked to plan possible short tests for in-use inspection. It has further recommended developing these on a pilot basis.

Moreover, under the current legal provisions state governments can introduce tighter emissions norms for in-use vehicles. In this context EPCA understands that there is a need for synergy of action between the Delhi government and the Central Government to improve the current PUC system and to phase-in an advanced vehicle inspection system. While it is the responsibility of the Delhi government to set up an appropriate institutional framework for vehicle inspection and infrastructure for actual inspection, supervision and audits, it is the responsibility of the Central Ministry of Road Transport and Highways to revise and develop emissions standards and test procedures to be adopted for enhancement of the PUC system and advancement of the inspection programme.

Part II: Other measures

A. Reducing traffic congestion

EPCA notes with great concern the uncontrolled motorisation in the National Capital Region of Delhi. So far the vehicular pollution control strategy has been to improve technology and fuel quality. But these improvements can get easily swamped if the traffic volume is not controlled. Vehicular pollution would require both technical and non-technical measures for an effective control of vehicular pollution. Today the vehicular population of Delhi is higher than the combined vehicular population of Mumbai, Chennai and Kolkata. The city already has an extremely high number of two-wheelers, but it now shows a clear trend of a higher rate of growth of private passenger cars as well. There are more than three million registered vehicles in the city and adding 100,000 every year. This is not sustainable.

Such a policy with clearly defined incentives and disincentives for encouraging public/mass transport and discouraging private vehicles is required to control the explosive growth of private vehicles which are responsible not only for creating congestion but also for high levels of toxic emissions. Though technological advances like improved fuel quality, introduction of alternative fuels and advancement of emission norms have helped making the air cleaner, increasing number of vehicles has the potential to nullify the benefits achieved.

However, a simple transport plan providing only more options for public transport might not be enough. Provision of improved mass transit options has to be coupled with policies discouraging motorisation and further improving vehicle and fuel technologies. These include command and control measures like restricting movement of traffic in heavy-traffic zones, restricting and charging higher fees for parking, cleaning pavements of all encroachments and also fiscal measures like annualising private vehicle taxes and charging them at a higher rate than public transport vehicles.

Delhi government has already developed a transport plan. EPCA commends this effort as this is an essential element of pollution control programmes in the city. But it is possible to further build on it to set targets for lowering the rate of growth in number of vehicles in the city and link it to time bound programme based on expansion of public transport facilities in the city. Delhi government should be asked to develop a plan of action for this.

EPCA would like to recommend the following:

1. Set up unified authority to design and implement composite transport policy: One of the major roadblocks to framing such a policy and implementing it is multiplicity of agencies involved to carry out transport management and traffic laws and rules in the city. Therefore, the priority task should be to set up a unified authority involving all concerned departments and agencies under GNCTD and the Union government for developing policies on traffic and transport management for the city of Delhi. This agency should have statutory power to frame and enforce laws and rule meaningfully and effectively to mitigate congestion and improve the transport and traffic scenario of the city.

2. Delhi government be directed to design fiscal policies to check explosive rise in the numbers of private vehicles and submit a schedule for implementation: EPCA would like to emphasise the fact that this authority should focus on developing composite transportation policy framework to link transport planning with air pollution control strategies in the city. The immediate focus should be on augmentation of public mass transport integrated with flexible feeder service, rationalisation of tax system so as to tax private modes of transport at a much higher level than public mass transport, annualisation of taxes paid by private vehicles, provision of incentives for

cleaner modes of transport (cleaner fuels and vehicle technologies), and active encouragement of non-motorised transport.

B. Number of three wheelers in the NCT Delhi: Should their number be further increased?

Recommendations:

The Supreme Court of India had directed the Delhi government to freeze the number of three wheelers in Delhi at the current level in 1998. Subsequently, vide the order dated December 20, 2002, the Hon'ble Court allowed a further increase of 5000 three wheelers in response to the plea from the Delhi government that there is considerable commuter demand for the services of the three wheelers.

EPCA has examined the issue and would like to recommend that Delhi government be directed to undertake a study and present a plan to the Hon'ble court with regard to the following:

- Potential demand for the services of three-wheelers in Delhi and the extent of the increase in their numbers to be allowed
- A composite plan on how would these be deployed in case of further expansion in their numbers.
- Innovative models possible for short-haul/feeder services of these vehicles especially in the context of Metro Rail's expansion plans and decongesting the main arterial road,
- Incentive schemes for encouraging phasing in of battery operated zero-emissions three-wheelers

C. By-pass goods vehicles

Recommendations

EPCA has examined the complexity of the problem of transit traffic in detail to understand the control strategies in coming commercial traffic into the city. This is a very difficult problem to control largely because of lack of uniformity of emissions norms across the country that allows more polluting vehicles to be registered outside Delhi, poor enforcement capacity to check and stop the transit vehicles, multiplicity of authorities that compound the problem of enforcement, and lack of synergy of action among the concerned state governments to deal with the problem collectively. EPCA recommends that all serious efforts be made to implement the Hon'ble Court's order on bypassing the incoming goods traffic that do not have business in the city by providing alternative routes outside the city.

The key recommendations are as follow:

1. The National Highways Authority of India (NHAI) should be directed to coordinate with the state governments in the NCR to speed up construction and alignment of the bypasses and submit a firm schedule for completion to the Hon'ble Court: The National Highways Authority of India should be directed to coordinate with the Chief Secretaries of the neighbouring states of Haryana, Rajasthan, Uttar Pradesh and Punjab to expedite this matter and a firm schedule for completion should be presented to the Court by NHAI.

2. **Reinforce directions to the Traffic Police to ensure that there is no entry of trucks into the city, except those genuinely destined for Delhi.**

3. Direct the Municipal Corporation of Delhi (MCD), through its Municipal Commissioner, to set up a system for verification and management of the truck entry into the city. Currently, MCD charges a toll tax from the trucks, based simply on the number of wheels of the truck. However, this toll tax should only be for trucks entering the city for loading and unloading. The MCD has to be responsible for ensuring that the trucks have genuine business in the city and maintain details accordingly.

D. Safety inspection of CNG buses

Following the Supreme Court order of July 29, 2002 EPCA has been monitoring implementation of independent third party inspection of safety standards for CNG buses according to the MRTH notification of November 19, 2001 in Delhi. Series of meetings have been held with the concerned agencies in this regard. Based on the information available from the Delhi government EPCA would like to make the following observations and recommendations in this matter.

EPCA has examined the specific issue of safety inspection of CNG buses as directed by the Court. It has also examined the scope of further expansion and upgradation of the CNG programme in the Capital and the changes needed in the inspection regime. The current safety inspection system of CNG buses has also thrown up some critical lessons regarding conversion process which needs to be integrated into the programme for corrective action for further improvement.

Recommendations are as follow:

Accelerate safety inspection of the entire CNG bus fleet on road

- Delhi government has already set up independent third party inspection at the Burari vehicle inspection center in Delhi. Pre-registration inspection of nearly 1800 CNG buses has been completed on a priority basis. EPCA is of the view that the Delhi government be directed to prepare a schedule to advance safety inspection of all the CNG buses that are already plying on the road and not wait for the buses to come up for their routine annual schedule of fitness check. This is necessary to ensure compliance with the new safety notification.

- In addition to the annual safety inspection at the Burari inspection centre, introduce a supplementary system where trained teams of inspectors can visit bus operators or depots and carry out inspection at those premises or at other suitable locations. It is possible to carry out the checks at the existing DTC stations. Increase the number of approved and competent teams to carry out the checks and their training should be given very high priority.

- Auditing of the entire safety inspection process must be carried out on a regular basis to improve the system further. Safety Council set up by the Delhi may submit a report on system of auditing.

Upgrade emissions inspection of CNG commercial vehicles and link it to the annual fitness inspection of CNG vehicles

This issue has been discussed in some detail in the section on PUC in the Part I of the report. But it is important to reiterate and highlight some special concerns regarding the emissions performance of the CNG vehicles. CNG is a clean technology that has been introduced to

improve emissions levels drastically in the city. Maintaining the quality of the programme is therefore critical to get the full environmental benefit from it. But in the absence of effective vehicle inspection programme to check on road deterioration and durability, technology may deteriorate fast and nullify gains. It is important to note that while particulate emissions benefit of the CNG programme will always remain, other gaseous emissions may become unstable if rigorous inspection is not conducted. This may happen especially if emissions control technology like catalytic converters deteriorate fast.

Apart from the CNG buses, it has also been brought to EPCA's notice that many three-wheelers plying on CNG are emitting excessive white smoke. EPCA has looked into this problem. Inferior quality piston ring that wears off fast leads to leakage and high consumption of lube oil that cause excessive smoke. Poor maintenance also compounds the problem.

EPCA therefore would like to emphasise that both new and in-use emissions standards for CNG buses and other CNG vehicles be made tighter and inspection procedures made more rigorous to improve the quality of the CNG technology.

Experts have also recommended a special focus on CNG vehicles inspection (safety and emissions). CNG buses should be brought within the ambit of centralised vehicle inspection system immediately. The test procedure for emission measurement should be transient loaded mode test focusing on measurement of NOx. CNG vehicles would require NOx emissions tests that are possible only on dynamometers.

Conversion of old diesel buses to CNG through kit installation can stop now

Delhi transport department has informed EPCA that the phase out plan for diesel buses mandated by the Hon'ble Court was completed in November 2003 when the last diesel bus had gone off the road. Delhi government had given some more time till March 31, 2003 to the CNG kit installers to complete conversion of some of the old diesel buses. The process of conversion of old diesel buses is now complete in Delhi.

EPCA therefore observes there are no further need for conversion of old diesel buses. **So further conversion through kit installation process in old diesel buses can be stopped.**

For future expansion of the CNG programme only new OEM made CNG buses should be allowed registration in Delhi for best emissions results. As mentioned earlier converted buses can have very unstable emissions on road and it is also very difficult to monitor quality of conversion and assure long term durability.

Expand the CNG programme in Delhi to include light and medium duty goods vehicles and plan the safety and emissions inspection infrastructure to meet the volume tests: EPCA notes that the Court mandated CNG programme has been implemented successfully in Delhi. But to maximize the benefit of the programme that has been fully established in terms of infrastructure requirement and commercialization of CNG technology, it is now possible to further upgrade and expand the programme to include other polluting categories of vehicles in Delhi. The immediate target of expansion should be the medium and light duty commercial vehicles in the city that are still running on diesel. It is important to develop a replacement scheme for these vehicles based on CNG. But this further expansion should be encouraged only with new and dedicated CNG vehicles and not simple conversion old and existing vehicles.

Further upgradation of the CNG programme in Delhi: EPCA understands that a huge corpus fund has been created from the daily penalty on diesel buses in response to the Hon'ble Court order of April 5, 2002. It is learnt that the department of transport, Delhi has collected a sum of around Rs 30 crore as fine from diesel buses that had continued to ply beyond 31st January 2002, violating the Hon'ble Court's deadline. This sum should be utilized to buy the Delhi government

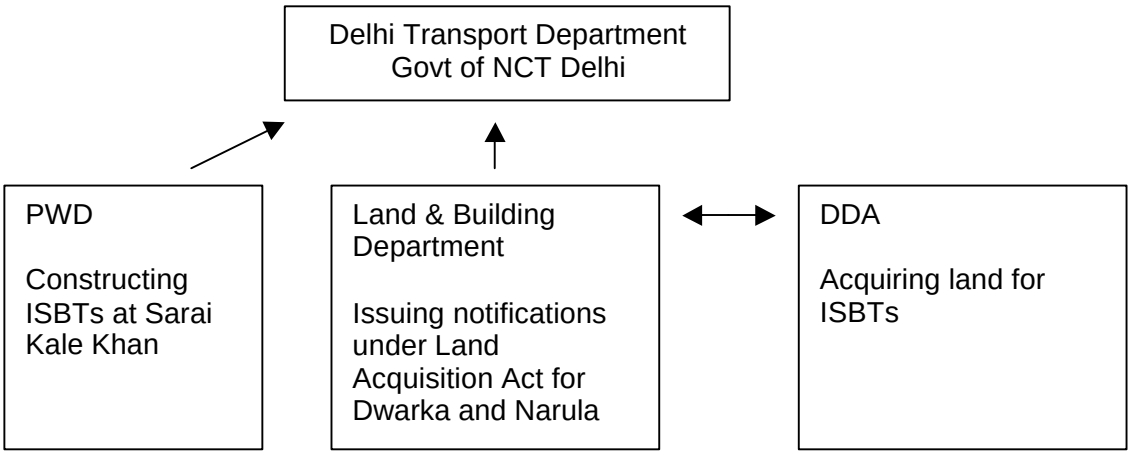
for further upgradation of the CNG programme and other abatement strategies. Delhi government be directed to develop specific schemes for which this fund can be utilized.

E. Interstate bus terminus

Recommendations

The Hon'ble Supreme Court had directed the Delhi government in July 1998 to set up two additional interstate bus terminus to prevent buses from other states to enter the city. But there has been considerable delay in completing the ISBTs directed by the Hon'ble court. There appears to be serious problem of coordination among the concerned implementing agencies. The concerned agencies involved in this project are as follow:

EPCA would like to recommend that the Delhi government be directed to submit a project schedule and deadline for completion of these bus terminus and a status report every six months.



Part I

A.1. New Mass Emissions Standards and In-use Emissions Standards for Two-wheelers

On 15 July 2002, the *Amicus Curiae* for the ongoing public interest litigation on air pollution in the National Capital region of Delhi had submitted an application to the Hon'ble Supreme Court. In this application the *Amicus Curiae* had raised the following issue with regard to pollution control from two-wheelers and sought directions from the Hon'ble Court:

> "It has been pointed out in certain reports that the future emissions standards for two wheelers are not commensurate with the needs of the city. International standards cannot be blindly adopted and applied as these two wheelers are a particular Asian problem. Therefore, we have to evolve emissions standards for new vehicles as well as in-use vehicles keeping in mind the ecology of the city. Bhure Lal Committee should be directed to examine the question of appropriate future standards for new two wheelers, current norms for in-use two-wheelers and their inspection system and also directed to recommend other measures including phasing out of old two-wheelers (if feasible) by evolving a suitable scheme for their replacement/buy back."

In response to this application the Hon'ble Supreme Court has issued the following order on February 14, 2003:

"I.A No 179: The Bhure Lal Committee is requested to submit a report within four weeks."

EPCA thus is required to examine the following:

- Appropriate future emissions standards for new two-wheelers
- Current in-use emissions norms for two-wheelers and their inspection system and other measures or suitable scheme for renewal of old fleet in the city (buy back schemes etc).

In order to examine these issues EPCA has reviewed the earlier relevant Court orders and deliberations of the EPCA and recommendations to the Hon'ble Court in this regard. It has further reviewed the submissions of the central and the state governments filed in response to the IA 179, to assess the status of current level of policy and implementation and consider if these are adequate to address the key concerns over pollution caused by two-wheelers.

Relevant Court orders till date:

July 28, 1998: Ban on supply of loose 2 T oil at petrol stations and service garages shall be imposed by 31 December 1998.

This order has been implemented.

October 4,1999: The Supreme Court in this order called for suggestions regarding emissions control from two-wheelers and three-wheelers.

Following this court order EPCA had submitted a report called "Proposals for Emission Controls on Petrol Two-Stroke Engine Driven Two- and Three- Wheelers" in October 1999.

February 14, 2003: "I.A No 179: The Bhure Lal Committee is requested to submit a report within four weeks." (In response to the Amicus application under consideration)

Response of the government to the IA 179 July 15, 2002

Following the submission of the IA 179 the Union of India and Delhi government have filed affidavits in the Supreme Court on July 25, 2002 and July 26, 2002 respectively.

Responses of both Union of India and Delhi government to the specific issue of two-wheelers raised in the IA 179 are listed below.

<table>
<tr><th>IA 179 of July 15, 2002 and prayer</th><th>Response of the Union of India in its affidavit of July 25, 2002</th><th>Response of Delhi government in its affidavit of July 26, 2002</th></tr>
<tr><td>With regard to two-wheeler emission norms</td><td></td><td></td></tr>
<tr><td>“One of the major pollutants in the matter of vehicular traffic is the two-wheeler. It has been pointed out in certain reports that the future emission standards for two-wheelers are not commensurate with the needs of the city. International standards cannot be blindly adopted and applied as these two wheelers are a particular Asian problem, as they are not in large numbers in any other part of the world. Therefore, we have to evolve emission standards for new vehicles as well as in-use vehicles keeping in mind the ecology of the city, the extent of two-wheeler traffic and the degree of congestion on the streets. It is respectfully submitted that the Bhure Lal Committee should be directed to examine the question of appropriate future standards for new two wheelers, current norms for in-use two wheelers and their inspection system and also directed to recommend other measures including phasing out of old two wheelers (if feasible) by evolving a suitable scheme for their replacement/buyback.” (para-6 Application on behalf of the amicus curiae in IA 179 of 2002)</td><td>UOI have mentioned the existing emission norms for two-wheelers in India as tighter than the European norms.

Existing emission norms for new petrol two-wheelers (With effect from 01.04.2002)
<table><tr><td colspan="2">Existing emission norms with effect from 01.04.2002, notified vide GSR no. 493 (T) of August 28, 1997</td></tr><tr><td>CO in g/km</td><td>HC+NOx g/km</td></tr><tr><td>2.0 (type approval)</td><td>2.0 (type approval)</td></tr><tr><td>2.4 (conformity of production)</td><td>2.4 (Conformity of production)</td></tr></table>Source: Union Of India(UOI) 2002, Affidavit Of UOI In Response To IA 179, July 25

Inter-ministerial task force which have been set up by UOI have given its recommendation for future emission norms with effect from 01-04.2005. (see below table)

<table><tr><td colspan="2">Recommendations of inter-ministerial task force with effect from 01.04.2005</td></tr><tr><td>CO in g/km</td><td>HC+NOx g/km</td></tr><tr><td>1.5</td><td>1.5</td></tr></table>Source: Union Of India (UOI) 2002, Affidavit Of UOI In</td><td>“…Lordships were pleased to direct UOI to file its reply as these issues pertains to central government. However the submission of the answering respondent is that while the matter is to be examined by the EPCA, there is a need to have stricter emission standards for new two wheelers keeping in view the fact that they account for nearly two-thirds of the vehicular population in Delhi.”</td></tr>
</table>

"Direct the Bhure Lal Committee to examine the matter is referred to in para 6 and 7 of this petition and submitted its report thereon"	2002, Affidavit Of UOI In Response To IA 179, July 25 In September 2001 government has set up another Expert Committee - - subgroup for future emission norms for new two wheelers. The report has not been submitted yet. The government had expected to notify the new emission norms within next six months. "….the government has already initiated requisite actions for finalizing/notifying the future emission norms for new two wheelers for implementation. It is therefore submitted that the issue….does not call for a reference to the Bhure Lal committee"	
Replacement/buyback scheme		
"The Bhure Lal Committee should be….directed to recommend other measures including phasing out of old two wheelers (if feasible) by evolving a suitable scheme for their replacement/buyback." (*para-6* Application on behalf of the *amicus curiae* in IA 179 of 2002)	UOI in its response says that the Hon'ble Court can consider this issue of evolvement of a suitable scheme for replacement/buyback of two-wheelers for examination by the Bhure Lal Committee.	No response on the issue

In this context EPCA would like to draw the attention of the Hon'ble Court to the fact that almost all the issues raised in the IA 179 under consideration now, were addressed by EPCA in its earlier report of October 1999, submitted following the Court order of October 4, 1999. EPCA therefore deems it fit to reiterate some of the key and relevant recommendations made then and in that light review the subsequent submissions from the central and state governments and the current developments following the IA 179. EPCA would build on these further to address the issues raised in the IA 179.

Some key recommendations of the EPCA report "Proposals for Emission Controls on Petrol Two-Stroke Engine Driven Two- and Three- Wheelers" October 1999:

i. Early Notification of Emission Norms for the Future

"Fix as early as possible the emission norms for 2003 and 2005 and to do so at levels of stringency that provide enduring compliance with emission norms, and the manufacturer's responsibility beyond the factory gates. The possibility of phasing them in, with an earlier introduction in Delhi and cities where the air pollution problem is acute.

The EPCA, in its progress report of June-August 1999, had made a brief recommendation that scooters, which are high emitters of particulates, must have their emissions norms tightened further, and the next set of standards be announced early.

ii. Durability of the Catalytic Converter:
"Since the emission norms of 2000 or later make no distinction between two-stroke and four-stroke engines, automobile manufacturers are taking two routes to reach the emission standards – while some are moving on to four-stroke engines on two-wheelers, others are fitting a catalytic converter on the two-stroke engine to achieve the same norm."

"The life of a two-stroke two-wheeler catalytic converter is considerably shorter than that for a car. The two- stroke engines fitted with a catalytic converter will meet the COP norms, as claimed by the manufacturers for only about 30,000 to 15000 kms or less, before the converter expires, and the engine emissions rise to levels well beyond the standard. Those who buy scooters are not likely to be the ones willing to incur recurring expenditure on replacement of the cat converter."

"The contention of the Automobile manufacturers is that the emission norms do not make a distinction between one two-stroke and four-stroke engines, and that so long as they meet the specified COP standards the technological choice of the route to conformity has to be allowed to them. Such an argument may be legally valid, but is of no practical use. It allows the manufacturers to get away with meeting the emission standards for a short period of two to five years after manufacture, knowingly passing on thereafter the onus of meeting the emission norms on the owner of the vehicle, who is not in a position to honour it, even if conditions were to be put in place by the manufacturers to enable him to replace it."

"In our view, the two-stroke with catalytic converter should not be acceptable as the technology that meets the emission norms of 2000, on the basis of the reasons given above and the grounds that the COP responsibility should extend for the reasonable life of the vehicle, fixed either legally or defined by reasonable experience with existing vehicles."

iii. Emissions Warranty
"This brings us to the delicate subject of Emissions Warranty, which has been under discussion with the automobile manufacturers for some time, and on which their attitudes can only be described as negative. Restricting ourselves only to the issue of a two-stroke vehicle fitted with a catalytic converter and thus enabled to meet the Emission norms only for a short period of the reasonable life of the vehicle, it is our recommendation, by majority opinion, that manufacturers who meet the year 2000 emission norms by fixing a catalytic converter on a two-stroke engine should provide warranty for emissions control and replacement of the catalytic converter for the reasonable life of the vehicle."

iv. Restraining the sale of two-stroke engines in Delhi
"Restraint on the sale of two-wheelers in Delhi, with or without catalytic converters, and take the decision to restrict registration in Delhi only to four-stroke engines that meet the India 2000 norms for two-wheelers. The EPCA has examined the feasibility of an order restricting the sale of two and three wheelers to only four-stroke engine only. The manufacturers association has supplied figures that show a production capacity of over 7 lakh four-stroke two wheelers in 1999-2000, increasing to approximately 14.5 lakh in 2000-2001 for four-stroke two wheelers. The production figures are sufficient to meet the demand of the city and the NCR. Such a decision should be implementable. We would therefore recommend such a restriction on sale and registration of two-stroke scooters, mopeds and motorcycles in Delhi and the NCR, and the permission to register and re-register only four-stroke two wheelers meeting the India 2000 norms."

v. Emissions Tax
"In order that manufacturers see benefit in early tightening of the emission norms, and their possible advancement for Delhi and the NCR, an emissions tax may be suggested. This could be

of two types – the one by the Central Government to manufacturers, that is linked to the emission norms, being lower on vehicles conforming to the tighter norms, and higher the older the vehicle gets, and providing incentive to the manufacturers to hasten technology changes and the introduction of vehicles based on future norms."

"The other could be a tax imposed on existing on-road vehicles, linked again to the emissions, getting higher for the older vehicle, and based on the age or the broader distinction of pre- and post- the various emission norms. Thus, a vehicle 20 years old could pay more tax than a vehicle 15 years old; alternatively, the pre-1991 could pay higher tax than one post-1991, and that higher than the post-1996 one."

"Such a scheme of taxation linked to emissions of the vehicle would encourage both manufacturers and owners to move to new and technologically improved vehicles. It would take the bite out of the move to upgrade technology at a faster pace, and of the phasing out of old vehicles."

vi. Existing Two-wheelers

"Phasing out of old vehicles: No practical solution suggests itself. Retrofitment of catalytic converters is not found practical; nor can the scooter be converted to CNG. At the same time, waiting for the old ones to die out and be replaced slowly by new vehicles with controlled emissions is unacceptably long. The two-stroke two-wheeler can only be dealt with by phasing it out. Though this move will be extremely unpopular, and undoubtedly lead to some hardship and much heartburning, especially since it has not been suggested for cars, the White Paper on Pollution in Delhi with an Action Plan by the Ministry of Environment and Forests recommends the following programme for phasing out:
Those of age 15 years or more w.e.f 4/4/2000
Those of age 10 years or more w.e.f 1/4/2005
All the remaining w.e.f 1/4/2007"

vii. A Buy Back scheme

"The EPCA's task would be to monitor this phasing out. Realising the difficulties involved, and the Government's track record in handling replacements, the Authority would like to suggest to the manufacturers that they propose a buy-back plan, supported by the Government with an incentive scheme that reduces taxes on vehicles bought in replacement, so as to make the replacement attractive to the owner. The increased sale of new vehicles should be incentive enough for the manufacturer to propose a viable buy back option which should be applicable to all vehicles that are pre-1991 to begin with. Manufacturers can also sell the second-hand vehicles they buy in other states, and in rural areas where the vehicle population is low. The government would have the incentive of being able to enforce its replacement scheme; replacing an old with a new controlled-emissions vehicle; as well as the savings on health costs. The government and the manufacturers should be able to work out an attractive scheme. The owner should cooperate if this carrot and stick method is used by the Government, emissions tax as suggested above to dissuade him from keeping his old vehicle, and the buy back scheme and incentives to attract him, even while the White Paper proposal is made applicable."

EPCA's observations with regard to IA 179

This section is divided into three parts:

A: Mass emissions standards for new two-wheelers
B: In-use standards for on-road two-wheelers
C: Non-technical measures to renew in-use fleet

EPCA has reviewed these issues on the basis of

Affidavits filed by the Union government and the Delhi government

Literature review

Written submission from the Society for Indian Automobile Association of India (SIAM)

A: Mass Emissions Standards For New Two-wheelers:

Delhi government has stated that the matter of setting norms for new and in-use two wheelers is the responsibility of the central government and therefore, central government should be asked to respond to this issue.

Central government on the other hand has contended as follow:

i. The existing emission norms for two-wheelers in India are tighter than the European norms.

ii. "….the government has already initiated requisite actions for finalising/notifying the future emission norms for new two wheelers for implementation. It is therefore submitted that the issue….does not call for a reference to the Bhure Lal committee"

iii. "In September 2001 government has set up another Expert Committee - - subgroup for future emission norms for new two wheelers. The report has not been submitted yet. The government had expected to notify the new emission norms within next six months."

EPCA would like to point out that since the submission of the Union of India affidavit in July 2002, Ministry of Road Transport and Highways (MRTH) has issued the draft notification on January 21, 2003 proposing new mass emissions standards two-wheelers for 2005. EPCA has therefore reviewed the proposed norms to assess if the new norms address the key concerns with regard to emissions from two-wheelers adequately.

Before proceeding to discuss the adequacy of the proposed norms EPCA would like to highlight the key concerns.

The total registered two-wheeler population in Delhi increased by 10.3 lakhs between 1991 and 2001 and continues to increase at an annual rate of 7 percent. In the registered fleet, the two-wheelers, now placed at approximately 22.3 lakhs (as on March 31st, 2001) out of a total of an estimated 34.56 lakh vehicles, are the most predominant – as much as 64 percent of the total registered vehicles in Delhi.

As IA 179 points out two-wheelers are a uniquely Asian problem. In Europe and the US these vehicles are very small in numbers and contribute very little to the total air pollution load. Therefore, technological solution to this problem will have to emerge from within Asia and more so in countries that are the major producers of two –wheelers like China and India. In Asia, India is the second largest producer of two wheelers producing 17 per cent of the total production in the region following China that produces 54 per cent of the Asian production.

The Supreme Court has rightly drawn attention to the special problem of two-wheeled vehicles in the NCR largely powered by two-stroke engines. It is estimated that two-stroke two-wheelers largely powered by two-stroke engines are responsible for nearly 60 percent of hydrocarbon emissions and 48 percent of carbon monoxide emissions. Two-strokes have special problems as inefficient combustion, which allows fresh fuel charge to go out unburned and lead to high emissions of unburned hydrocarbons. Traditionally, these vehicles have been associated with

high hydrocarbon and carbon monoxide emissions and so only these pollutants in addition to nitrogen oxides are regulated from these vehicles.

But emerging evidence now point towards two exceedingly grave problems – high emissions of particulate and other unregulated air toxics like benzene from two stroke engines. This EPCA feels is going to emerge as a serious regulatory challenge in the future.

EPCA would therefore like to take note of the emerging evidence worldwide that point towards very high particulate emissions from these vehicles which are not even regulated. According to a World Bank study[1], "Until recently new two-stroke engines emitted as much as an order of magnitude more particulate matter than four stroke engines of similar size. When vehicle age, maintenance, lubricants and fuel quality are taken into account, two-stroke engines in South Asia probably emit particulate matter at an even higher factor". Moreover, two stroke engines have typically lower fuel efficiency than four stroke engines with as much as 15-40 percent of the fuel-air mixture escaping from the engine through the exhaust port increasing hydrocarbon emissions.

Limited PM emissions data for two-wheelers is also available from ARAI in India that also show much higher level of PM emissions from two-stroke two-wheelers compared to four-stroke two-wheelers in India. (See Table 1)

Table 1: Particulate matter emissions factors for two-wheelers in India

Vehicle type	Odometer (Kilometers)	Amount of lubricant	Lubricant types	Particulate matter emissions (grams per kilometre)
Motor cycle	215	Metering	API/JASO FC	0.055
Scooter	550	2%	JASO FB	0.032
Scooter with catalyst	550	2%	JASO FB	0.015
Scooter four stroke	650	n.a.	n.a.	0.0005

Note: All vehicles are two-stroke engines without catalytic converters unless otherwise indicated. Measured on Indian driving cycle. All vehicles are well maintained.
Source: Unpublished data from Automotive Research Association of India (ARAI) and Bajaj Auto Ltd cited in Masami Kojima et al 2000, Improving urban air quality in south Asia by reducing emissions from two-stroke engine vehicles, World Bank, Washington, p 14.

Estimates of PM emissions from two-wheelers are available from other countries as well. In some traffic intersections in Bangkok Thailand two-wheelers are estimated to contribute as much as 47 percent of the total particulate load[2].

Studies are currently underway in the US Environment protection Agency (USEPA) to measure particulate emissions from in-use two-stroke two-wheelers, brought from Bangkok. Preliminary test data available from the USEPA on this study shows alarmingly high levels of PM emissions from in-use two-stroke two-wheelers – respective model years of 1991, 1994 and 1996. Emissions range from 0.0587 gm/mile to 1.4755 gm/mile (0.036 gm/km to 0.9168 gm/km). It is

[1] Masami Kojima et al 2000, Improving urban air quality in south Asia by reducing emissions from two-stroke engine vehicles, World Bank, Washington

[2] Michael Walsh 2001, *2-3 Wheelers in Asia and their Impact on the Environment,* Regional Workshop on Reduction of Emissions from 2-3 Wheelers, Hanoi, Vietnam

important to note that all these vehicles have automatic oil injection system which means lube oil consumption was controlled. This only warns us of the gravity of the problem in our cities that we have not even assessed.

A study by CPCB[3] shows that PM emissions factor of two-wheelers of 2006 is projected to be as high as 0.05 gm/km, which is higher than the particulate levels tested for some diesel buses.

The key focus of the Supreme Court rulings in the NCR has been to reduce the particulate emissions from vehicles. It is estimated that after moving the public transport in the city to CNG, the large fleet of two-wheelers along with trucks are responsible for substantial particulate emissions from the transport sector.

It is important to point out that this problem has found very little policy attention and developing standards for particulate matter from two wheelers is still not on the official agenda as evident from the new draft notification of January 2003 issued by the Ministry of Road Transport and Highways.

EPCA understands that one of the important causes of high PM emissions from two stroke two-wheelers is the misuse of lubricants. In fact to address this problem the Hon'ble Court in its order of July 28, 1998 banned sale of loose 2 T oil at petrol stations and service garages in the NCT Delhi to discourage the sale of recycled and other unsuitable engine oils. The Court has now mandated sale of only pre-mixed oil-fuel at specified proportions. India since then has also adopted standards for lubricants for two wheelers. Since April 1999 all two wheelers are required to use lubricants that confirm to both American Petroleum Institute TC (API TC) and Japanese Standard Organisation FC specifications for low smoke lubricants.

But it is not clear if this has been a sufficient deterrent on availability and use of loose and substandard oil in the market and the extent of misuse.

EPCA is of the view that the most effective way to address the problem of high PM emissions would be to regulate PM emissions from two-stroke engines. It is therefore, important that the concerned agencies begin to develop reliable and reproducible methodology for measuring particulates from two-stroke engines and generate statistically significant data to set PM standards as soon as possible.

Moreover, as mentioned earlier, high benzene emissions is yet another area of concern. High scavenging losses (fresh fuel charge going out unburnt) combined with benzene and high aromatics in petrol are supposed to be the major contributory factors. Indian two-wheeler industry is supposed to have lowered the scavenging losses considerably over time by designing better port configuration in two-stroke engines – estimated to be from 35 per cent in 1991 to 14 per cent in 2000. In the meantime the Hon'ble Court has also mandated 1 per cent benzene petrol in Delhi. But total aromatics in petrol are still not regulated and are very high. During combustion some of these aromatics are converted to benzene resulting in high benzene emissions. Further development for controlling exhaust benzene emissions from two-stroke engines is urgently needed.

In view of these special problems associated with two-stroke two-wheelers EPCA in its earlier report of October 1999 had proposed a ban on these vehicles. But EPCA now understands that tightening of mass emissions standards since then has accelerated a move towards four-stroke technology. Two-stroke two-wheelers still comprise nearly 70-80 percent of the on-road fleet. But the share of four-stroke two-wheelers has increased of late estimated to be 60-65 per cent of total new sales in 2002. Still in terms of numbers two-stroke two-wheelers are very large. This only

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[3] Central Pollution Control Board 2000, *Emission Factors for Different Categories of Vehicles pg 212*, Transport Fuel Quality for Year 2005

bears out the importance of phasing in technology forcing standards. It is in this context EPCA would like to examine the issues raised with regard to new and in-use standards for two-wheelers in The IA 179.

1. Adequacy of the proposed norms for new two-wheelers

Ministry of Road Transport and Highways (MRTH) has issued the draft notification on the proposed norms for two-wheelers to be enforced in 2005. The Auto Fuel Policy had announced these norms originally (See table 1).

Table 1: Proposed norms for two-wheelers

	Year/status	Vehicle type	CO (g/km)	HC+NOx (gm/km)	Test method
Current	2000	All types	2.0 (TA) 2.4 (COP)	2.0 (TA) 2.4 (COP)	IDC (Cold start)
Proposed	2005[1]	All types	1.5 (TA=COP)	1.5 (TA=COP)	IDC (Cold start)
Proposed	2008[2]		1.00	1.00	IDC (Cold start)

Note: 1. MRTH has endorsed the norms proposed by the Auto Fuel Policy for 2005.
2. Auto Fuel Policy has also proposed norms for 2008. But those have not been considered yet.
3. The new draft notification has proposed deterioration factor of 1.2 (To account for deterioration of devices like catalytic converters)
4. In the new draft notification type approval and conformity of production norms are same.
Source: Draft Notification, January, 2003, MRTH

Though Auto Fuel policy has proposed norms for both 2005 and 2008, the government is currently notifying norms only for 2005. EPCA notes that the new draft notification proposes for the first time deterioration factor for two wheelers and that type approval and conformity of production norms are the same.

The Union of India in its affidavit to the Court has contended that India meets the most stringent standards in the world. EPCA has reviewed the current and proposed emissions standards of India and Taiwan that are known to have met the most stringent emissions standards so far. EPCA in its earlier report on two-wheelers (October 1999) had pointed out the limited value of comparing Indian norms with those of other countries. Two-wheelers are a uniquely Asian problem and would need uniquely Asian solution. More than 90 per cent of the world's two wheelers are produced in Asia.

But this time while reviewing the two-wheeler norms worldwide EPCA was surprised to note that Europe and California followed by the rest of USA are due to enforce more stringent HC and NOx standards than what even India is proposing to meet in 2005. (See Table 2). CARB Tier 2 emissions standards for motorcycles beginning 2008, is going to be the most stringent for HC+NOx at 0.8 g/km. US EPA will implement this with a 2-year lag, in 2010. HC+NOx norms at 0.8 g/km is supposed to be challenging and CARB will do a technical progress review for all motorcycles to meet this norm. This at least indicates what is technically possible to achieve. India thus is going to lose its so called leadership role if it fails to keep up. Even European Union will meet 0.8 gm/km of HC and 0.15 gm/km for NOx for vehicles more than 150 cc in 2006. This clearly shows, that these governments are forcing technology development even in this vehicle segment.

Table 2: Mass emission norms in different countries

Country/Year	2w category	CO	HC	NOx	HC+NOX	Test

of implementation		**(gm/km)**	**(gm/km)**	**(gm/km)**	**(gm/km)**	
EU (gm/km)						
June 17, 1999	Mopeds	6.0	-	-	3	UDC
June 17, 2000	Mopeds	1.0	-	-	1.2	UDC
June 17, 1999	2s Motorcycle	8.0	4.0	0.1	-	UDC
	4s Motorcycle	13.0	3.0	0.3	-	UDC
2003	Motorcycle <150cc	5.5	1.2	0.3	-	ECE R40
	Motorcycle>=150cc	5.5	1.0	0.3	-	ECE R40
2006	Motorcycle <150cc	2.0	0.8	0.15	-	UDC cold start
	Motorcycle>=150cc	2.0	0.3	0.15	-	WMTC
Taiwan (gm/km)						
2002	<700cc	3.5	-	-	2.0	CNS 11386
2004	<700cc, 2s	7.0	-	-	1.0	Cold start
	<700cc, 4s	7.0	-	-	2.0	Cold start
USEPA (gm/km)						
2006	Class-I (<180cc)	12.0	1.0	-	-	
2006	Class-II (180-279cc)	12.0	1.0	-	-	
2006	Class-III (280cc & above)	12.0	-	-	1.4	
2010	Class-III (280cc & above)	12.0	-	-	0.8	
CARB (gm/km)						
2004 through 2007	Motorcycles 280cc or greater	12.0	-	-	1.4	
2008 and subsequent	Motorcycles 280cc or greater	12.0	-	-	0.8	

Source:

1. USEPA 2002, Office of Transportation and Air Quality, Regulatory Announcement, Proposed Emission Standards for New Highway Motorcycles and Recreational Boats July.
2. N V Iyer 2003, Technology and regulatory aspects of controlling air pollution from two and three wheelers in Asia, Workshop on vehicular pollution for South Asian journalists – organized by Centre for Science and Environment, February
3. California Air Resources Board, Rulemaking: 1998-10-12 Final Regulation Order On-Road Motorcycle Regulation, Final regulation order, Amend title 13, California code of regulations, Section 1900

2. The difference that the EPCA observes is the preponderance of two-stroke technology in India as opposed to predominant four-stroke powered two-wheeler fleet in the US or California. Moreover, tightening of norms in India and Taiwan are showing a certain trend. According to the World Bank report[4] Taiwan by enforcing 1.0 gm/km of HC+NOx will virtually eliminate two-stroke

[4] Masami Kojima et al 2000, Improving urban air quality in south Asia by reducing emissions from two-stroke engine vehicles, World Bank, Washington

engines from 2004 onwards. Only four stroke engines are expected to meet these norms. Even in India the trend is somewhat in that direction though not so drastic. Two-stroke engine vehicles in India can meet Bharat stage I norms of 2000 only if oxidation catalysts are installed. As mentioned earlier, tighter norms are responsible for increasing share of four-stroke engines vehicles in the new fleet.

3. Yet another unique feature of the Indian fleet is the very large share of very small engines (mopeds of 50 cubic centimetres engines) powered by two-stroke engines that are responsible for leniency in the standards as well. These cannot survive further tightening immediately as these cannot yet be adapted to four-stroke technology. There is apprehension that any further tightening will hit the small size vehicles (mopeds) hard making their survival difficult.

4. Moreover, it is also not clear the implications of combining hydrocarbon and nitrogen oxide standards. This may provide cushion for higher hydrocarbon emissions from two-stroke engines and for nitrogen oxide emissions for four-stroke engines. It is therefore important to review this to address the trade-off.

5. EPCA understands that the Indian two-wheeler industry has made substantive effort in reducing emissions from the 1991 levels (see table 3). In fact, emissions levels have been reduced by as much as 85 percent over the past decade in India. This progress also exposes the special limitation of this technology. EPCA notes with concern that even with more stringent standards in place in 2005 (1.5 gm/km for CO, 1.5 gm km for HC+NOx) one new two wheeler (both four-stroke and two-stroke) will emit for instance more CO compared to a new Euro IV compliant car in Europe (1 gm/km). This has serious implication as we are adding more two wheelers to our fleet every year than cars.

Table 3: Mass Emission Standards for two wheelers (All figures in gm/km)

Standards with effect from	CO	HC+NOx	Conditions
April 1996[1]	4.5	3.6	1. IDC test with Warm Start 2. 10% relaxation in CO & 20% in HC+NOx for COP volumes
April 2000[2]	2.0 (TA)	2.0 (TA)	1. IDC test with Cold Start
	2.4 (COP)	2.4 (COP)	
Proposed 2005 norms[3] (Bharat II norms)	1.5	1.5	1. IDC test with Cold Start 2. TA norms are equal to COP norms Deterioration factors

Source:
1. Central Motor Vehicle Rules, 1995
2. Central Motor Vehicle Rules, 6th Amendments – 2000, mass emission standards for vehicles manufactured on and after 1st April, 2000
3. Gazette of India 2003, Ministry of Road Transport and Highways, New Delhi

6. Only a rigorous analysis of type approval emissions data available with testing agencies and assessment of technical options available can establish if there is any further scope of tightening them immediately that is technically feasible to meet. This information is not available. However, a cursory review of available type approval emissions data for 2000 model year of two-wheelers from ARAI and also SIAM[5] (for 27 two-stroke and 17 four-stroke two wheeler) show that the levels achieved are well within the range of the proposed norms of 1.5 gm/km for all parameters (Table 4 and 5).

Table 4 Type approval average emission data of 2000 model year two wheelers tested in ARAI and available from SIAM

[5] SIAM 2000, An *aide memoire* on two stroke engines

(All figures in gramme per kilometre)

	CO	HC	Nox	HC+Nox
Two stroke	0.83	1.42	0.02	1.44
Four stroke	0.63	0.71	0.33	1.04

Source: Automotive Research Association of India, 2002, *mimeo*

Table 5: Emissions test data of two wheelers from ARAI
(Average emission figures are in gramme per km)

	CO	HC+Nox
Two stroke	0.78	1.23
Four stroke	0.85	1.06
Overall	0.81	1.16

Source: SIAM 2000, An *aide memoire* on two stroke engines, *Mimeo*

This shows two-wheelers of 2000 model year have already achieved quite low levels. But in the absence of statistically significant data it is not possible to draw firm conclusion on the adequacy of the proposed standards of 1.5 gm/km for all regulated parameters.

SIAM in its written submissions to EPCA has stated, “the limits recommended by the Expert Committee on Auto Fuel Policy in conjunction with the new rules and regulations represent the best that the industry can achieve with innovative use of the known technologies and within the available time frame of less than two years. Meeting norms that are more stringent than the recommendations made by the Expert Committee for the 2008/10 time frame will require the use of far more advanced technologies that are yet not available on an industrial and commercial scale for adoption on small two wheelers. The emerging technologies identified are direct fuel injection for two-stroke engines with oxidation catalytic converters, port fuel injection for four-stroke engines with three way catalytic converters. These technologies are complex and costly. Major development efforts would be required.”

Since it is not possible to comment with certainty on the adequacy of the proposed norms in view of extremely limited data available, it is advisable to design more innovative strategies to accelerate technology development in this sector to approach near zero to zero emissions as a leapfrogging strategy. It is therefore important to design fiscal incentives (emissions based taxation) to give incentives for early introduction of new standards. To be able to do this effectively, the Union of Indian should be directed to announce norms for 2005 and 2008 together and immediately and then provide tax incentives to those manufacturers who would comply with the new standards before the stipulated timeframe.

EPCA has also been given to understand that the Indian two-wheeler industry is also working towards developing alternative fuelled two-wheelers such as LPG etc. If more enhanced standards are announced in advance this may create opportunity for these technologies to develop fast and have an advantage in meeting tighter standards within a tighter time frame.

EPCA also takes note of the fact that for the first time deterioration factor to account for durability of emissions control systems and the progressive deterioration of emissions over a period of usage has been mandated under the proposed norms for 2005. This is particularly important in view of the fact that new two-stroke models are coming with catalytic converters with low durability (max 30,000 km) with no clear road map as to how to monitor them once these are on road.

EPCA would like to emphasise that introduction of such technologies enhance the need for a system that would ensure long-term durability of engines and emissions control components. Currently, there are many uncertainties. As is evident from available studies, catalytic converters for two-stroke engines are not designed to achieve a high level of conversion of CO and HC as

those for cars because of the greater quantity of HC and lubricant in the exhaust gas. They typically reduce emissions by half. In case of two-stroke three-wheelers a World Bank study[6] estimates that given their high usage "a catalyst might have to be replaced 20 times to maintain the original level of particulate emissions. This is clearly a problem." The same study mentions further, "In India SIAM is offering the government a warranty of 30,000 km for all two-and three-wheelers equipped with catalytic converters. Catalyst durability of 30,000 km would enable drivers to replace their catalyst at the same intervals as they have their engines overhauled."

But in practice there is currently no system either to verify the performance of these devices through rigorous emissions checks or ensure replacement of these devices if needed. On-road management of these technologies is of critical importance. Moreover, with regard to petrol vehicles like two-wheelers fuel quality issues such as sulphur content of petrol and its impact on the efficiency of oxidation catalysts fitted to these two-wheelers have not been assessed at all. Commensurate improvement in fuel quality in terns of sulphur content should be mandated.

EPCA further notes that the two-wheeler industry has already announced voluntary emissions warranty for emissions performance of the vehicles but without proper inspection procedures and adequate legal framework for its enforcement these provisions remain only on paper. It is now therefore important that the government establishes effective emissions inspection facilities for on-road vehicles to enforce emissions warranty effectively.

[6] Masami Kojima, Carter Brandon and Jitu Shah 2000, Improving urban air quality in south Asia by reducing emissions from two-stroke engine vehicles, World Bank, Washington, p18

B. In-use emissions standards for two-wheelers

EPCA has dealt with the matter of in-use standards and test procedures for in-use vehicles in much greater detail in the section on PUC system in this report. Therefore, this section should be read in conjunction with the PUC section. However, in this section EPCA would like to highlight the following key points with regard to in-use norms and test procedures for two-wheelers.

Under Pollution Under Control Certificate currently in force in Delhi a uniform standard of 4.5 percent CO by volume of exhaust is measured at low idle speed in all two wheelers irrespective of age and the level of technologies that include old carburetted two-stroke engines, new two-stroke engines with catalytic converters and four-stroke two-wheelers.

EPCA has taken note of two recent technical evaluations of the PUC system currently in operation in Delhi and in other cities by independent agencies. These include:

Study commissioned by the World Bank to John Rogers who conducted this study during August and September 2002 in India to assess the PUC system in the cities of Delhi, Mumbai, Pune and Bangalore (henceforth World Bank report). It analyses in detail the limitations of the current PUC test procedures and norms and recommends ways in which this could be improved.

The second study was commissioned by the Centre for Science and Environment to the US based Michael P Walsh, former Director of the Motor vehicle Pollution Control with the United States Environment protection Agency (USEPA); and Lennart Erlandsson, General Manager, Motor Test Centre, Sweden. They had conducted their study in Delhi in October, 2002 to recommend a phase-in plan for an improved and centralized vehicle inspection programme along with commensurate standards and test procedures that can be implemented in Delhi. (Henceforth CSE report).

These studies have highlighted the limitations of the current test procedures and norms for two-wheelers.

The World Bank study[7] has explained the following weaknesses in the current PUC test procedures for two-wheelers and how open it is to manipulation:

> In the current idling test for two and three wheelers it is virtually impossible to insert the probe sufficiently into the exhaust pipe to avoid air entrainment (that leads to dilution of exhaust). This would require the use of an extension tube which none of the PUC centres use.
>
> Since neither carbon dioxide nor oxygen is measured there can be no control for dilution of exhaust. Thus it is easy to reduce the reading by withdrawing the probe slightly from the exhaust pipe until the entrained air in the pipe reduces the exhaust CO concentration to desired level.
>
> Since all two wheelers are carburetted CO levels can also be easily reduced during this low idle test by weakening the mixture, and if required by retarding the ignition timing in extreme cases. As the test requires the engine to produce only sufficient power to keep itself running there are no checks and balances that could identify these false passes.

[7] John Rogers 2002, Assessment of the Pollution Under Control Programme in India and recommendations for improvement, Prepared for the South Asia Urban Air Quality management programme, The World Bank, Washington, October. P 14

EPCA has been given to understand that the Ministry of Road Transport and Highways (MRTH) is reviewing the current PUC norms. EPCA has written to MRTH for details on the proposed norms. Reply is still awaited. EPCA has therefore taken note of the details on the norms under consideration discussed in the technical reports mentioned earlier.

It is evident that MRTH in addition to tightening the CO norms for petrol vehicles including two-wheelers is also proposing to introduce idle HC norms. The new limit values under consideration for idle CO and HC for two wheelers are as follow: 9000 ppm HC for two-stroke engines, 4,500 ppm HC for four-stroke engines and 3.5 per cent CO for all. Since statistically robust in-use emissions test data are not available it is difficult to comment on the adequacy of the norms under consideration.

EPCA has therefore, taken into consideration the technical opinion of the expert reports in this matter. While commenting on the adequacy of the norms under consideration the experts have taken note of a small survey conducted by ARAI on in-use emissions profile of two-wheelers that shows clearly that no new two wheelers would fail at PUC centres if the proposed set of standards are applied. Proposed HC norms are too lenient for new two-wheelers and the proposal should be considered to match the engine technology.

The purpose of in-use standards is to maintain low emissions profile of both old and new vehicles. It is equally important to ensure that new vehicles do not deteriorate fast. EPCA would also like to point out that it is also important to consider smoke opacity test for two-wheelers. Measurement of smoke from two wheelers that are already in force in Taiwan can be a very effective deterrent to misuse of lube oil responsible for excessive smoke from these vehicles. Experts have also recommended that new techniques must be developed for two stroke engines to measure smoke during controlled conditions.

The discussions in the PUC section of this report bears out the need for phasing out of the present PUC centres and introduction of inspection only centralised centres with more advanced testing facilities and commensurate test procedures and norms. The CSE report (Walsh and Erlandsson) that outlines the ways to improve the vehicle inspection programme in Delhi has recommended that in the phase-in plan for more advanced vehicle inspection programme two-wheelers should be introduced to the new system immediately after the commercial vehicles. They have further recommended that test procedure for emissions measurement for two wheelers should preferably be a transient loaded mode test on a chassis dynamometer to replace the current simple idle tests. Both the World Bank report and the CSE report have mentioned that ARAI is developing a simple loaded test for two wheelers on a single roller dynamometer. This has good potential for application in inspection programme and should be expedited fast.

Till the time centralised facilities are created for these vehicles, the current PUC should be upgraded in the manner discussed in the PUC section (four gas analyser, lambda control, etc).

EPCA would like to emphasise the fact that for a large and an ageing fleet of two wheelers there are no immediate technical alternatives available to control emissions. Only a rigorous and credible inspection system can keep the technology clean.

C. Non-technical measures to renew in-use fleet

One of the major concerns is the enormously large fleet of ageing two-wheelers that are predominantly powered by two-stroke engines. Fast renewal of this fleet is essential to address the air quality objectives in the city.

The government has considered phasing out of old vehicles by capping the age as has been done in the case of commercial vehicles. In fact, EPCA would like to point out that the White Paper on pollution in Delhi that was issued by the Ministry of Environment and Forests in 1998

along with an action plan had recommended the following phase out plan for two-stroke engines based on the age of the vehicles:

Those of age 15 years or more w.e.f 4/4/2000
Those of age 10 years or more w.e.f 1/4/2005
All the remaining w.e.f 1/4/2007

But phasing out of old private vehicles is an extremely unpopular strategy that governments shy away from enforcing. It is therefore recommended that a composite fiscal policy like raising annual taxes on older vehicles, is designed to accelerate fast fleet replacement. Market based instrument are likely to be more effective than a blanket ban based on age. EPCA has already recommended a buy-back plan in its 1999 report -- an incentive scheme from the manufacturers and the government that reduces taxes/prices on vehicles bought in replacement of old vehicles, so as to make the replacement attractive to the owner. EPCA now feels that instead of keeping the strategy confined to one such scheme it is important to design a composite tax policy that will act as an incentive for fast renewal of old fleet.

In view of this EPCA would like to propose a combination of meaningful and effective fiscal measures that will encourage and force fast replacement of old fleet. Also only technological advancement of new two-wheelers cannot help as any improvement in per vehicle emissions will be swamped by the sheer increase in the numbers. It is therefore important to target the older fleet with fiscal policies that can discourage their ownership and usage.

Recommendations

As IA 179 points out that two-wheelers are a uniquely Asian problem as these are the dominant and a very polluting mode of transport in Asian cities. In Europe and the US these vehicles are very small in numbers and contribute very little to the total air pollution load. Therefore, technological solution to this problem will have to emerge from within Asia. These vehicles should be the focus of intense research and development to make them as clean as possible within a tight time frame. It is therefore, important to have technology forcing standards to accelerate technology development. EPCA recognises the unique features of this vehicle segment that primarily targets low to middle income classes in Indian cities and is extremely price sensitive. Appropriate fiscal policies can help to address this issue.

1. New mass emissions standards

a. Union of India specifically Ministry of Finance be directed to implement emissions based tax for early introduction of new norms:

Ministry of Road Transport and Highways (MRTH) has issued the draft notification on the new mass emissions standards for two wheelers to be implemented from 2005. EPCA has reviewed this draft. Keeping in view the need for fast acceleration of technology development in this sector EPCA recommends emissions based taxation that allows tax credits and incentive to the industry to meet the new emissions norms before time. This will be more meaningful if emissions standards for 2005 and 2008 are announced together and linked to fiscal incentive to make industry meet those norms in advance. The Auto Fuel Policy has already recommended the next batch of emissions standards for 2008. This is very important keeping in view the fact that even after meeting the tighter norms – 1.5 gm/km for CO in 2005 a new two-wheeler would emit more CO compared to a Euro IV compliant car in Europe (1 gm/km).

Only this can help to clear the uncertainties over the future road map and help in early introduction of advanced technology. In this context EPCA would like to mention that a similar recommendation was made by EPCA earlier in its report of October 1999 on the same matter which stated: “In order that manufacturers see benefit in early tightening of the emission norms, and their possible advancement for Delhi and the NCR, an emissions tax may be suggested. This could be of two types – the one by the Central Government to manufacturers, that is linked to the emission norms, being lower on vehicles conforming to the tighter norms, and higher the older the vehicle gets, and providing incentive to the manufacturers to hasten technology changes and the introduction of vehicles based on future norms.”

EPCA also understands that Indian manufacturers have developed alternative fuelled two-wheelers like LPG etc. Announcement of tighter norms in advance will provide opportunity to this segment to develop fast and have an advantage in meeting tighter standards within a tighter time frame.

b. Ministry of Road Transport and Highways be directed to set particulate emissions standards for two-stroke two-wheelers to be enforced from 2005: Studies from the across the world and also from ARAI, Pune have shown how particulate emissions from two-stroke powered vehicles are emerging as a key concern. EPCA would therefore recommend regulation of the PM emissions from these vehicles and set PM standards. Therefore, develop methodology for measuring particulate matter emissions from two-stroke engines and set PM standards for these vehicles and enforce them by 2005.

It is important to mention here that current efforts are not sufficient to address the problem particulate emissions from two-stroke engines. For instance, pre-mixing of lube and fuel has been made mandatory to check misuse of lubricants to control smoke emissions. But it is not clear how

effectively this has been able to prevent misuse of lube oil available loose in the market. If a blanket ban is not a practical approach to deal with two-stroke engines, it is more important to have PM emissions standards. EPCA notices that already with tighter emissions norms in force share of four-stroke engines is steadily increasing over the years. Currently the share of the four-stroke two-wheeler sale is estimated to be more than 60 percent of the new sales. Technology forcing standards is therefore critical in eliminating the technologies that don't transform keeping pace with the air quality objectives.

c) Direct ministry of petroleum and natural gas to regulate total aromatics immediately in addition to 1 percent benzene already in place to reduce high toxic emissions from two-stroke two-wheelers: High scavenging losses from two-stroke powered vehicles results in very high unburnt hydrocarbon emissions. As a result, even the unregulated emissions like benzene could be very high. Hon'ble Supreme Court has already directed lowering of benzene to one percent in the NCT Delhi. But total aromatic in petrol is still not regulated. This also contributes to the formation of benzene during combustion. Thus, commensurate fuel quality improvements along with engine design improvements are urgently needed to control unregulated emissions like benzene. EPCA is recommending a fuel quality based strategy as there is hardly any information available on regulating these emissions from vehicles.

2. In-use standards for two-wheelers:

The recommendations on in-use standards for two-wheelers should be read in conjunction with the section on PUC in this report that discusses in detail the limitations of the current PUC test procedures and standards and the scope for further improvement. EPCA would like to point out that upgradation of vehicle inspection system and norms would require considerable detailing with regard to technical and institutional requirements that cannot be included in totality in this report. EPCA has highlighted key issues of concern and findings in this report. But comprehensive technical assessments of the current PUC programmes are now available from independent sources - World Bank and Centre for Science and Environment (CSE) that are appended to this report. MRTH should take note of the findings and make a composite plan to improve the vehicles inspection test procedures and standards to meet the objective of these programmes effectively. EPCA would however highlight some key recommendations in this regard to set as a benchmark for upgrading the current system.

In its recommendations EPCA would like to mention that in addition to upgrading the current PUC system which is already on the official agenda a more advanced vehicle inspection programme be initiated on a pilot basis in Delhi that can become the basis for replication in other cities as well. But the beginning would have to be made in Delhi right away. To enable establishment of pilot project in Delhi MRTH would have to notify appropriate test procedures and norms under the Central Motor Vehicles Act and rules for I) upgrading the current PUC programme and ii) adoption of more advanced test methods and norms for phasing in centralised inspection programme. With introduction of tighter mass emissions standards and better fuel quality and an extensive CNG programme in place Delhi would require a more advanced vehicle inspection system to match the diverse levels of technology on road.

Ministry of Road Transport and Highways (MRTH) be directed to:

a. Notify effective and tighter PUC norms for two-wheelers immediately. MRTH is currently reviewing the PUC norms for two-wheelers along with other vehicle segments. As discussed in the main report the proposed norms are too lenient to make an impact. Technical review of the proposed norms as available from the World Bank and CSE technical studies show that the proposed idle HC norms of 9000 ppm for two-stroke engines for instance is very lax and will rarely ever fail any vehicle. In view of this tighter norms should be notified according to technology levels of vehicles on road to target gross polluters effectively (normally 20 percent of

the fleet at a given time). In addition to this smoke opacity test should be adopted for two-wheelers under the current PUC programme. Upgrade the PUC test methods to ensure accuracy and integrity of tests conducted (like dilution control through measurement of carbon dioxide and oxygen in the exhaust, lambda control etc). This issue has been discussed in greater detail in the PUC section.

b. Notify simultaneously commensurate test procedures and norms for in-use two-wheelers to implement advanced inspection test procedures to replace PUC in a phased manner: MRTH be directed to develop advanced test procedures for two wheelers to phase in enhanced inspection and maintenance programme in Delhi. EPCA has been informed that ARAI is developing a simple roll test on a dynamometer for two wheelers. This should be urgently expedited and applied under the new inspection system.

It is important to mention here that advanced inspection procedures are required for two-wheelers especially in view of the influx of new two-stroke engines fitted with oxidation catalyst with 30,000 km durability. Only effective inspection can detect the efficiency status of these devices and enable their long-term management in terms of periodic replacement if needed.

3. Emissions warranty

Poor durability of engine and emissions control equipment like catalytic converters are serious problems and therefore establishing the principle of manufacturers' responsibility for on-road performance is of critical importance. It is important to note that though voluntary emissions warranty has been offered collectively by the two-wheeler industry in India it cannot be implemented effectively under the current PUC system. To implement emissions warranty more advanced vehicle inspection system will have to be adopted. This would also require a comprehensive legal framework for enforcement. This should be defined as early as possible.

4. Fiscal measures to renew the old fleet and also control explosive increase in two-wheeler numbers in the long run:

The Delhi government be directed to design fiscal measures to renew old fleet of vehicles and further control increase in their numbers in the city. EPCA agrees with IA 179 that fast renewal of the on-road fleet is urgently needed to replace the older vehicles with new vehicles meeting more stringent norms. Originally, the Ministry of Environment and Forests (MEF) had recommended phase-out plan for two-stroke engines in the city based on the age of vehicles. But this could not be enforced. Instead of waiting for the old ones to die out and be replaced slowly by new vehicles with controlled emissions will take unacceptably long time. In view of this EPCA would like to propose a combination of meaningful and effective fiscal measures that will encourage and force fast replacement of old fleet. It is very important to target the older fleet with the following fiscal measures that can discourage their ownership and usage.

The combination of fiscal measures can include the Following:

Impose periodic taxes on two-wheelers to make ownership and usage of old vehicles more expensive: This should be more frequent and higher for the older age groups. Currently, only commercial vehicles are required to pay an annual registration fee but private vehicles are not yet covered. This anomaly should be corrected.

Periodic taxes can be imposed according to the mass emissions standards these vehicles meet. This recommendation has already been made by EPCA in its October 1999 report. EPCA would like to reiterate the same point once again. The report had then stated, "Tax imposed on existing on-road vehicles, linked again to the emissions, getting higher for the older vehicle, and based on the age or the broader distinction of pre- and post- the various emission norms. Thus, a vehicle 20 years old could pay more tax than a vehicle 15 years old; alternatively, the pre-1991

could pay higher tax than one post-1991, and that higher than the post-1996 one." Such a scheme of taxation linked to emissions of the vehicle would encourage both manufacturers and owners to move to advanced technology fast.

EPCA has already recommended a buy-back plan in its 1999 report -- an incentive scheme from the manufacturers and the government that reduces taxes/prices on vehicles bought in replacement of old vehicles, so as to make the replacement attractive to the owner. EPCA is of the view that instead of keeping the strategy confined to one such scheme it is important to design a composite tax policy that will incentivise fast renewal of old fleet.

5. Improve public transport to discourage ownership and usage of tow-wheelers: Controlling further increase in the numbers and usage of two-wheelers will be effective and possible only if a composite transport policy is framed to improve public transport in the city to meet the mobility demand. This is yet another recommendation that the EPCA had made in its October 1999 report stating "Only when this is done, and done efficiently, will it be able to provide commuters with a viable option to using their own vehicles, and thereby reduce the congestion of vehicles on the road. Although we have said this before, we cannot forbear from reiterating it, so important do we think this measure is to the orderly planning for traffic and air quality management of the city." It reiterates this recommendation and in this respect would like to draw the attention of the court to the recent efforts of the Delhi government to draw up a comprehensive public transport policy. These efforts need to be supported, endorsed and urgently implemented.

A. 2. Pollution under control certificate scheme

On 15 July 2002, the *Amicus Curiae* for the ongoing public interest litigation on air pollution in the National Capital Region of Delhi had submitted an application to the Hon'ble Supreme Court. In this application the *Amicus Curiae* had raised the following issue with regard to pollution control certificate programme (PUC) and sought directions from the Hon'ble Court:

> "It has also been reported that the "pollution under check" system being operated by the Delhi transport department leave much to be desired. It is submitted that Bhure Lal committee be directed to examine the system, define the in-use emissions norms and to direct any improvements it considers appropriate."
>
> "Direct the Bhure Lal Committee to examine the matter is referred to in para 6 and 7 of this petition and submitted its report thereon."

In response to this application the Hon'ble Supreme Court in its order on February 14, 2003 directed the EPCA to examine the matter.

To examine these issues EPCA has reviewed the earlier relevant Court orders. It has further reviewed the submissions of the central and the state governments filed in response to the IA 179, to assess the status of current level of policy and implementation and consider if these are adequate to address the key concerns in emissions from in-use vehicles. It has further reviewed the independent technical assessments of the current PUC centres conducted by other agencies for informed opinion and recommendations.

Relevant Court orders till date:

The Supreme Court order of July 28, 1998: This directs comprehensive I&M programme to be started by the transport department and the private sector by 31 March 2000.

EPCA would like to inform that the Calcutta High Court had soon after issued a stay order preventing private sector participation in I&M. EPCA had subsequently recommended in its progress report of June-August 1999 for re-examination of this issue and lifting of this stay order. The Hon'ble Supreme Court in its order of March 23, 2001 vacated this stay order.

Response of the government to the IA 179 of July 15, 2002

Following the submission of the IA 179 both the Union of India and Delhi government have filed affidavits in the Supreme Court on July 25, 2002 and July 26, 2002 respectively.

Responses of both Union of India and Delhi government are listed below.

IA 179 of July 15, 2002	**Response of the Union of India in their affidavit of July 25, 2002**	**Response of Delhi government in their affidavit of July 26, 2002**
"It has been reported that the 'pollution under check' system being operated by the Delhi transport department leaves much to be desired. It is submitted that the Bhure Lal committee should be directed	"UOI informs the court that a sub-committee headed by N R Krishnan under the Expert Committee is already looking into the matter of I&M. The sub-group has interacted with SIAM, testing	The PUC system being operated in Delhi is in conformity with the provisions of the CMVR 1989 and MRTH notification no. GSR –400 (E) of May, 31 2002 (as per its latest amendment) regarding

to examine the system, define the in-use emission norms and to direct any improvements it may consider appropriate." (*para-7* Application on behalf of the *amicus curiae* in IA 179 of 2002) "Direct the Bhure Lal Committee to examine the matter is referred to in para 6 and 7 of this petition and submitted its report thereon"	agencies/institutions and the government of NCT of Delhi. The affidavit says "It is therefore that the issue….need not be referred to the Bhure Lal Committee at this stage. The Hon'ble Court may take a view after the government has finalized its scheme and the same is submitted to the court."	checking tail pipe emissions. To improve the existing authorized pollution checking centers, the department has initiated programme for computerization of the pollution checking activity at its pollution checking centers. In addition, the authorized PUC centers are being inspected and surprise checks carried out to ensure compliance on their part to the conditions of authorization.

In view of these submissions from the Union and the state governments EPCA has done the following:

1) Review of the recommendations of the Auto Fuel policy that has been released since the submission of the Union of India affidavit to understand the proposed official roadmap on this issue.

2) Conducted independent assessment of the PUC system on the basis of two independent technical evaluations recently done to recommend the ways to improve vehicle inspection system in Delhi.

Details:

1) Review of the recommendations of the Auto Fuel policy: Summary of findings and recommendations

Key observations and recommendations of the proposed Auto Fuel Policy of the Union of India:

Auto fuel policy on the limitations of the current computerised PUC system:

> **"Emissions checking of the vehicles in India is presently being done at emissions test centres located at oil retail outlets or at centers authorized by the transport departments"**
>
> "Most of the existing emissions test centers do not follow the correct procedures for testing vehicles. This is largely due to inadequate training of the technicians at the centers."
>
> "To address the inadequacies of the present emission checking system SIAM has developed a computerized emissions checking system for petrol vehicles to eliminate/minimise malpractices and minimize human interventions, improve credibility and acceptance of emissions certification process and establish a strong database of vehicles tested which can be made use of by government authorities for taking policy decisions."
>
> "The PUC test with or without computers do not represent emissions performance as: Idle CO tests are simple tests measuring the volumetric concentration of carbon monoxide while vehicle is under idling condition."

"At present almost all vehicles are using carburettor for fuel control except for a few using electronic engine management system. Carburetors can be easily adjusted for lean setting for passing the tests. These tests do not measure mass emissions. The idle test does not represent the realistic engine operating conditions. The major engine control system for fuel control and ignition control have different operating modes under idling with no load and under driving with varying load."

"The regulatory mass emissions test is carried out under a driving cycle test in which the vehicle is driven on a transient driving cycle simulating road conditions and emissions are measured. As the engine operating conditions are different there is no good statistical correlation between idling test and mass emissions test results. Further NOx concentration cannot be measured under idling conditions as its very low when the vehicle is idling."

"In view of these it is imperative to develop a short test for effective implementation of the inspection and maintenance programme which will measure mass emissions of in-use vehicles under transient cycle. The tests may be different for 2 wheelers, cars, LCVs and HCVs."

Key recommendations of the Auto fuel policy:

- The existing PUC system needs to be replaced/upgraded to a more reliable computerised systems.
- The computerised emissions checking system proposed by SIAM should be adopted.
- Reduce the frequency of inspection to once a year for new private vehicles of upto 5 years of age and twice a year for more than 5 years of age for old private vehicles. For commercial vehicles frequency should be 6 months to begin with and to reduce it to 3 months finally.
- Link annual vehicle insurance with inspection certificate.
- ARAI mass emissions testing system should be considered for further study so that it can be dovetailed with PUC checks.
- Replacement of old polluting vehicles should be encouraged through an appropriate mix of incentives and disincentives.
- **Emissions warranty and recall system**: The Mashelkar Committee felt that there was a need for emissions warranty and recall system due to the fact that presently the responsibility of emissions performance of a vehicle totally rests on the vehicle owner whereas the vehicle manufacturers remains completely unaware of the emissions performance of the vehicle once it is sold. In view of this the committee recommends putting in place an emissions warranty system with the following features:

  Emissions warranty that can facilitate emissions checks of vehicles picked up randomly from delivery points as well as random emissions performance checks of the LPG/CNG conversion kits.
  The offered warranty system may be made more comprehensive defining the legal framework.
  An on road emissions testing procedures may be developed.

Engineering infrastructure for comprehensive surveillance of new and in-use vehicles at IITs or at reputed engineering colleges or at other research institute is recommended.

Auto fuel policy has proposed the following phase-in plan to improve in-use vehicles inspection**:**

In NCT Delhi:
New PUC checking system for all categories of vehicles by Oct 1, 2003
In other metros April 2004
In whole country April 2005

I&M system for all categories of vehicles in NCT Delhi by April 2005
Other metros April 2006
Whole country, April 2010

For upgradation of the PUC centers Auto Fuel Policy recommends adoption of the computerised PUC system developed by SIAM

EPCA's observations on Auto Fuel policy

Important observations have been made in Auto Fuel policy with regard to inadequacy of the current PUC tests and the need for further improvement.

However, EPCA would like to point out the issues that have not been dealt with adequately in the Auto Fuel policy. These are as follow:

i. Even though the Committee has pointed out the limitations of idling tests conducted under the current PUC programme, its proposal with regard to upgradation of the PUC programme is inadequate. It is only proposing to add computers and a web camera to the existing centres. It does not comment how will this help if the current PUC norms and test procedures and enforcement framework are not improved alongside. It does not discuss the need for additional test parameters and monitoring of other pollutants in the current PUC test to make these tests more realistic and effective. (EPCA would discuss these issues in the later section).

ii. Similarly, Auto Fuel policy has not discussed the limitations of the current free acceleration smoke test for diesel vehicles and how to upgrade this further. Moreover, EPCA observes the lack of appreciation of the need for appropriate test methods that can measure particulate matter emissions from diesel vehicles, which is one of the greatest health concerns.

iii. Auto Fuel Policy has recommended adoption of short test for effective implementation of the inspection and maintenance programme which will measure mass emissions of in-use vehicles under transient cycle. ARAI and other concerned testing agencies have been asked to study possible short tests for applications. It has further recommended developing these on a pilot basis. EPCA appreciates this suggestion. But it is important to point out that till the time these systems are established allowing further expansion and investments in the current computerized PUC programme without upgrading the norms and test procedures **will create entrenched business interest and rolling them back later to phase in centralised and advanced testing centres will be very difficult.** Therefore, there is need for greater clarity in the roadmap with regard to the immediate improvements required in the current PUC system, limiting its further expansion and the milestones to phase-in centralized testing centers with advanced testing facilities.

2. EPCA's assessment of the PUC system

Hon'ble Supreme Court has directed EPCA to examine the current system, define the in-use emissions norms and to direct any improvements it considers appropriate. To address these concerns and for a proper technical review of the issues under consideration EPCA has taken cognizance of two very recent and detailed technical evaluations of the PUC system in India done by experts contracted by independent agencies. These reports are based on field investigation and consultation with the concerned target groups including the government regulatory agencies, state transport corporation, certification agency, instrument manufacturers, Society for Indian Automobile manufacturers. These reports are:

i) Study commissioned by the World Bank to John Rogers, vehicle emissions specialist who has helped to develop inspection and maintenance programme in Mexico city. He conducted this study during August and September 2002 in India to assess the PUC system in the cities of Delhi, Mumbai, Pune and Bangalore (henceforth World Bank report). It analyses in greater detail the limitations and inadequacies of the current test procedures and norms and recommends ways in which this could be improved. This report is called "Assessment of the Pollution Under Control Programme in India and recommendations for improvement," Prepared for the South Asia Urban Air Quality management programme, The World Bank.

ii) The second study was commissioned by the Centre for Science and Environment to US based Michael P Walsh, former Director of the Motor vehicle Pollution Control with the United States Environment protection Agency (USEPA); and Lennart Erlandsson, General Manager, Motor Test Centre, Sweden. They have conducted the study during October, 2002 in Delhi to evaluate the PUC system and the fitness tests for the commercial vehicles currently in force and recommend a phase-in of an improved and centralized vehicle inspection plan along with commensurate standards and test procedures that the Delhi government could implement (henceforth CSE report). This report is called "A Plan for Progress: Motor Vehicle Inspection in the National Capital Region of Delhi."

Both studies are appended to this report.

For any other improvement in the current system it is very important to have clarity in the objectives of a vehicle inspection programme to set targets for improvement. There is need for greater appreciation and understanding of the objectives that govern good vehicle inspection programme across the world: EPCA would like to outline the following:

- Emissions from vehicles depend largely on the proper functioning of engine components. Any malfunction of the air and fuel or ignition management system may cause high emissions. An effective inspection and maintenance programme (I&M) can identify these problems and ensure their repair to meet the appropriate standards[8].
- Force gross polluters – vehicles unable to meet the standards through maintenance or repair -- out of circulation. Studies done across the world show that a small fraction of overall fleet is responsible for a large percentage of total vehicular emissions. The US Auto/Oil programme found that 20 percent of vehicles were responsible for 80 percent of

[8] Lennart Erlandsson and Michael P Walsh, 2003, Motor Vehicle Inspection in the National Capital Region of Delhi, A Plan for Progress, Prepared for Centre for Science and Environment, New Delhi, March 7.

emissions. It is important to identify these vehicles effectively for repair[9]. It is expected that the proportion of the gross polluter would be larger in the developing countries.

- It is rarely obvious which vehicles fall in the gross polluter category as emissions may not be always noticeable and emissions control malfunctions do not always affect vehicles driveability. Effective I/M programme can identify problem vehicles.[10]
- Ensure that the vehicle owners bring their vehicles into compliance (through maintenance). Discourage vehicle owners from tampering with emissions control systems or misfueling their vehicles[11].
- Identify in-use vehicles that require recalls by vehicle manufacturers to rectify inherent technical flaws in emissions control components that cause higher emissions.[12]
- Identify in-use vehicle components defects and failures covered by vehicle manufactures warranty programme.[13]
- Provide feedback to regulatory authorities on the performance of the system and technologies to plan further improvements.[14]

It is important to review the PUC programme currently in force to assess if this fulfills these objectives.

The sections 56 and 59 of the Motor Vehicles Act, 1989, (CMVR) govern the inspection and maintenance of vehicles in India. The pollution under control certificate programme in force currently have the following elements:

i) Commercial vehicles: Annual fitness check for commercial vehicles which include exhaust smoke opacity tests (65 Hartridge Smoke Unit (HSU) for diesel vehicles under free acceleration and idling carbon monoxide tests (3 percent CO by volume) for commercial vehicles on CNG/petrol. A certificate of fitness is issued under section 56 of CMVR annually to all commercial vehicles. This means that the commercial vehicles undergo an overall fitness tests as well as emissions test every year.

ii) Private vehicles: These do not require mandatory fitness checks till after the age of 15 years. But these vehicles require PUC certificates every three months in Delhi (idling CO limit of 3 per cent by volume for cars and idling 4.5 per cent CO by volume in two-wheelers, free acceleration 65 HSU smoke density limit for diesel cars and multi-utility vehicles).

The current PUC scheme of vehicle inspection in place since 1992 has not been modified even once. The only modification so far has been the introduction of computerised data collection and Web camera for automatic imaging of number plates. There is no change in the test procedures and

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[9] John Rogers, 2002, Assessment of the Pollution Under Control Programme in India and recommendations for improvement, Prepared for the South Asia Urban Air Quality management programme, The World Bank, Washington, October. P 3

[10] Lennart Erlandsson and Michael P Walsh, 2003, Motor Vehicle Inspection in the National Capital Region of Delhi, A Plan for Progress, Prepared for Centre for Science and Environment, New Delhi, March 7.

[11] Bekir Onursal et al, 1997 Vehicular Air Pollution: Experience from seven Latin American Urban Centres, World Bank Technical paper No 373, Washing ton, pp 66-67

[12] Onursal et al

[13] Ibid

[14] Ibid

emissions norms and overall framework of enforcement. Delhi has nearly 400 PUC centres spread across the city, which check more than three million registered vehicles. Level of compliance is very low. A mere 17 percent of the fleet, turned up for emissions checks. Weak emissions standards, faulty test procedures, poorly maintained equipment, and extremely weak vigilance combine to undermine the credibility of the programme.

Summary of key findings and recommendations of the two technical evaluation of the PUC system

PUC standards and test procedures

The World Bank report[15] makes the following observations with regard to the weaknesses in the current PUC test procedures that make the system vulnerable to manipulation:

Idle CO test for Petrol vehicles

- Since all two and three wheelers and a sizeable proportion of cars are carburetted CO levels can be easily reduced during the low idle test by weakening the air fuel mixture, and if required by retarding the ignition timing in extreme cases. As the test requires the engine to produce only sufficient power to keep itself running there are no checks and balances that could identify these false passes.

- The World Bank report further points out that "it is easy to reduce both CO and HC from a vehicle by delay in ignition timing and leaning out the air/fuel mixture. This late and lean approach not only reduces CO and HC but also reduces engine power and increases NO. Without measuring NO it is not possible to detect if the engine has been tuned "late and lean" just to pass the test."

- In the idling test for two and three wheelers it is virtually impossible to insert the probe sufficiently into the exhaust pipe to avoid air entrainment (that leads to dilution of exhaust). This would require the use of an extension tube to prevent air entrainment which none of the PUC centres have/or use.

- Since neither exhaust carbon dioxide nor oxygen are measured there can be no control for dilution of exhaust. Thus, it is easy to reduce the reading by withdrawing the probe slightly from the exhaust pipe until the entrained air pipe reduces the exhaust CO concentration to the desired level.

- The new computerized PUC system only enables data entry and generation of local database. No changes are proposed to the test procedure, analytical equipment, requirement for calibration or central supervision and audit. This is a serious weakness in the current system.

- **The emissions limits have remained unchanged at very high levels allowing almost all vehicles to pass the test.**

Smoke opacity test for diesel vehicles

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[15] John Rogers, 2002, Assessment of the Pollution Under Control Programme in India and recommendations for improvement, Prepared for the South Asia Urban Air Quality management programme, The World Bank, Washington, October.

- **According to the World Bank report all PUC centers that currently test diesel vehicles are equipped with partial flow smoke meters without engine temperature or rpm measurements. The probe is inserted into the vehicle tailpipe and a series of five or eight accelerations are performed. Whilst the acceleration should be conducted at full throttle until the maximum governed engine rpm is reached, in practice a more lenient test is usually performed at partial throttle to a much lower rpm. This means that while according to correct test procedures the engine should be rapidly accelerated at full throttle and smoke meter reading recorded when maximum governed engine rpm is attained, in actual practice the test is performed at partial throttle opening and much lower rpm so as to get a low smoke meter reading. (If speed and oil temperature are not measured at the time of test it is not possible to check accuracy of tests.)**

- Smoke opacity is not representative of the particulate emissions from diesel vehicles. Studies show that smoke opacity measured under a controlled load on a dynamometer has a poor correlation with particulate emissions and that smoke opacity measured under free acceleration test has essentially no correlation for HC and for NOx emissions and is considered to be the test that is most unlikely to predict the emissions performance of modern computer controlled engines. Free acceleration test procedure is not adequate for indicating particulate or NOx emissions.

- The assessment of particulate emissions from in-use diesel vehicles requires a short transient dynamometer test procedure that can measure particulates in engine exhaust which is of prime concern.

Based on these observations EPCA would like to draw attention to the mounting evidence to state that the current smoke opacity tests is not at all adequate to measure fine particulate emissions from diesel vehicles. In fact another report from the World Bank states, "If diesel vehicle testing programme does not lead to the reduction of fine particulate emissions, then it shall have failed in its ultimate objective, the reduction of pollutants that damage the public health."[16]

This study further points out that a number of high particulate emitters have quite low scores on smoke emissions registered during free acceleration smoke opacity tests, while some of the high smokers have relatively low particulate emissions compared to the true gross polluters. This means that the current smoke test **"run the danger of misclassifying gross polluters as relatively clean and low polluters as high polluters."**[17]

Smoke tests can only help to diagnose malfunctioning and defects among older engine vehicles with mechanically controlled fuel systems. These tests are not at all effective for modern electronically controlled engines or turbo charged engines. For these vehicles an alternative test procedure needs to be developed. **Short dynamometer based transient tests are needed.**[18]

Drawbacks in the current organizational framework of PUC

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[16] Tackling diesel emissions from in-use vehicles, 2002, South Asia Urban Air Quality management Briefing Note no 10, Urban Air Pollution, The World Bank, November

[17] Tackling diesel emissions from in-use vehicles, 2002, South Asia Urban Air Quality management Briefing Note no 10, Urban Air Pollution, The World Bank, November, p3

[18]. Ibid

Another regulatory challenge is to set up an appropriate institutional framework for conducting effective inspection, supervision and auditing of the test centers for enforcement.

But there are limitations in the manner in which the current PUC centers are organized.

The World Bank study points out the following problems[19]:

- Too many centers to be able to supervise and control
- Anybody can set up a PUC center with minimal investment and little checking or supervision from a regulatory body.
- A serious lack of training and established operating and test procedures
- Major instruments calibration problems
- No independent audits
- Minimal enforcement
- Very little accountability. A center can issue a bogus certificate with impunity.
- There is no independent body with the responsibility of analyzing the results from the PUC centers to determine and or recommend changes in the emissions limits or to analyse systematic problems with specific vehicle types. Most of the members involved with defining the PUC process are from industry and equipment manufacturers and do not have experience or expertise to develop a PUC programme with sustainable improvements over time. Such a continuing improvement would require regular updating of test protocols, emission limits and operating procedures, likely to be necessary every other year or so.

The CSE technical report points out that a good I/M programme would require a proper vehicle registration system to record actual numbers on road. As of today, the registration data is not representative of actual numbers on road. For inspection and reinspection of vehicles the registration office must be able to trace the problem vehicles and track their inspection status. This makes computerized registration and rationalization of the registration system essential.

Ways to improve the system in Delhi

The following key issues emerge from the technical reports with regard to phasing in of an improved system:

- A complete phase out plan of the numerous existing testing centers that are difficult to control and supervise must be scheduled. Even while upgrading the PUC system announce the plan to completely centralize and privatise the system in a given time frame. Replace the smaller PUC centres in a phased manner with fewer centralised but bigger centres capable of testing large number of vehicles at a time and keep them under strict surveillance.
- The sequence of introducing different categories of vehicle to the centralized inspection system should follow the order of priority with regard to most polluting categories. Move the commercial vehicles (diesel commercial vehicles and CNG buses, autos and taxis) first to centralised inspection centres where more advanced testing facilities are available. Since commercial vehicles already need to go through routine annual fitness check and emissions tests, the inspection center located at Burari in Delhi, should be immediately upgraded to meet the new requirements.
- Subsequently, phase-in all private vehicles within the ambit of centralised inspection with improved test procedures. Priority focus to be on two-wheelers and vehicles with advanced emissions control system like catalytic converters.

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[19] John Rogers, 2002, Assessment of the Pollution Under Control Programme in India and recommendations for improvement, Prepared for the South Asia Urban Air Quality management programme, The World Bank, Washington, October. P 5

- **Till the time the system is completely centralized improve the current PUC system (norms, test procedures and institutional framework for its enforcement).**
- **Encourage privatisation of inspection centers with strong government supervision. (**

Upgrading of the current PUC system

The PUC system should be immediately enhanced with suitable enhanced emissions norms and test procedures:

The technical reports have indicated the following improvements in the current PUC norms and test procedures.

In-use emissions standards

EPCA has been given to understand that the Ministry of Road Transport and Highways is currently reviewing the PUC norms and are proposing to introduce idling hydrocarbon norms and revise the idling CO norms for petrol and CNG vehicles.

Actual test database on the basis of which such standards have been proposed are not available. Therefore, technical judgment is the other basis to assess the adequacy of the new norms. The CSE technical report show that the proposed hydrocarbon norms, for petrol cars without catalytic converters at 1,500 ppm (parts per million); 750 ppm for those with catalytic converters; and 9,000 ppm for two-stroke two-wheelers, are too lenient. The report makes this observation on the basis of the experience with similar technologies in the West and their known emissions profile on road. According to the report idle hydrocarbon emissions from a petrol car fitted with a three-way catalytic converter must never exceed 100 ppm. It is also mentioned in the same report based on the consultation with the ARAI that the proposed HC norm of 9000 ppm for two-stroke two-wheeler is too lenient to fail any vehicle.

The World Bank report has expressed concern about the current scale of non-compliance in all the cities that it has studied and prefers to keep the standards lenient to lower the failure rate initially and then gradually tightened them progressively over time to improve compliance. But it states very categorically with regard to the current norms that the emissions limits have remained unchanged at very highly lenient levels allowing almost all to pass.

However, both reports have recommended drastic improvements in test procedures both for the current PUC and the improved centralized inspection centers.

These are:

Improvements in emissions measurements in PUC centres:

Petrol vehicles

- For petrol vehicles shift from presently used 2-gas analyzers to 4-Gas Analyzers calibrated and certified to measure CO, HC, carbon dioxide (CO_2), oxygen (O_2) for accurate testing. Measurement of CO2 and O2 as a dilution correction factor will eliminate the problem of tampering at the time of testing to dilute the exhaust by not putting the probe correctly. Measurement of Lambda (actual air-to-fuel ratio compared to the stoichiometric ratio) should also be included.[20]

[20] John Rogers, 2002, P 52 (World Bank report)

- All the gas measuring equipment used must be controllable from the computer to ensure that automatic gas calibration and leak checks are being correctly performed every three days at a minimum and that "ambient and residual gas values are within limits before allowing the instruments to be zero referenced between tests. Computer control can lock out the instrument if any functional problem is detected."[21]

- Introduce both low and high idle measurements (emissions measurements at low and high speeds) for more realistic measurement immediately.[22]

Need for improvement in smoke opacity test of diesel vehicles in PUC centres

Till the time more improved loaded test procedures are adopted for diesel vehicles it is important to further upgrade the instruments and test procedures in the PUC centers for accurate results. These include the following:

- Instruments for recording exhaust opacity along with such parameters as engine oil temperature, speed, atmospheric pressure and humidity at the time of testing to make sure that the testing has been done on a sufficiently warmed up engine and at the maximum governed speed as required.
- This would require a reference table on recommended RPM and oil temperature for different engine models and software to store it.

CNG vehicle inspection

Experts have recommended a special focus on CNG vehicles inspection. The CSE report points out that in the absence of effective emissions inspection system, many CNG buses are coming in with after-treatment devices with poor durability.

The report states that the idle CO emissions data for CNG buses available at vehicle inspection unit in Burari shows unacceptably high levels in the fleet that is relatively new. Statistics showed that out of 300 emissions measurements conducted at Burari at the time of their visit, 18 per cent of the tested buses had CO idle values of more than 3.0 per cent and about 60 per cent of the buses had CO values of more than 1.0 per cent. Experts noted that maximum idle CO of 3.0 per cent for CNG buses were too lenient, especially when all buses are equipped with catalytic converters. According to the experts this indicates that the catalytic converters are not working. In the US a maximum of 0.5 per cent CO at idle is accepted for CNG bus, as compared to 3.0 per cent in India. It is advisable to reconsider the present limit value of 3.0 per cent. CNG buses should be brought within the ambit of centralised vehicle inspection system immediately. The test procedure for emission measurement should be transient loaded mode test focusing on the measurement of NOx. These along with LPG vehicles should be however subjected to the enhanced PUC system, until the new I/M programme is fully implemented for various groups of CNG vehicles.

Catalytic converter is included in the exhaust emission control system by CNG engines manufacturers' in order to fulfill the standards for new vehicles/engines. But the performance warranty of converters is only 72,000 km. This should be compared with the European requirements for manufacturers' responsibility and warranty, which is eight years or up to 500,000 kms. The report states "what happens after this limit is unclear; according to our knowledge there is no requirement for changing the converter at specified driving distances and no specific control is carried out during the annual fitness check."

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[21] John Rogers, 2002, P 52 (World Bank report)

[22] CSE report

The report further states that in view of the prospect of LPG vehicles now coming into the market comprehensive regulations for conversions should be developed for both LPG installations in the vehicles as well as emissions performance of both converted and dedicated LPG vehicles.

The report has recommended a combined safety and emissions tests for CNG buses. This has been discussed in greater detail in the second part of the report.

Phase-in loaded test procedures in centralized centres

It is evident that even with improvements in the current test procedures it will not be possible to measure other key pollutants of concern – particulate matter and nitrogen oxides from in-use vehicles. In view of this and also to get more accurate test results that are representative of actual emissions on road it is important to introduce loaded mode tests on chassis dynamometer.

Loaded mode tests for petrol and CNG/LPG vehicles

- Gradually phase in "loaded mode" test on chassis dynamometer. This will enable introduction of NOx emissions measurement as well as PM measurement. Without measuring NO it is not possible to detect if the engine has been tuned "late and lean" just to pass the test. Petrol vehicles that are tuned in this way to pass the idle CO tests are usually re-tuned immediately afterwards to regain this lost power. Hence measurement of NO on a dynamometer test is useful to control and minimize this practice. Dynamometers are essential to minimize false passes. Two types of dynamometers are required for two and three wheelers, and for cars. In Delhi a third heavier dynamometer should be specified to allow dynamic testing on CNG and diesel powered buses.[23]

- For objective test results it is further recommended that to be effective the test protocol must minimize the impact of the test technician can have on the tests outcome. It is recommended that the test results should not be made available to the test technician in the test lane until the computer has entered the results in the database. Otherwise, it is common practice for testers to prevent rejects from occurring by tampering with lane computer, test procedure or with the vehicle.[24]

Diesel vehicles

Since smoke opacity has poor correlation with particulate emissions it is recommended that a short transient dynamometer test procedures for in-use diesel vehicles be defined and implemented in which both visible smoke and particulate matter are measured.[25]

As mentioned earlier, the current tests for diesel vehicles do not adequately measure diesel particulate emissions, of grave health concern in most cities. Evidence shows that the current smoke opacity tests are not representative of particulate emissions from diesel vehicles. Only loaded mode tests with particulate matter standards can verify particulate levels. Ministry of Road Transport and Highways (MRTH) will have to immediately notify loaded mode test procedures along with appropriate standards on a chassis dynamometer so that commercial vehicles (both diesel and CNG/LPG vehicles) can be subjected to improved I&M in the critically polluted cities as per the proposed plan.

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[23] World Bank report and CSE report

[24] World bank report

[25] John Rogers, 2002, P 52 (World Bank report)

Calibration and audits and government supervision

A lot of emphasis has been given in both reports by experts on the role of strong government supervision and auditing of the entire inspection system to enhance credibility and reliability of the programme. Some of the key recommendations are:

- The elements of the government supervision and auditing should include covert as well as overt audits, calibration checks, training supervision and strict enforcement and penalties. Remote computer based auditing will help to distance the inspecting staff from the centers.

- In PUC centers instruments calibration be performed by independent accredited material standards laboratories every three months. In centralized centers this should be performed every month.

- Private sector should be encouraged to setup inspection centers and undertake actual inspection. But these private centers should be set up through open bidding. A legal framework be established to penalize centers for fraudulent practices.

CSE report has detailed a phase-in plan for establishing centralized inspection centers for commercial vehicles in Delhi that is appended to this report as Annexure 1.

Emissions warranty and recall programme

Vehicle inspection programme should also be able to detect inherent technical flaws and malfunction due to engineering defects in the emissions control components of vehicles for which manufacturers are responsible. EPCA would like to point out that the automobile manufacturers have already collectively volunteered to provide emissions warranty. But such warranties will not be effective if these remain pegged to the minimal provisions of the current PUC. Enforcement of such warranties would require more advanced vehicle inspection programme. The problem of poor durability of engines on road also raises the question if it is time to introduce a Recall Programme. As CSE report points out "When systematic errors in the emissions control system are verified has to be modified in an in-use compliance test programme, the manufacturer of the vehicles has to modify all vehicles in the market free of charge within a specified number years or limited driving distance." As mentioned earlier, Auto Fuel Policy has already recommended emissions warranty and recall programme for India.

Recommendations

B. Pollution Under Control system

Significant measures with regard to improvement in fuel quality, vehicle emissions standards and introduction of cleaner fuels like CNG have been implemented to control vehicular pollution in the NCT Delhi under the aegis of the Apex Court. As a result of these changes the mix of vehicle technologies and vintage is very different in Delhi from that of many other cities of India. There are newer technologies and a uniquely large fleet of CNG vehicles in Delhi. The immediate issue therefore is how do we maintain their low emissions during their useful life on road and ensure that these meet the durability requirement.

This would require well designed vehicle inspection programme matching different technology levels in the city. This poses serious challenge to designing an appropriate vehicle inspection programme for NCT Delhi. Delhi government has already been directed by the Hon'ble Supreme Court to establish a proper vehicle inspection system in Delhi by March 2000.

Currently, the only inspection system in place is pollution under control certificate programme (PUC). The main report details out the limitation of this programme and the ways to improve it. In the summary here EPCA would like to list out the key recommendations to improve the current vehicle inspection system. The recommendations are in two parts. I) Immediate improvement needed in the current PUC test procedures, norms, and institutional framework for auditing and supervision to make it more effective, and, ii) A phase-in plan to replace the decentralized PUC centers with centralized inspection only centres with more advanced test procedures and commensurate norms and facilities. This will be done according to the priority order of vehicle categories. EPCA has taken into account the findings and observations of the two independent technical evaluations available from the World Bank and the Center for Science and Environment in this regard.

I. Improving the PUC system

Ministry of Road Transport and Highways be given the following direction

Petrol and CNG vehicles

Notify tighter PUC norms immediately:

EPCA has given a detailed assessment of the current and proposed PUC norms in the relevant sections. This shows how the current norms and test procedures are open to manipulation and allows all vehicles to pass. EPCA has been given to understand that MRTH is currently reviewing the PUC norms and is proposing to introduce idling hydrocarbon norms and revise the idling CO norms for petrol and CNG vehicles. Technical reports discussed in the main report show that the proposed norms are too lenient to make an impact. The current proposal of 1500 ppm of hydrocarbons for cars without catalytic converters and 750 ppm for cars with catalytic converters are too lax. Technical reports show that the comparable technology fitted with three-way catalytic converters in Europe cannot exceed 100 – 200 ppm.

Even if the norms should target in getting rid of the worst 20 percent or gross polluters from the fleet, from technical judgment as stated in the experts reports it appears that the proposed norms are too lenient for this. It is therefore, important to set meaningful and effective norms according to the levels of technologies (for example vehicles with and without catalytic converters etc). To meet the present and the future requirements of vehicle inspection programme appropriate test procedures and standards should be established immediately.

Upgrade the PUC test procedures for petrol vehicles

In addition to emissions tests it is important to monitor the additional testing parameters to ensure accuracy of tests and prevent manipulation of test results at the PUC centers. Since the MRTH is already reviewing the PUC norms and test procedures EPCA would like to state that the two technical reports on PUC system in Delhi have detailed out in great length the various technical improvements required in the current procedures. EPCA would like to recommend that the concerned agencies like MRTH, ARAI take note of the suggestions and recommendations in these reports and act on it to make the system more effective.

EPCA would like to highlight the key improvements needed to set the broad framework for inspection:

- For petrol vehicles shift to 4-Gas Analyzers calibrated and certified to measure idle CO, HC, carbon dioxide (CO_2), oxygen (O_2) for accurate testing. Measurement of CO2 and

O2 as a dilution correction factor will eliminate the problem of tampering at the time of testing to dilute the exhaust by not putting the probe in the tail pipe correctly. Measurement of Lambda (actual air-to-fuel ratio compared to the stoichiometric ratio) should also be included.

- All the gas measuring equipment used must be controllable from the computer to ensure that automatic gas calibration and leak checks are being correctly performed every three days at a minimum and that "ambient and residual gas values are within limits before allowing the instruments to be zero referenced between tests. Computer control can lock out the instrument if any functional problem is detected."

- Introduce both low and high idle measurements (emissions measurements at low and high speeds) for more accurate measurement immediately.

Upgrade PUC test procedures for diesel vehicles immediately

Need for improvement in smoke opacity test of diesel vehicles in PUC centres
Till the time more improved loaded test procedures are adopted for diesel vehicles it is important to further upgrade the smoke meters and test procedures in the PUC centers for accurate results. For instance: Such instruments must be provided to record smoke opacity, engine, lube oil temperature, ambient pressure and humidity. This would require a master reference table on recommended RPM and oil temperature for different engine models and software to store it.

MRTH be directed to notify loaded test procedures along with commensurate norms for different vehicle categories in bigger centralized centers to be set up in a phased manner in critically polluted cities like Delhi.

Assessment of the available information shows that even with improvements in the current PUC test procedures it will not be possible to measure other key pollutants of concern – particulate matter and nitrogen oxides from in-use vehicles. These pollutants cannot be measured under PUC system. To get more realistic test results for in-use vehicles that are representative of actual emissions on road it is important to introduce loaded mode tests on chassis dynamometer.

iv. Notify PM norms and test procedures for in-use diesel vehicles

PUC system has very limited value when it comes to measuring harmful emissions from diesel vehicles. Studies now conclusively show that smoke opacity test currently done under the PUC system has poor correlation with particulate emissions. It is therefore recommended that a short transient dynamometer test procedures for in-use diesel vehicles be defined and implemented in which both visible smoke and particulate matter are measured. MRTH will have to immediately notify loaded mode test procedures along with appropriate standards on a chassis dynamometer so that commercial vehicles (both diesel and CNG/LPG vehicles) can be introduced to improved I&M in Delhi.

It is important to emphasise that it is meaningless to have diesel in-use emissions test system that cannot monitor particulate emissions from these vehicles – that have very serious health consequences. Even after moving all buses to CNG, large number of light to medium duty diesel commercial vehicles are plying on the road. Even more worrying is the increasing trend in diesel car sales in the capital region. To allow such a large fleet of diesel vehicles to ply without appropriate and effective inspection can have serious implications for the particulate emissions that have been guiding all the Court rulings so far.

Notify improved in-use norms and test procedures for inspection of CNG vehicles

This issue has been discussed in some detail in the section on safety inspection for CNG buses in Part II of the report. But it is important to reiterate and highlight some special concerns regarding the emissions performance of the CNG vehicles. CNG is a clean technology that has been introduced to improve emissions levels drastically in the city. Maintaining the quality of the programme is therefore critical to get the full environmental benefit from it. But in the absence of effective vehicle inspection programme to check on road deterioration and durability, technology may deteriorate fast and nullify gains. It is important to note that while particulate emissions benefit of the CNG programme will always remain, other gaseous emissions may become unstable if rigorous inspection is not conducted. This may happen especially if emissions control technology like catalytic converters deteriorate fast.

The CSE technical report has stated that the idle CO emissions data for CNG buses available at Burari inspection center in Delhi are unacceptably high in the fleet that is relatively new**.** Statistics of 300 emissions measurements conducted at Burari during 2001 shows that 18 per cent of the tested buses had CO idle values of more than 3.0 per cent and about 60 per cent of the buses had CO values of more than 1.0 per cent. Experts noted that maximum idle CO of 3.0 per cent for CNG buses were too lenient, especially when all buses are equipped with catalytic converters. In the US a maximum of 0.5 per cent CO at idle is accepted for CNG buses, as compared to 3.0 per cent in India. According to the experts idle CO levels higher than 1 percent indicate that the catalytic converters are not working. It is advisable to reconsider the present limit value of 3.0 per cent. CSE technical report points out that in the absence of effective emissions inspection system, many CNG buses are coming in with after-treatment devices with poor durability. Catalytic converter is included in the exhaust emission control system by CNG engines manufacturers' in order to fulfill the standards for new vehicles/engines. But the performance warranty of converters is only 72,000 km. This should be compared with the European requirements for manufacturers' responsibility and warranty, which is eight years or up to 500,000 kms. The report states "what happens after this limit is unclear; according to our knowledge there is no requirement for changing the converter at specified driving distances and no specific control is carried out during the annual fitness check."

Apart from the CNG buses, it has also been brought to EPCA's notice that some three-wheelers plying on CNG are emitting excessive white smoke. EPCA has looked into this problem. Inferior quality piston ring that wears off fast leads to leakage and high consumption of lube oil that cause excessive smoke. Poor maintenance also compounds the problem. This problem can be addressed only if more improved standards both mass emissions and in-use emissions standards are notified and rigorous inspection initiated to accelerate technology development and discipline maintenance habits.

EPCA therefore would like to emphasise that both new and in-use emissions standards for CNG buses and other CNG vehicles be made tighter and inspection procedures made more rigorous to improve the quality of the CNG technology. The test procedure for emission measurement should be transient loaded mode test focusing on measurement of NOx. CNG vehicles would require NOx emissions tests that are possible only on dynamometers.

Emissions warranty and recall programme: As mentioned in the two-wheeler section vehicle inspection programme should be designed to enable fast implementation of emissions warranty and recall programme. More advanced vehicle inspection should be phased in on a priority basis so that emissions warranty as offered by the manufacturers already and a recall programme can be implemented effectively. Under the recall programme the government can conduct independent tests on batches of vehicles in the market to check compliance with emissions norms. If inherent technical defects are detected in the engine and emissions control components for which manufacturers are responsible, they would be asked to recall the entire batch of the vehicles and remedy the problem at their own costs. This is the only way manufacturer's can be held responsible for durability and emissions performance of their products. Auto Fuel policy also recommends implementation of this.

Improvement in the inspection infrastructure in Delhi

Setting up of the inspection infrastructure, supervision and auditing of the inspection system is the responsibility of the state government. Delhi government should be directed to develop a vehicle category-wise inspection programme for commercial vehicles with the requisite trained and skilled staff to undertake to execute such a programme.

The Hon'ble Supreme Court has already directed that I&M programme be started by the transport department and the private sector. EPCA has also recommended earlier to the Court to facilitate private participation to undertake vehicle inspection. It is recommended that while actual physical inspection and setting up of inspection centers on build and operate basis can be contracted out to private parties the government focuses more on developing institutional capacity to supervise and audit the system. As and when privatization happens it should be done on the basis of open bidding process.

The following elements should be built into the improved inspection framework:

- A complete phase out plan of the numerous existing testing centers that are difficult to control and supervise must be scheduled. Even while upgrading the PUC system announce the plan to completely centralize the system in a given time frame. The bigger inspection only centres should be capable of testing large number of vehicles at a time.
- The sequence of introducing different categories of vehicle to the centralized inspection system should follow the order of priority with regard to most polluting categories. Move the commercial vehicles (diesel commercial vehicles and CNG buses, autos and taxis) first to centralised inspection centres where more advanced testing facilities are available. Since commercial vehicles already need to go through routine annual fitness check and emissions tests, the inspection center located at Burari in Delhi, should be immediately upgraded to meet the new requirements.
- Subsequently, phase-in all private vehicles within the ambit of centralised inspection with improved test procedures. Priority focus to be on two-wheelers and vehicles with advanced emissions control system like catalytic converters.
- For objective test results to be effective the test protocol must minimize the impact the test technician can have on the tests outcome. It is recommended that the test results not be made available to the test technician in the test lane until the computer has entered the results in the database. Otherwise, it is common practice for testers to prevent rejects from occurring by tampering with lane computer, test procedure or with the vehicle.
- Encourage privatisation of inspection centers with strong government supervision.
- A lot of emphasis has been given on the role of strong government supervision and auditing of the entire inspection system to enhance credibility and reliability of the programme.
- Till the time the system is completely centralized improve the current PUC system (norms, test procedures and institutional framework for its enforcement).
- It is recommended that to ensure better quality of service and compliance, the periodicity of PUC certification for Delhi should be made every six months from the existing system of once every three months.

Computerise and rationalize vehicle registration system for effective enforcement of vehicle inspection programme: CSE report has pointed out that for an effective inspection programme a proper vehicle registration system should be put in place to record and reflect the actual numbers on road. For inspection and re-inspection of vehicles the registration officials must be able to trace problem vehicles and track their inspection status. The registration system should also detect vehicles that have not been inspected on time or have failed. It is important to rationalize and computerize the registration system to meet these objectives.

EPCA would like to summarise that the central government is only focusing on the basic PUC strategy for the whole country as the minimum national requirement. It has ignored the principle that has already been established by the Hon'ble Supreme Court with regard to mass emissions standards that critically polluted cities like Delhi would require more advanced action. While the PUC programme should be modified immediately along the lines discussed, more advanced inspection test procedures and norms should be developed alongside that can be introduced on a pilot basis in Delhi (for instance, loaded mode test on chassis dynamometer to enable more representative measurements of emissions). Even the proposed Auto Fuel Policy has recommended adoption of short test for effective implementation of the inspection and maintenance programme which will measure mass emissions of in-use vehicles under transient cycle. ARAI and other concerned testing agencies have been asked to plan possible short tests for in-use inspection. It has further recommended developing these on a pilot basis.

Moreover, under the current legal provisions state governments can introduce tighter emissions norms for in-use vehicles. In this context EPCA understands that there is a need for synergy of action between the Delhi government and the Central Government to improve the current PUC system and to phase-in an advanced vehicle inspection system. While it is the responsibility of the Delhi government to set up an appropriate institutional framework for vehicle inspection and infrastructure for actual inspection, supervision and audits, it is the responsibility of the Central Ministry of Road Transport and Highways to revise and develop emissions standards and test procedures to be adopted for enhancement of the PUC system and advancement of the inspection programme.

Annexure 1: A phase-in plan for inspection of commercial vehicles

Inspection of Commercial Vehicles

Propose a three-step approach to carry out inspection of commercial vehicles in Delhi.

Step 1: *Substantially Upgrade Burari Inspection Centre*

- Three fully equipped lanes with a capacity of 60,000 tests per annum on eight-hour shift should be installed.
- One additional lane for three-wheelers with a capacity of 30,000 tests per annum on eight-hour shifts should also be installed.
- It is estimated that the cost per lane will be approximately Rs 10-15 million.
- Construction of the facility, purchase and installation of the equipment could be completed within a year or less.
- It is strongly recommended that the facility be built and operated by a private contractor selected through a competitive bidding process.

An international tender document should be developed and released to invite internationally recognised inspection companies together with local counterparts to establish three new fully equipped inspection lanes for four-wheel driven commercial vehicles and one new fully equipped inspection lane for three-wheelers.

The Burari centre should be privatised and to assure long-term transfer of know-how, the tender should describe in detail how this would be managed. The new Burari inspection centre should be in full operation one year after the release of the tender.

Step 2: Add New Privately Built and Operated Inspection Centre for Trucks.

As soon as the tendering process for the Burari inspection centre is initiated a new tender should be released with a focus on inspection of trucks. The technical capability of the inspection lanes should be same as for the Burari inspection centre, but preferably the location of this second inspection centre should be in the “south” of Delhi to reduce travel distance of the vehicle to be inspected. The new second inspection centre should also be in full operation one year after the issuance of the tender document and close to the opening of the Burari centre.

- Three lanes focused on trucks should be included with a capacity to test 60,000 vehicles/annum per shift.

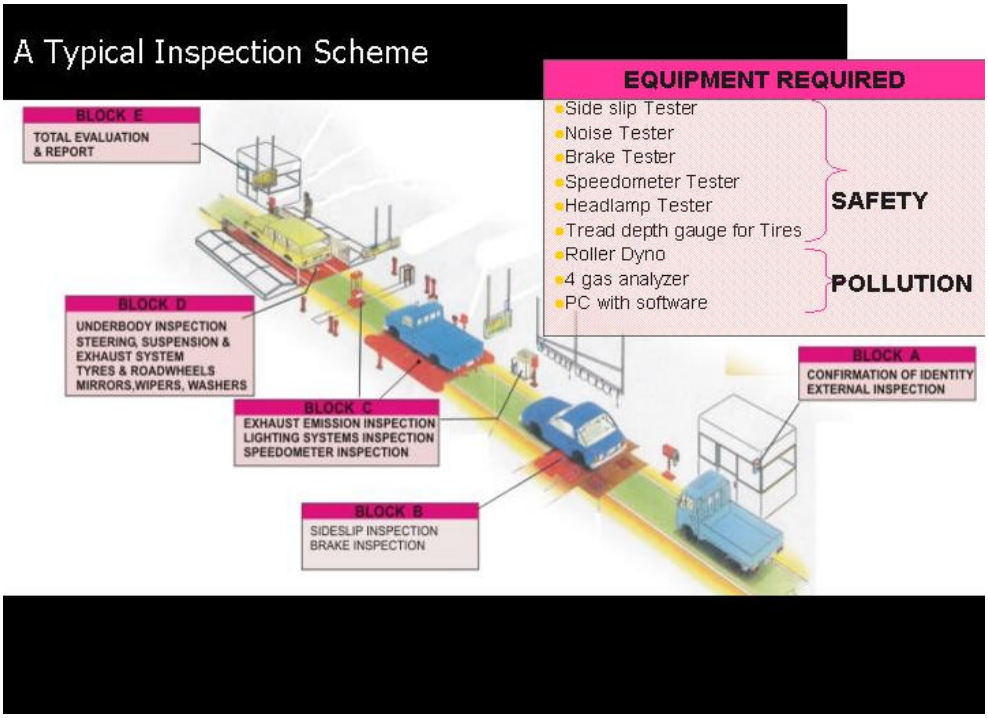


Figure 2: A typical, centralised inspection scheme, which could serve as a model for these facilities

Step 3: Add a Third *New Privately Built and Operated Inspection Centre for Commercial Light Duty Vehicles and Three-wheelers.*

The third inspection centre should be tendered at the same time as the second and in the same way as the other two. Two inspection lanes should be built for light-duty vehicles and one inspection lane for three-wheelers. With the third inspection centre in operation the demand for testing of commercial vehicles can be met. Inspection centre number three can be put in operation by middle of 2004.

- Two lanes focused on light-duty vehicles and one lane for three-wheelers should be included.

Gradual Shift from PUC Centres to Centralised Lanes For All Vehicles

As soon as the three facilities for inspection of commercial vehicles are completed, other types of vehicles should be introduced into the new system.

- Replace the smaller PUC centres with fewer centralised but bigger centres capable of testing large number of vehicles at a time and keep them under strict surveillance. As centralised inspection facilities expand, keep phasing out the smaller centres.
- The frequency of measurement should be changed from once every three months to once a year for private vehicles in the improved system, but with no higher total cost to the vehicle owner. In this context it must be made clear to all PUC operators that this system is temporary and transitional till a permanent centralised system is fully established.

Centralised inspection centres for passenger cars should be introduced and spread across the city. The size of these centres should be smaller than the ones for commercial vehicles but still large enough to cope with a significant number of passenger cars and two-wheelers each day. As proposed for commercial vehicles, similar but smaller centres for personal vehicles should also be operated by private enterprises and tendered in the same way as mentioned above. A phase-in programme needs to be determined. It is recommended to start the inspection programme for new catalyst vehicles to maintain the low emissions for a longer period and also for two-wheelers, specifically with two-stroke engines, since they are major contributors to the poor air quality.

on'ble Supreme Court directed the EPCA to submit a report on I A 179, in response to the application of the Amicus Curiae.

The Hon'ble Court directed that "
four weeks."

The Amicus had submit

The Hon'ble Court had on November 20, and December 16, 1997 directed authorities including Delhi police to take various steps directed towards addressing the traffic problems in the city. The Delhi police had initially filed status reports, but has now stopped doing so.

Other relevant Supreme Court orders on traffic congestion in the city

The EPCA has also reviewed the earlier orders of the Hon'ble Court and the extent of implementation of the orders.

In two orders passed on November 20 and December 16, 1997, the Supreme Court ( )
the implementation of a series of measures to control the growing traffic congestion and to
tion

Motor Vehicles Act and generally with the control of the traffic shall ensure the following:

1. *ists, buses ("heavy goods vehicles, medium goods vehicles, and 4 wheel*

   1997) shall be confined to the bus lane and equally no other motorised vehicle is er upon the bus lane. We direct the MCD, NDMC, PWD, Delhi

   to ensure that bus lanes are segregated and roads markings are provided on all such police and transport authorities.

2. *Buses halt only at bus stops designated for the purpose and within the marked area. In*

   Delhi Cantonment Board would t
   appropriate markings made, and 'bus bays' built at such places as may be indicated by
   (November 20, 1997).

3. *Any breach of the aforesaid directions by any person would, apart from entailing other legal consequences, be dealt with as contravention of the conditions of the permit which could entail suspension/cancellation of the permit and impounding of the vehicle.*

4. *To enforce these directions, flying squads made up of inter-departmental teams headed by an SDM shall be constituted and they shall exercise powers under Section 207 as well as Section 84 of the Motor Vehicles Act. The government is directed to notify under*

Section 86(4) the officers of the rank of Assistant Commissioners of Police or above so that these officers are also utilised for constituting the flying squads.

5. *We direct the police and the transport authorities to consider immediately the problems arising out of congestion caused by different kinds of motorised and non-motorised vehicles using the same roads. For this purpose, we direct the police and transport authorities to identify those roads which they consider appropriate to be confined only to motorised traffic including certain kind of motorised traffic and identify those which they consider unfit for use by motorised or certain kinds of motorised traffic and to issue suitable directions to exclude the undesirable form of traffic from those roads. "Needless to add, this is in addition to the statutory power conferred under Section 115 of the Motor Vehicles Act under which the authorities can prohibit or restrict any class of vehicle(s) from being used, inter alia, on any particular route or during any period of time."* (added by the order of December 16, 1997).

6. *We direct that this Order will be carried out notwithstanding any other order or directions by any authority, Court or Tribunal, and that no authority shall interfere with the functioning of the police and the transport department in so far as implementation and execution of these directions is considered.*

December 16, 1997

1. *We direct the civic authorities to take necessary steps to remove immediately all encroachments – temporary or permanent – on roads and pavements, which affect the smooth flow of traffic or obstruct the way of pedestrians. Stray cattle and other similar obstructions would also have to be similarly dealt with.* (December 16, 1997).

In addition to these, the Court passed certain more directions in order dated July 28, 1998:

2. *Restriction on movement of goods vehicles during day*
3. *Phasing out of commercial vehicles more than 15 years old*
4. *Augmentation of public transport to 10,000 buses (stage carriage).*

Responses of the government to the IA 179

EPCA has assessed the responses of the Delhi police and transport department in the light of action taken on the Supreme Court orders. The responses of the Transport Department and the Delhi police show that though the orders of the Hon'ble Court have been carried out to a large extent (see Table 1), there is yet a lot to be done. For instance, neither the transport department, nor the Delhi police (This is for the civic authorities i.e. MCD, NDMC and Delhi Cantt Board) respond to the direction of the Court on immediate removal of temporary or permanent encroachments from pavements and roads. Again, there has been no response from either department on the Court's direction that "the police and the transport authorities to consider immediately the problems arising out of congestion caused by different kinds of motorised and non-motorised vehicles using the same roads. For this purpose, we direct the police and transport authorities to identify those roads which they consider appropriate to be confined only to motorised traffic including certain kind of motorised traffic and identify those which they consider unfit for use by motorised or certain kinds of motorised traffic and to issue suitable directions to exclude the undesirable form of traffic from those roads." This direction, if implemented with some amount of planning to achieve a target of reducing congestion and pollution, could have had great impact. More so due the legal power of the authorities "under Section 115 of the Motor Vehicles Act under which the authorities can prohibit or restrict any class of vehicle(s) from being used, inter alia, on any particular route or during any period of time."

Table 1: Compliance status of Supreme Court orders

	Court orders	**Application on behalf of the *Amicus Curiae* filed on 15.7.2002**	**Response of**	
			Delhi traffic police, filed on 26.7.2002	**Transport department**
		The Hon'ble Court had on November 20, and December 16, 1997 directed authorities including Delhi police to take various steps directed towards addressing the traffic problems in the city. The Delhi police had initially filed status reports, but has now stopped doing so.	At the outset it is denied that the answering respondent is not implementing the orders of this Hon'ble Court. It is submitted that as per directions of this Hon'ble Court the Delhi police has been diligently enforcing and implementing the directions of this Hon'ble Court passed from time to time. It is submitted that the last status report was submitted before this Hon'ble Court on 04.12.2001.	In reply to the contents of para 5, it is submitted that the Delhi traffic police is filing status report in reply to this para. However, it is submitted that NCT of Delhi and Delhi traffic police has been filing status report from time to time which were already on record.
	Speed governors: *No heavy- and medium transport vehicle and light goods vehicles being four wheelers would be permitted to operate on the roads of the NCR and NCT,*		All officers of Delhi traffic police are regularly briefed about the contents of the direction to launch prosecution and impounding commercial vehicles which are found plying with	Installation of suitable speed control devices was made as a permit condition by STA. On September 12, 2001, Ministry of Road Transport and Highways has amended Rule 118 of

	Delhi, unless they are fitted with suitable speed control devices to ensure that they do not exceed the speed limit of 40 kmph. This will not apply to transport vehicles operating on Inter-state permits and national goods permits.		improper/defective speed governing devices. The speed governing devices are to be installed in commercial vehicles as required in the permit conditions for category of vehicles as required in the permit conditions for category of vehicles as specified by the direction of this Hon'ble Court. This is being monitored by the State Transport Authority who is the sole authority to declare fitness, and to issue/cancel these permits. The transport vehicle which is found operating without or with defective speed governor is prosecuted by the Delhi traffic police officers and the vehicle is also impounded. A show cause notice is issued to the registered owner of he defaulter transport vehicle for suspension of permit for a period up to 30 days, apart from other legal punishments decided by the concerned courts. After suspending the permit of the transport vehicle, the vehicle is deposited in the STA office at Burari, Delhi, to undergo the sentence of the suspended permit. From 23.11.1997 to 15.7.2002, prosecution was launched against 16,221 transport vehicles for plying with defective speed governors. In addition, the Delhi traffic police also organises regular special speed checking on daily basis in open stretches of roads in NCT of Delhi through Radar Guns under the close and direct supervision of Traffic Inspectors. During the	CMVR to incorporate new standard AIS: 018, for speed control device.

			year 2001 and 2002 (up to 15.07.2002), 171,559 and 92,197 vehicles were prosecuted for over speeding respectively. From 23.11.1997 up to 15.07.2002 the Delhi traffic police also prosecuted 14,263 transport vehicles for over speeding beyond 40 kmph. However, in this respect it is also submitted that mechanical speed governors are prone to tampering.	
	The authorities aforesaid should, therefore, ensure that the transport vehicles are not permitted to overtake any other four-wheel motorised vehicle.		From 23.11.1997 to 15.07.2002, Delhi traffic police has launched prosecution against 41,963 transport vehicles for overtaking other four wheel motorised vehicle and similarly, 19,058 transport vehicles were also prosecuted for not driving in the bus lane.	
	They will also ensure that wherever it exists, buses shall be confined to the bus lane and equally no other motorised vehicle is permitted to enter upon the bus lane. We direct the MCD, NDMC, PWD, Delhi government and DDA, Union government and the Delhi Cantt. Board to take steps to ensure that bus lanes are segregated and roads markings are provided on all such roads as may be directed by the police and transport authorities.		After the order of Hon'ble Court, dated 20.11.1997, all roads where bus lanes could be provided were identified. Bus lanes were segregated and road markings were provided by the civic road owning agencies, that is, MCD, PWD, NDMC and Delhi Cantt. Board etc Painting of bus lanes and road markings on roads of NCT of Delhi is an ongoing work and is being undertaken by these civic road-owning agencies from time to time. Since 20.11.1997 Delhi traffic police has been regularly interacting with these civic road-owning agencies to carry out these works on roads identifying specific job requirements needed.	
	They will ensure that buses halt only at bus		The Delhi traffic police launched prosecution for	

	stops designated for the purpose and within the marked area. In this connection also MCD, NDMC, PWD, Delhi government, DDA, and Union of India and Delhi Cantt. Board would take all steps to have appropriate bus stops constructed, appropriate markings made, and 'bus-bays' built at such places as may be indicated by transport/police authorities.		the violation of this direction and prosecuted 7949 buses for the period from 23.11.1997 to 15.7.2002, which were found halting at places other than the designated bus stops.	
	To enforce these directions, flying squads made up of inter-departmental teams headed by an SDM shall be constituted and they shall exercise powers under Section 207 as well as Section 84 of the Motor Vehicles Act. The Government is directed to notify under Section 86(4) the officers of the rank of assistant commissioners of police or above so that these officers are also utilised for constituting the flying squads.		Nine assistant commissioners of police along with subordinate stuff in nine police districts of Delhi have been entrusted with the task to enforce all the directions of Hon'ble Court passed from time to time. From 23.11.1997 to 15.07.2002, the Delhi traffic police has launched prosecution againsts 129,963 commercial transport vehicles for violating directions of the Hon'ble Court from time to time.	To enforce this directions transport department has amended Delhi Motor Vehicles Rules, 1993 and delegated powers under sections 86 to Group A and Group B Gazetted Officer to suspended a permit or to recover from the holder thereof a sum of money agreed upon in accordance with the subsection 5 of section 86 of Motor Vehicle Act 1988.
	All roadside hoardings to be removed not later than 22.11.1997		After the order of the Hon'ble Court, all hazardous hoardings existing in the area of NCT of Delhi were identified and removed in close coordination with all civic road agencies. In the process of removal of hazardous hoardings, litigations were initiated by the persons affected. However, in compliance of the direction of this Hon'ble Court, Delhi police successfully ensured removal of all the hazardous hoardings. Further, whenever a new	

			hazardous hoarding is noticed by the Delhi police, prompt action is taken to remove the same addition. Urban Development Department of GNCT of Delhi has also constituted a committee consisting of representatives of MCD, NDMC, Delhi Cantonment Board, PWD and Delhi traffic police to examine the existing norms and policies for display of hoardings and to suggest changes keeping in view the orders of the Hon'ble Court.	
			Additional info: Delhi traffic police is continuously implementing the directions pertaining to the safety of school children. For the general awareness of the Transport Operators and school authorities advertisements in prominent Newspapers are published. Informative pamphlets on road safety are distributed to various road users and particularly in all schools in Delhi. The traffic inspectors and sub-inspectors deployed in field duties have standing instructions to keep regular liaison with the school authorities so that the shortcomings noticed during such visits if any can be rectified. The Delhi traffic police also carries out prosecution against buses engaged in transportation of school children. These buses are prosecuted for violation of the directions and guidelines of Hon'ble Supreme Court of India.	

	We direct the police and the transport authorities to consider immediately the problems arising out of congestion caused by different kinds of motorised and non-motorised vehicles using the same roads. For this purpose, we direct the police and transport authorities to identify those roads which they consider appropriate to be confined only to motorised traffic including certain kind of motorised traffic and identify those which they consider unfit for use by motorised or certain kinds of motorised traffic and to issue suitable directions to exclude the undesirable form of traffic from those roads.			Transport department has issued public notice specifying the inter-state routes of buses for three ISBTs on 31.12.1997. It is submitted that as per directions of this Hon'ble Court contained in order dated November 20, 1997, a public notice was issued on December 31, 1997 for termination of inter-state buses at ISBT, Anand Vihar and ISBT, Sarai Kale Khan to decongest the ISBT, Kashmere Gate. In the said notification, Transport Department specified destination of various inter-state routes at ISBT, Anand Vihar, ISBT, Sarai Kale Khan and ISBT, Kashmere Gate. Further, transport department defined terminals/routes for buses having inter-state permits and national permits. The movement of such vehicles was restricted to 10 numbers of such routes thereby reducing traffic congestion in the interiors of Delhi.
	Implementation of directions to restrict plying of commercial vehicles including which are 15 years old from October 2, 1998			The Apex Court vide order dated 22.09.98 has modified the orders directing that by 31.12.98 all the commercial/transport vehicles whether registered in NCT Delhi outside but plying in Delhi, which are of more than 15 years old shall not be allowed in Delhi. The validity of the permit being issued by STA is restricted to a maximum of 15 years from the date of registration. In order to enforce not to ply 15 years old commercial/transport vehicles on the roads in

				light of the said direction, enforcement wing of transport department GNCT Delhi impounded 682 vehicles till June 2002.

EPCA'S OBSERVATION: Multiplicity of authority with undefined roles and need for a unified authority

EPCA feels that these orders, which could have gone a long way to solve the congestion problem and the transport crisis in the city, have not been able to do so due to lack of a integrated action plan comprehensive policy framework which could not be developed by the implementing agencies, utilising the directions and the legal powers vested in them.

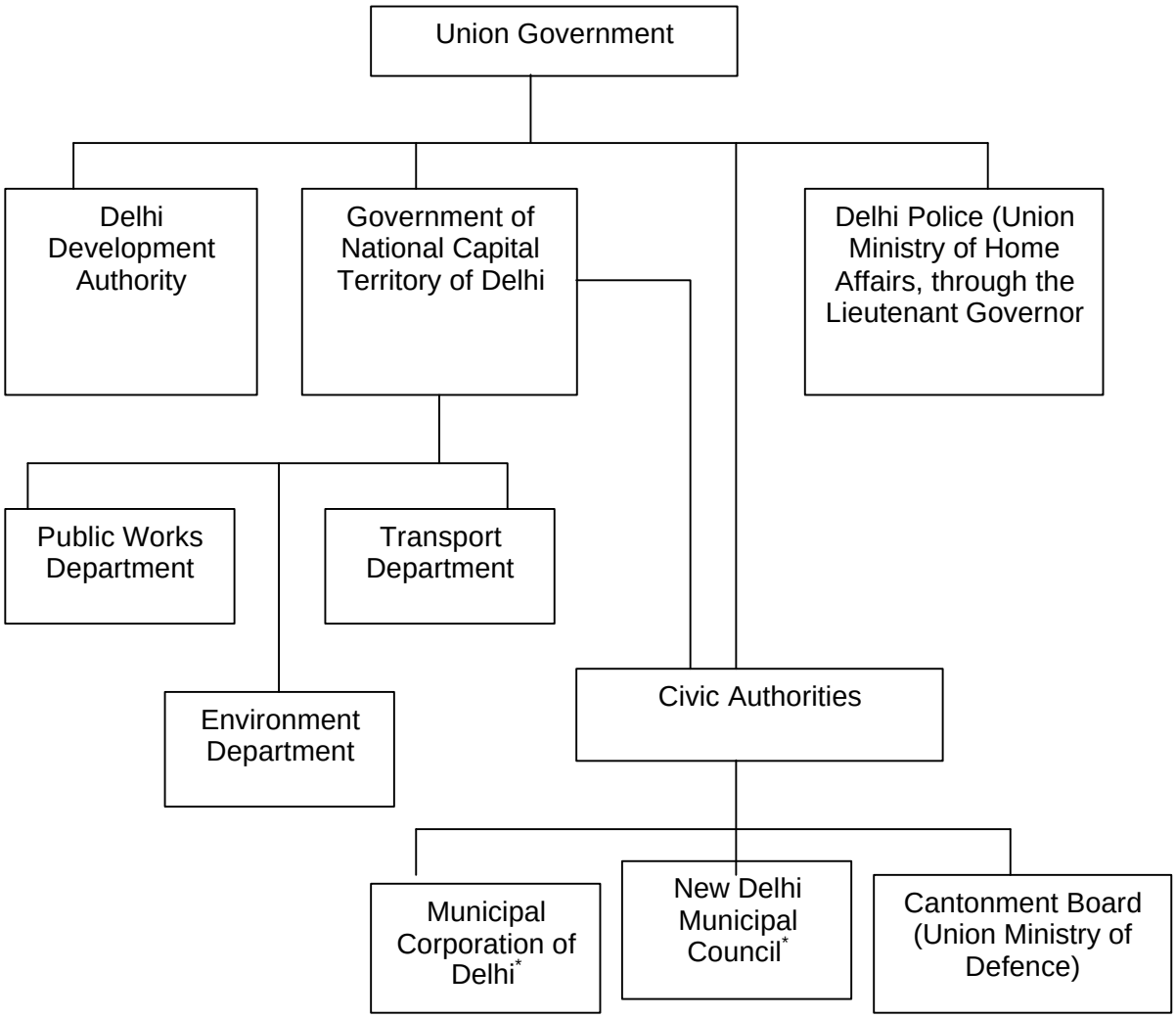
The EPCA finds that weakness of the institutional framework in transport and traffic management has been a major impediment in implementing the orders of the Hon'ble Court. The Hon'ble Court directed its orders to "police and all other authorities entrusted with the administration and enforcement of the Motor Vehicles Act." Though specific agencies were named in the orders, no specific roles were assigned to them. Thus there has been a multiplicity of authorities without a statutory supervisory agency.

Transport policy of the Delhi government

The Delhi government in September 2002 has announced a transport-operating plan for Delhi. The action points most relevant to public transport enhancement in the short-term include rationalisation of bus routes, bus priority lanes for selected corridors, introduction of premium bus services, timetable integration of bus and metro as the short-term and providing parking facilities. The medium to long-term plans include running high capacity bus system (on five selected corridors to start with), electric trolley buses (on two selected corridors to start with), feeder bus route for metro and finalisation of proposals for bus lanes and bus only roads

While the plan is a move in the right direction, it only considers supply side management by providing high capacity buses, electric trolley, separate bus lanes etc, and lacks in a comprehensive policy framework to bring in a shift to commuter preference. Therefore, it is necessary to integrate the elements of the transport plan in the perspective of its policy framework, for it to make any impact on the pollution and traffic congestion on Delhi's roads.

The policy framework should be expanded so as to bring about a shift from growing automobilisation to a better and more efficient use of public transport whose supply needs to be augmented.



Note: * Under separate Acts and Chairperson (NDMC)/Commissioner (MCD) appointed by Union Ministry of Home Affairs; funds for projects given by Department of Urban Development, Government of National Capital Territory of Delhi.

The Hon'ble Court has categorically stated that, "no authority shall interfere with the functioning of the police and transport department in so far as implementation and execution of these directions is concerned." Yet multiplicity of authority comes in the way of developing a composite transportation (traffic management and de-congestion) plan and its execution.

Lack of coordination among these (a unified command over these) agencies has made traffic and transport management extremely difficult (haphazard and ad-hoc at best and inefficient at worst). The result has been deteriorating traffic congestion.

EPCA therefore feels that there is urgent need of a unified authority involving relevant departments of all these agencies. This agency should have enough statutory power to frame and enforce policies to mitigate congestion and improve the transport scenario of the city. EPCA feels this unified authority should be under the Government of National Capital Territory of Delhi, with appropriate statutory powers since the GNCTD represents the city's interests.

As institutional arrangement take shape it is important to pay attention to principles of transportation planning to control the rising numbers and usage of vehicles in the city. Following the intervention of the Hon'ble Supreme Court significant changes have taken place in the city with regard to fuel quality, advancement of emissions norms, introduction of cleaner fuels like CNG. But benefits of the advance technology development may soon get swamped if the increase in the numbers of vehicles is not controlled.

Need for clarity of command clear policy framework to manage congestion

Though the intention of the Court was to clear the city of traffic congestion, the directions have not been successful in doing so, as is clear from the growing number of vehicles and increasing congestion on road. This has been mainly due to the fact that these directions did not address related policy issues comprehensively, and also because the agencies involved could not work to the optimal level, implement the directions in a sustained manner due to lack of a cohesive policy framework.

The policy must have clearly defined incentives and disincentives is required to control the proliferating number of private vehicles which are responsible for creating congestion and pollutant emissions. Provision of improved mass transit options has to be dovetailed with policies discouraging motorisation and improving vehicle and fuel technologies.

The unified authority should be given the mandate to frame such a policy within a definite time period, and oversee its implementation.

Assessment of the current situation and the issues that needs to be addressed

Certain disturbing trends come out from the registration figures. The most important perhaps is a steady and quick shift from two-wheelers to passenger cars. While two-wheelers still constitute about 65 per cent of the vehicle fleet, the size of passenger car fleet has increased at a much higher rate than that of two-wheelers. According to latest available estimates 164 passenger cars on average are registered per day as compared to 117 two-wheelers (see table 1).

It is difficult assess conclusively the trend in vehicular population from the existing registration data as registration data are not representative of the actual numbers on road. Registration data is cumulative and is not corrected on the basis of scrappage, vehicle retirement, transfers etc. For an effective transportation plan it is important to rationalise the registration data to reflect the actual numbers on road and should be computerised.

Table 1: Growth of vehicular population in Delhi

Passenger cars are increasing at a faster rate than two-wheelers and private vehicles constitute 90 per cent of the vehicle fleet

Vehicle category	Decadal growth rate (in %)[1]			As percentage of total vehicles[1]			Average number of vehicles registered per day
	1974-83	1983-92	1992-2001	1983	1992	2001	
Cars, Jeeps, Station wagons	75.92	222.21	109.18	20.45	22.42	26.64	164
Two-wheelers	182.34	196.40	69.34	66.53	67.10	64.53	117
Auto rickshaws	75.66	177.35	29.58	3.62	3.42	2.52	
Taxis	61.80	34.36	71.70	1.19	0.55	0.53	
Buses	157.81	81.33	105.35	1.67	1.03	1.20	
Goods vehicles	113.97	146.25	47.26	6.54	5.48	4.58	
Total	139.86	193.85	70.81	100	100	100	

Sources:

1. Calculated from *'Statement Showing the Registered Population of Vehicles in Delhi'* provided by the office of the State Transport Authority, Delhi, and Motor Transport Statistics of India.
2. Website of the Transport Department of the Government of NCT of Delhi, http://delhigovt.nic.in/dept/trabody.htm

Compared to other Indian cities, Delhi has the highest number of passenger cars per thousand people and is next only to Chennai in case of two-wheelers (see Table 2). But going by numbers of these two categories of vehicles, as well as total vehicles, the vehicle population exceeds the combined population of Mumbai, Chennai and Kolkata.

Table 2: Motorisation in Indian metropolises

Delhi has the highest rate of car ownership?

City	Passenger cars[1] (2000)	Cars/ 1,000 people[2]	Two-wheelers (2000)[1]	Two-wheelers /1,000 people[2]
Delhi	869,820	63	2,184,581	158.50
Mumbai	303,108	17.12	407,306	23
Chennai	199,848	47.40	848,118	201.17
Kolkata	265,477	20.58	334,649	25.94

Sources:

1. Anon 2002, Motor Transport Statistics of India 1999-2000, Transport research wing, Ministry of road transport and highways, Government of India, New Delhi.
2. Calculated on the basis of motor transport statistics and population of the cities

Thus, the city is showing the signs of what has been termed 'auto-dependence,' that is, a very high level of dependence on personalised vehicles and absence of an adequate mass transport system. The direct consequences of this trend are traffic congestion, a high level of emissions, increase in road accidents and constraints in mobility and accessibility for those without private vehicles.

EPCA'S DELIBERATIONS ON TRAFFIC MANAGEMENT SYSTEM

From its inception, the EPCA has considered traffic management system as one of its priority action areas.[26] In its first progress report (March-June 1998), the EPCA had expressed the need for a policy on restriction of private vehicles.

The EPCA had in April 1998 directed the Delhi Police to prepare a plan for a 'no vehicle zone' in some highly congested areas, for instance, Chandni Chowk, Connaught Place, Karol Bagh, Lajpat Nagar, Kamla Nagar etc. Suitable parking provision nearby was also planned. The Authority also felt that road bearing capacity for vehicles is saturated in Delhi, and therefore, a ban on new registration of vehicles should be considered. On May 4, 1998, the EPCA decided to request DCP (Traffic) to prepare a proposal for declaring 'no traffic zones' in congested areas of Delhi and send to the Authority.[27]

[26] Anon 1998, Report on monitoring and priority measures, Environment Pollution (Prevention and Control) Authority, National Capital Region, Delhi, March-June, *mimeo*.

[27] Anon 1998, Minutes of the eleventh meeting of the Environment Pollution (Prevention and Control) Authority, National Capital Region held on May 4, Delhi, *mimeo*.

On May 28, 1998, EPCA agreed that CPCB would identify areas where traffic density is great and as such pollution level is high.[28]

In August 1998, EPCA held detailed deliberations with the DCP (Traffic) on traffic management of most polluted intersections/areas in Delhi, synchronised signals, establishment of area traffic control and central control room for diversion of traffic based on air quality monitoring data. The DCP (Traffic) was asked to submit a consolidated programme regarding de-congestion and measures taken.[29]

A joint survey of Delhi Development Authority (DDA) and Traffic Police was carried out in 1998 to identify places that can be used as parking lots. In October 1998, the chairpersons of NDMC and MCD were asked to prepare a conceptual integrated transport system in association with DCP (Traffic) for places like Connaught Place, Karol Bagh, Chandni Chowk, Kamla Nagar, Lajpat Nagar, Laxmi Nagar etc. The Delhi Police was directed by EPCA to carry out rapid traffic survey for Connaught Place.[30]

The Authority felt that the movement of vehicles and parking lots should be decided on the basis of traffic pattern. It directed that traffic management for Connaught Place should be done in two phases. The first phase with no cost involvement or minimum cost involvement, that is making change of incoming and outgoing lanes, parking lots and re-tendering of parking lots with modern facilities so that parking charges shall be paid on time. The second phase would involve preparing a comprehensive traffic management plan with increased parking lots outside Connaught Circus and introduction of battery operated/CNG operated buses for movement from public parking lot to various blocks of Connaught Place. The Authority also decided to request the Commissioner (Police) not to allow parking in Chandni Chowk area.[31]

When the EPCA ran a public awareness campaign in 1999 regarding traffic decongestion and sought public feedback, it got the a very enthusiastic and constructive response (*see table 3*)[32].

Table 3: Public response to advertisement by EPCA

Serial	Option description	Percentage of people preferring the idea (out of 7,753 responses)
1	Remove all encroachment on footpaths	95
2	Create no-traffic zones and undertake pedestrianisation of shopping areas	93
3	Encourage use of car-pools and chartered buses	91
4	Ban use of more than 15 year old passenger vehicles in Delhi	82
5	Revise fares to encourage private participation in pubic transport	68

[28] Anon 1998, Minutes of the 14th meeting of the Environment Pollution (Prevention and Control) Authority, National Capital Region held on May 28, Delhi, *mimeo*.

[29] Anon 1998, Minutes of the 27th meeting of the Environment Pollution (Prevention and Control) Authority, National Capital Region held on August 24, Delhi, *mimeo*.

[30] Anon 1998, Minutes of the 34th meeting of the Environment Pollution (Prevention and Control) Authority, National Capital Region held on October 26, Delhi, *mimeo*.

[31] Anon 1998, Minutes of the 37th meeting of the Environment Pollution (Prevention and Control) Authority, National Capital Region held on November 16, Delhi, *mimeo*.

[32] Anon 1999, Fourth Report of the Environment Pollution (Prevention and Control) Authority, National Capital Region, Delhi, *mimeo*.

6	Stagger working hours/holidays	67
7	Make colony roads one way	62
8	Make parking expensive in congested areas	60
9	Charge night parking fee on colony roads	45
10	Make new vehicle purchase in Delhi more expensive	36
11	Allow only even and odd numbered vehicles on alternate days	33

In 2000, the Chief Secretary of the Delhi government responded to an earlier missive from the EPCA on various traffic measures in the form of a note on status of action taken. The EPCA asked the Chief Secretary for clear deadlines for each action plan.

However, the traffic congestion in the city is reaching critical levels and EPCA is of the view that piecemeal solutions have not helped matters. There is an urgent need to develop a policy framework to solve the existing problem and also to plan for a sustainable urban transportation system.

EPCA review of global practice to control congestion and numbers

Governments across the world have tried different methods to bring the problem of traffic management under control. Most of them are taking multi-pronged approach to deal with congestion and promote shift to a sustainable mode of transport and to reduce the load of air pollution from vehicles. These include a review of the existing public transportation system, controlling private automobiles, land use development, fiscal and regulatory controls.

1. Augment the public transport system

The European Commission points out that whereas until the 1970s the main function of public transport was to satisfy the individual needs of the less affluent members of society, progressively the policy discourse has been changing, pointing instead to the necessary contribution of public transport for congestion relief and environmental preservation. High quality public transport systems characterise many Swiss, Dutch and French cities. Urban areas in Italy, Germany and Finland among others also score well in this area. Frequency of service, high quality vehicles and integrated ticketing systems for all public transport modes play an important role in most of these cities. In Switzerland, convenient, no-wait connections between train and bus services are being introduced throughout the country. In Japan a similar approach has been applied with success for decades. In the Survey of Cities a majority of cities – particularly in EU accession and other CEE countries – report giving priority to measures to improve public transport during the 1990s. The responses suggest that assuring improved public transport services will remain a top priority in the coming decade.[33]

According to the International Energy Agency (IEA), if a bus is reasonably full, it can displace anywhere from 5 to 50 other motorised vehicles, including often very dirty two-wheelers as well as cars. Moreover, the collective impact of bus system reform on world oil use can be large by substantially cutting oil use in the large urban centres of developing economies.[34]

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[33] Anon 2001, Implementing sustainable urban transport policies, Final report of the ECMT-OECD project on Implementing Sustainable Urban Travel Policies, European Conference of Ministers of Transport, *mimeo*

[34] Anon 2002, *Bus systems for the future: Achieving sustainable transport worldwide*, International Energy Agency, Paris, France, p12.

Significantly, even with a shortage of buses in the city for its 14 million people, a 1994 survey by Operations Research Group showed that 62 per cent of trips were made by bus.[35] This becomes more crucial due to the fact that a bus, while occupying just twice the road space of a car can carry 20-40 times more passengers.[36] Thus improving the bus system in the city will not only reduce congestion, but decrease emissions too.

The issue of private participation in the transport service is also crucial. While the Delhi Transport Corporation is the major bus service provider, most of the private bus operators are owners of few buses. While it is difficult for the transport department to control so many small-scale service providers, the scale of operation of these operators stop them from making major investments to improve the service or technology. According to the IEA, "systems must be reformed to improve service and profitability, by moving from 'bus versus bus' competition on the same route to competition for a licence to serve entire routes. The level of service required for the entire route should be specified in the contract, and provision of this service should be assisted by supporting policies, such as adequate fares."[37]

2. Control number of private vehicles

It is clear that if emissions are to be brought down and road space is to be freed up for public transport usage, number of private vehicles on Delhi's roads needs to be brought down. Different countries have established various ways of controlling number of private vehicles on road. Besides achieving it by providing clean, reliable and safe pubic transport, other measures include restriction of vehicle usage and other fiscal measures like congestion tax.

COMMAND AND CONTROL APPROACH: Paris has had a long-time practice of allowing private cars with only odd or even number plates to ply when air pollution levels reach critical levels. So does Mexico City. More than 100 cities of Europe, North and South America and Asia, use city centre automobile restriction as a means to reduce congestion and pollution.[38]

CONGESTION TAX: Congestion pricing or peak-period pricing is a specific pricing scheme that charges auto users a premium for using road capacity when it is scarce, that is, at peak periods.

From February 17, 2003, London started charging a congestion tax of US $8 on cars entering 21 square kilometres in the city centre to ease traffic congestion. On the very first day traffic levels fell by 25 per cent.

The highly successful public transport system of Singapore owes its success to a great extent to the city's area licensing scheme (ALS) introduced in 1975 to reduce morning peak commuting into the central business district (CBD).[39] The ALS has been attributed with many benefits, such as reducing the percentage of commuters driving to the CBD from 56 per cent in 1975 to 23 per cent

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[35] Anon 1994, Household travel survey in Delhi, final report, Operations research Group, New Delhi, cited in Dinesh Mohan *et al* 1997, Delhi on the move: 2005; Future traffic scenarios, Indian Institute of Technology, A report prepared for the Central Pollution Control Board, *mimeo*, p29.

[36] Anon 2002, *Bus systems for the future: Achieving sustainable transport worldwide*, International Energy Agency, Paris, France, pp45-48

[37] Anon 2002, *Bus systems for the future: Achieving sustainable transport worldwide*, International Energy Agency, Paris, France, p13

[38] Anon 2001, *Mobility 2001: World mobility at the end of the twentieth century and its sustainability,* World Business Council for Sustainable Development, Geneva, Switzerland.

[39] Peter Newman *et al* 1999, Sustainability and cities: Overcoming automobile independence, The Centre for Resource Economics, Washington DC, USA.

in 1983 and increasing the bus mode split from 33 per cent to 69 per cent. Since 1998, the als has been replaced by Electronic Road Pricing (ERP) system, which charges motorists every time they drive past an ERP gantry during operational hours.[40]

Variable tolls implemented on several French auto routes on approaches to Paris and in three cities in Norway (Bergen, Trondheim, and Oslo) have likewise had a significant impact.[41] About 30 per cent of motorways in Europe are tolled. In Switzerland any domestic or foreign vehicle under 3.5 tonnes has to purchase and display a 'vignette' (or permit) which allows the vehicle to use all Swiss motorways for one year.[42]

But there have been apprehensions about congestion tax for various reasons. A commuter may drive more if the congestion charge is used to build more roads rather than providing more transit alternatives. Alternatively, people may drive more as they shift to 'rat running' through suburban streets to avoid congestion-priced streets.[43]

In Austria and the Netherlands, the problem of detouring has been solved by building up a tight network of payment stations. In Switzerland, the payment occurs through the equipment of vehicles with an on-board unit. Since all roads are burdened, there are no incentives for detouring.[44]

PARKING CHARGES: According to Eduardo Vasconcellos, associate director of the Brazilian National Public Transport Association, and author of *Urban transport, environment and equity: The case for developing countries*, "parking restrictions is one of the most powerful mechanisms to restrict the use of cars, because micro-accessibility is directly affected." Therefore it is imperative that when the different agencies are focussing on creating more parking lots, even multi-storeyed ones, they should reflect the cost of the land occupied by the cars and the investment made to create them.

3. Other fiscal measures

While vehicles bring mobility to the riders, they impose a cost on the society in terms of air and noise pollution, using public space, congestion delays, and risk of accidents. Prices paid for a journey rarely reflect the true costs of that journey. Economists therefore argue that vehicle users should be made to pay for these costs, also called external costs, which would consequently lower decrease the level of auto use.

As a European Commission (EC) report put it, "Decisions made by individuals with respect to their choice of mode, their location and investments are to a large extent based on prices. So prices have to be right in order to get transport right."

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[40] Anon undated, Land Transport, Singapore Fact Sheet Series, Ministry of Information, Communications and the Arts, Government of Singapore, http://www.mita.gov.sg/bksltp.htm

[41] Anon 2001, *Mobility 2001: World mobility at the end of the twentieth century and its sustainability,* World Business Council for Sustainable Development, Geneva, Switzerland.

[42] Anon 2000, Variabilisation and differentiation strategies in road taxation, ECMT, Group on transport and environment.

[43] Peter Newman *et al* 1999, Sustainability and cities: Overcoming automobile independence, The Centre for Resource Economics, Washington DC, USA.

[44] Anon 2000, Variabilisation and differentiation strategies in road taxation, ECMT, Group on transport and environment.

For instance, congestion is estimated to cost the EU 2 per cent of GDP every year, accidents another 1.5 per cent, while air pollution costs 0.4 per cent and noise pollution 0.6 per cent. According to the EC, the existing road taxation falls far short of covering all these costs. Studies from the US, Germany, Switzerland and Australia show that the external costs of cars vary from US $ 2,185-4,220.

There are various forms in which fiscal instruments are used to mould commuter choice and recover transport costs.

VEHICLE PURCHASE AND ANNUAL TAX: In most European countries, purchase taxes on vehicles are higher than on other goods. In Denmark the registration tax for passenger cars vary from 105-180 per cent of the value of the car, and the annual tax is based on fuel consumption and diesel vehicles are taxed more than petrol vehicles. In France, the registration tax varies according to horsepower of the engine. In Austria, the registration tax varies from 6-16 per cent of the price according to fuel consumption and the annual vehicle tax is based on engine power. The tax increases 20 per cent for vehicles without catalytic converter. In Germany the annual tax paid by cars depend on their emission levels. In Norway and Netherlands purchase tax is based on weight and size of engine, whereas the annual tax is based on weight of the vehicle. Additionally, some countries use fiscal incentives to scrap old vehicles, thus accelerating the replacement of older vehicles with new, less polluting vehicles. Switzerland has a bonus-malus system in addition to the annual tax, based on fuel consumption and emissions criteria, which allows a reduction of maximum 50 per cent and increase of maximum 30 per cent in comparison to the fixed tax.[45]

FUEL TAX: Higher fuel taxes influence consumer behaviour in a number of complex ways. In the short-term consumers react by curtailing automobile use. The empirical evidence suggests that short-term effect is relatively minor – a 10 per cent increase in fuel price translates to a 2-3 per cent reduction in total automobile travel. However, according to the World Business Council of Sustainable Development, such automobile use differences understate the total impact of fuel taxes on sustainability. Empirical analyses of the of the effects of price on gasoline consumption in the OECD countries indicate that a 10 per cent increase in gasoline price has the effect of reducing total gasoline consumption by 6-8 per cent, with much of the reduction a consequence of consumers choosing to use relatively fuel-efficient automobiles.[46]

Cheap diesel is one attraction of rapid dieselisation of the private car fleet in the city. Now there is little difference between a dirty fuel like diesel and a much cleaner fuel like compressed natural gas. While a litre of petrol now costs Rs 29.57, diesel costs Rs 18.57 and CNG costs Rs 16.83/kg. The government thus has the option of increasing the price of diesel sold to passenger cars in the NCR region, because doing it alone in the NCT region might just have the effect of reducing sales of the fuel in the city while pushing up sales in the adjoining areas. The price should be increased in consideration of the number of kilometres travelled by passenger cars in the city, and those travelling in and out of the city. This would not only provide an incentive to cleaner fuels like CNG, but also reduce the price attractiveness of diesel and moreover, influence the travel behaviour of the diesel car owners.

FISCAL APPROACHES IN DELHI

As mentioned earlier the Delhi government has so far concentrated only on the supply side management that is providing more buses, building more roads, and building flyovers. But no

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[45] Anon 2000, Variabilisation and differentiation strategies in road taxation, ECMT, Group on transport and environment.

[46] Anon 2001, *Mobility 2001: World mobility at the end of the twentieth century and its sustainability,* World Business Council for Sustainable Development, Geneva, Switzerland.

attempt has been made so far to make ownership and usage of private vehicles more expensive. There is no effort yet to design fiscal measures to control demand to check motorisation in the city. On the contrary, the current taxes are so designed that the public transport is taxed higher than private transport.

ROAD TAX IN DELHI: Buses pay an annual road tax, which is much higher any year than the one time road tax paid by private passenger cars. Thus while private vehicles are let off with a one time payment, public transport is taxed annually. In other words, while the per capita emissions from a person travelling in a car is much higher than a bus traveller, he pays much less than the bus traveller. Thus travel by public transport in Delhi is actually penalised, while car travel is rewarded.

It is imperative to rectify this anomaly.

An annual road tax on private vehicles, besides generating more revenue, will also rectify the prevailing anomaly of penalising public transport. However, according to international transportation expert Todd Litman of the Canada-based Victoria Transport Policy Institute, "the strategy which appears to have the greatest potential for more optimal pricing is to use mileage or kilometre-based fees.'[47] Such charges are vehicle fees based on kilometres driven. This can have variations like weight-distance charges, distance-based vehicle insurance and emission charges.[48]

Such a road tax will therefore not only make the polluters pay, but also encourage less driving and phasing out of older vehicles fast.

There is no annual tax on private vehicles in Delhi and they pay one-time road tax.

In the latest 2003-04 budget the Delhi government changed the earlier system of road tax on the basis of laden weight of the vehicle to an ad valorem basis of road tax calculation for private non-commercial vehicles. The new road tax rate is based on value of vehicles in two slabs, that is, 2 per cent on vehicles costing up to Rs 4 lakh and 4 per cent on those costing more than Rs 4 lakh.

4. Invest in public transport, clean fuels and clean vehicle technology

Once proper pricing of transport is recovered, the next step to cost recovery is how to use that money. As of now, the revenue generated by road taxes goes to a consolidated fund from where funds are allocated without any reference to the share of contribution by different segments of economic activity.

However, such revenue can be used to create an investment fund, which can be utilised to augment public transport, design fiscal incentives for clean fuels and vehicle technologies and improve road conditions.

5. Evoke polluter pay principle for emissions and congestion mitigation measures: Following the Hon'ble Court's order of April 5, 2005, for the first time in the country penalty was imposed on the basis of polluter pay principle, on diesel buses for violating the Court order and not moving to CNG. This penalty has generated a huge corpus of Rs 30 crore that is today available to the Delhi government to fund other emissions control measures in the city. This experiment demonstrates how it is possible to develop fiscal instrument for improvement of

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[47] Todd Litman 1999, Distance-based charges; A practical strategy for more optimal vehicle pricing, Victoria Transport Policy Institute, Victoria, Canada

[48] Todd Litman 1999, Distance-based charges; A practical strategy for more optimal vehicle pricing, Victoria Transport Policy Institute, Victoria, Canada

transport and technology to control emissions. This has been a pioneering effort and should built on to develop future fiscal policies in the city.

Recommendations

EPCA notes with great concern the uncontrolled motorisation in the National Capital Region of Delhi. So far the vehicular pollution control strategy has been to improve technology and fuel quality. But these improvements can get easily swamped if the traffic volume is not controlled. Vehicular pollution would require both technical and non-technical measures for an effective control of vehicular pollution. Today the vehicular population of Delhi is higher than the combined vehicular population of Mumbai, Chennai and Kolkata. The city already has an extremely high number of two-wheelers, but it now shows a clear trend of a higher rate of growth of private passenger cars as well. There are more than three million registered vehicles in the city and adding 100,000 every year. In fact the daily addition is to the tune of ---- cars and ---- two wheelers. This is not sustainable.

At present Delhi suffers from congestion due to a lack of a composite transport and traffic management policy. Such a policy with clearly defined incentives and disincentives for encouraging public/mass transport and discouraging private vehicles is required to control the explosive growth of private vehicles which are responsible not only for creating congestion but also for high levels of toxic emissions. Though technological advances like improved fuel quality, introduction of alternative fuels and advancement of emission norms have helped making the air cleaner, increasing number of vehicles has the potential to nullify the benefits achieved.

However, a simple transport plan providing only more options for public transport might not be enough. Provision of improved mass transit options has to be coupled with policies discouraging motorisation and further improving vehicle and fuel technologies. These include command and control measures like restricting movement of traffic in heavy-traffic zones, restricting and charging higher fees for parking, cleaning pavements of all encroachments and also fiscal measures like annualising private vehicle taxes and charging them at a higher rate than public transport vehicles.

EPCA would like to recommend the following:

1. Set up unified authority to design and implement composite transport policy: One of the major roadblocks to framing such a policy and implementing it is multiplicity of agencies involved to carry out transport management and traffic laws and rules in the city. Therefore, the priority task should be to set up a unified authority involving all concerned departments and agencies under GNTDC and the Union government for developing policies on traffic and transport management for the city of Delhi. This agency should have statutory power to frame and enforce laws and rule meaningfully and effectively to mitigate congestion and improve the transport and traffic scenario of the city.

2. Delhi government be directed to design fiscal policies to check explosive rise in the numbers of private vehicles and submit a schedule for implementation: EPCA would like to emphasise the fact that this authority should focus on developing composite transportation policy framework to link transport planning with air pollution control strategies in the city. The immediate focus should be on augmentation of public mass transport integrated with flexible feeder service, rationalisation of tax system so as to tax private modes of transport at a much higher level than public mass transport, annualisation of taxes paid by private vehicles based on kilometres driven, provision of incentives for cleaner modes of transport (cleaner fuels and vehicle technologies), and active encouragement of non-motorised transport.

Delhi government has already developed a transport plan. It is possible to further build on it to set targets for lowering the rate of growth in number of vehicles in the city and link it to time bound programme based on expansion of public transport facilities in the city. Delhi government should be asked to develop a plan of action for this.

B. Number of three-wheelers

The *Amicus Curiae*, had submitted an application to the Hon'ble Court on 15 July 2002. This application on behalf of the *amicus* had raised various issues.

The application by amicus curiae regarding three-wheelers stated the following,

> *"One of the specific directions which had been issued to the transport department was a freeze on the number of three wheelers- this Hon'ble Court had directed on 16.12.97 that no new permits for three wheelers would be issued –only a replacement of an existing three wheeler with a new three wheeler would be permitted."*
>
> *"It has been reported that there has been a significant increase in the number of three wheelers despite the order of this Hon'ble Court. It is, therefore, necessary to direct the Delhi transport department to file a status report in relation to the number of three wheelers on the roads, and the steps taken by them to implement the order of this Hon'ble Court referred to above."*

Further the application stated, *"It is therefore prayed that this Hon'ble Court may:*

> *Direct the Delhi Police and the Delhi Transport Department to file a status report as to the compliance of the orders from this Hon Court dated November 20th 1997, Dec 16th 1997 and July 28th 1998 indicating the extent of compliance and in particular clarifying the matter relating to the number of three wheelers that have been permitted to operate and the establishment of the interstate bus terminals."*

EPCA's mandate

The Hon'ble Supreme Court in its order of February 14, 2003 has directed Environment Pollution (Prevention and Control) Authority (EPCA) to examine the following:

I.A No. 179: The Bhure Lal Committee is requested to submit a report within four weeks.

Background of issues raised by the A*micus Curiae*

A series of Court orders have been issued from time to time to deal with the problem of emissions from three wheelers and congestion caused by them.

Order dated 16.12.1997:

> *"One of the major pollutants identified in the various affidavits as well as in the latest status report filed by the government the TSR using a two-stroke engine… It would be in the interest of the environment to freeze the number of TSRs at the level at which they are actually in use in Delhi. We therefore direct there would be no grant of fresh permits in case of TSR, save and except by way of replacement of an existing working TSR with a new one."*

Following this vide notification dated 23rd April 1997 the department froze the number of auto-rickshaws at the existing number at that time i.e. 82,138. The department is now registering three-wheelers only as replacement of existing three-wheelers. Accordingly as upto 19th April 2002, 41,959 three-wheelers on CNG have been registered and given permits to ply in Delhi.

Order of July 28, 1998:

> *"Implementation of directions to restrict plying of commercial vehicles including taxis, which are 15 years old, by 2nd October 1998.*
>
> *Replacement of all pre 1990 autos and taxis with new vehicles on clean fuels by 31.3.2000*
>
> *Financial incentives for replacement of all post 1990 autos and taxis with new vehicles on clean fuels by 31.3.2001"*

In this case the order related to capping the age of commercial vehicles was further modified by the Court vide order dated 22.9.98 to extend the deadline for its implementation to 31.12.98. Hence the validity of the permit is now restricted to a maximum of 15 years of age from the date of registration. In order to enforce not to ply 15 years old commercial/transport vehicles on the roads in light of the said direction, enforcement wing of transport department GNCT Delhi impounded 682 vehicles till June, 2002.

As per the court order the government has also implemented the provision for financial incentives for replacement of old three wheelers with CNG three-wheeler. So far, the Auto-Rickshaw Branch of the Transport department, has allowed the following incentives:

1. Sales tax exemption being given in 4002 cases
2. Interest subsidy amounting to Rs 1,34,15,770/- have already been provided in 4062 cases

Currently, according to the Transport Department, there are 46,052 total registered three-wheelers with valid permits and running on CNG and a petrol tank as allowed by the Court**.** Out of the total official figure of 46,052 three-wheelers, 31,001 are OEM and the rest 15,051 are retrofitted.

Order dated 17.9.2001:

> "We however wish to clarify that there is no order of the court which either compels conversion of autos or taxis to CNG single fuel mode or prohibits the use of Euro II new taxis or four stroke autos on clean fuel."

In the light of this the government of Delhi, took the decision to ban registration of two-stroke auto rickshaws running on petrol or CNG in the national capital territory of Delhi with effect from May 1, 2002. But four-stroke three-wheelers running on low benzene petrol are allowed.

Order dated 20.12.2002:

> *"Meanwhile, we modify the order dated 16th December 1997 and permit fresh registration of 5000 (five thousand) new Auto Rickshaws on CNG/LPG mode."*

EPCA's Observations

In the context of the sequence of development EPCA has examined the contention of the Amicus with regard to violation of the Court order on freezing the number of permits for three wheelers and the reported increase in their numbers.

"It has been reported that there has been a significant increase in the number of three wheelers despite the order of this Hon'ble Court. It is, therefore, necessary to direct the Delhi transport department to file a status report in relation to the number of three wheelers on the roads, and the steps taken by them to implement the order of this Hon'ble Court referred to above."

EPCA has reviewed the status report that has been filed by the Transport Department in response to the Amicus application to the Hon'ble Court (I.A. No 179/2002).

Transport department has informed the Hon'ble Court that:

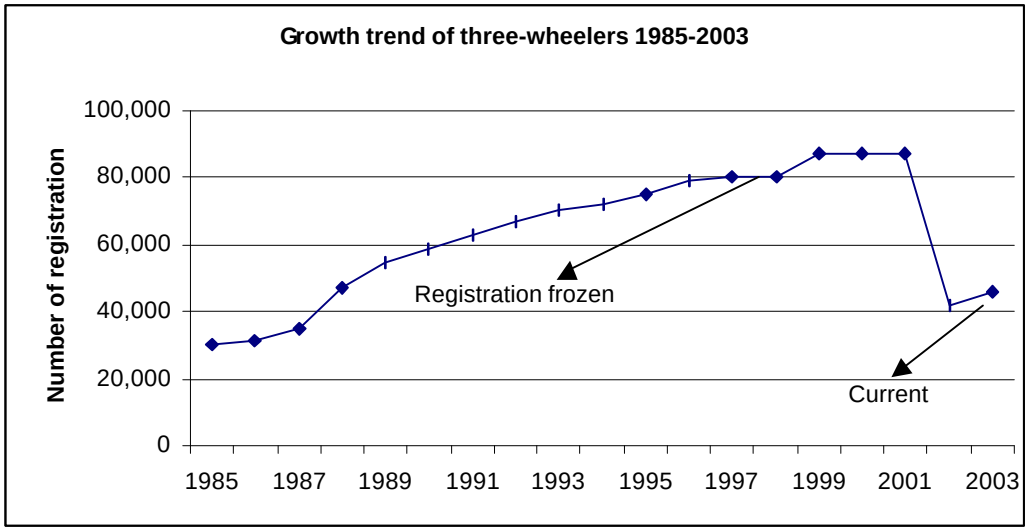
- "The contents of point 2 and 3 (amicus application) are denied and it is submitted that vide notification dated 23rd April 1997, the department had frozen the number of auto-rickshaws at the existing number at that time i.e. 82,138 as per direction of this Hon'ble Court."

- "The department is registering three-wheelers only as replacement of existing three-wheelers. Accordingly as upto 19th April 2002, 41,959 three-wheelers on CNG have been registered."

- "Financial incentives to prospective three-wheeler buyers for replacing their petrol-driven three-wheelers on CNG are also being given in the form of interest subsidy and one time sales tax exemption. As on date, no three-wheelers are being registered and/or given permits except on replacement basis."

Delhi police has not mentioned anything on this matter in their affidavit. It only states, "The remaining submissions contained in I.A. pertains to other government agencies, hence needs no reply." (Affidavit dated July 26, 2002)

Graph 1:



2. EPCA would like to highlight yet another point with regard to actual number of three-wheelers on road. It appears that the registration data is not representative of the actual vehicles on road. After the implementation of the CNG order the number of registered three-wheeler is said to be 46,052 as against the official frozen registered data of 82,138 as submitted to the Court.

Transport Department have cited various reasons for this gap in registered and actual figures, including three-wheelers having gone off the road. Further it is learnt that because of the Court order on replacement criteria, few three-wheelers were getting registered in Delhi. This was because the registered numbers were never represented as the actual numbers on roads. Though the registered three-wheeler figure was 82,138 the actual was much less, and hence lesser number of three-wheelers went for replacement and so obviously fewer number of three-wheelers are currently plying on roads.

3. EPCA has been informed that the Government of Delhi had subsequently appealed to the Hon'ble Court for permissions to issue permits to increase the numbers of three wheelers in the interest of commuters.

The Supreme Court thus in order dated 20.12.2002 allowed registration of 5,000 new auto-rickshaws on CNG and LPG in Delhi on plea of Delhi government to lift the restriction on registration of new auto-rickshaws.

Issue under consideration

Recently, Hon'ble Court gave the permission to increase the number of permits by 5000.
With the addition of 5000 more three-wheelers permitted by the Hon'ble Court the total number of three-wheelers is expected to be 51,052. It has also been established that three-wheelers only on clean fuels can be permitted in Delhi. So prima facie there cannot be any objection to increasing the current numbers.

If such an increase is allowed in future it is important to define the possible strategies that would maximize the environmental benefits from the earlier court orders in this matter with regard to emissions control and also meet the transport need in the city.

However, EPCA would like to point out in this context that all the court orders regarding three-wheeler's should be read in conjunction with the issue of congestion raised in the IA 179 under consideration.

> "It cannot be denied that congestion is one of the major contributors to the problem of air pollution caused by vehicles. It, apart from causing a waste of precious resources of fossil fuels, leads to increase danger of accidents." "To deal with these problems this Hon'ble Court had directed on November 20th, 1997, and further on December 16th 1997, the authorities including the Delhi police to take various steps directed towards addressing the traffic problems in the city. The Delhi police had initially filed status reports, but has now stopped doing so."

EPCA is of the view that if the Delhi government feels the need for further expansion of the current three-wheelers fleet in the capital then this would have to be carefully evaluated in terms of projected demand for such vehicles and the nature of deployment of these vehicles to maximize mobility and emissions benefit.

The future deployment of this mode of transport should meet both the objectives – low emissions and reduced congestion. It is important to have a clear policy not only with regard to the type of fuel they use, that has already been taken care of, but also with regard to the nature of their deployment for carrying passengers for short hauls and act as feeder services to mass transport.

Currently three wheelers are deployed in two forms – I) as short haul point-to-point shuttle service on per passenger fixed fare basis and ii) On demand from private passengers where fare is charged according to the distance traveled. Technically, while the former operates more like

public transport the latter tantamount to private usage on payment basis. So these are either deployed as intermediate public transport or as private transport with low occupancy i.e three persons.

It appears that short haul**s/**feeder services in operation in designated areas meet the environmental and mobility demand best. As it operates in full capacity per passenger emissions would also be less in this case. Privately used three wheelers occupy higher road space, carry less number of passengers, add to the congestion and the fare is also not conducive to passengers of all socio economic classes. Thus, increasing the number of three wheelers in this category may not maximize the environmental and mobility benefits, even if these are on cleaner fuels. (There are no private three-wheelers, doesn't want this)

Though three-wheelers currently plying on road are on clean fuel, namely CNG, for further expansion EPCA would like to observe that the government must actively encourage zero emissions three-wheelers - these include LPG and electric battery-operated three-wheelers.

EPCA has taken note of some innovative models currently initiated by the Delhi government with regard to the deployment of zero emissions three-wheelers in congested business districts.

Some observations on dedicated deployment of battery-operated three-wheelers in Connaught Place: Currently a public-private partnership program is in place for operation of battery-operated electric three-wheelers in the inner Circle of Connaught Place. Two-wheelers are not allowed to park in the inner circle. They can park only in designated parking place opposite Pallika Bazaar. Battery-operated three-wheelers are deployed as feeders to connect the parking area and the rest of the Inner Circle. There are around 4 battery-operated three-wheelers currently plying in the area. They have a carrying capacity of 9 passengers and a driver per trip. So in one trip all four of them together can effectively transport 36 passengers thus replacing at least 18 two wheelers if two persons per two wheelers is assumed.

There are around 800 to 1000 two-wheelers that use pay parking everyday. At Rs 5 per two-wheeler the revenue generated by the NDMC is around Rs 5000 per day. This revenue is shared by the NDMC and the company responsible for providing and operating the vehicles on a 50-50 basis and maintaining the charging station nearby. This programme will be expanded to include cars as well. According to NDMC officials they have plans to enlarge the fleet. Further they would be considering various other areas where similar partnerships can be worked out.

Privately owned battery operated three-wheelers in Red Fort: There is yet another privately managed model in the Red Fort area where a similar shuttle service between two points have been initiated. In this case the battery-operated three-wheelers are deployed to ferry passengers on the basis of per person fare basis. The battery-operated electric three-wheelers ply from the Red fort to the Fatepuri Masjid. It's basically point-to-point service covering a very short distance of 1.25 km charging Rs 2 per person per trip. In this area these are an add-on to the existing fleet of CNG three wheelers and other vehicles are not restricted. The owner rents out the battery-operated vehicles to anybody who is interested to run and make a profit on the route. The driver has to collect the vehicle from Scooters India's office and again in the evening they have to leave the vehicle at the same place. The operator charges a daily fixed amount from the drivers.

According to information gathered by us the operator charges Rs 350 from the drivers. Anything above that is profit for the driver. The driver does not bear any kind of cost apart from the rent that he has to pay everyday. Every other expenditure on the vehicle is borne by the operator even electricity charges are paid by the operator. The technical support comes from Scooters India.

Currently, the manufacturers are taking considerable responsibility with regard to maintenance and charging of vehicles in most cases. Scooters India and Mahindra Eco Mobiles are active players in this market. Bajaj is also planning the launch of its battery-operated three-wheeler very soon.

The experimental model cited above is gaining popularity with commuters and authorities. Such dedicated services should be introduced to begin with, and then they can be expanded in other congested districts as the model develops.

In view of the available information EPCA would like to recommend that it would be prudent enough to ensure that any further increase in the number of registration beyond what has already been permitted should be in the zero emission categories namely the battery-operated electric three-wheelers, in addition to CNG and LPG.

Recommendations

EPCA would therefore like to recommend that Delhi government be directed to undertake study and present a plan to the Hon'ble court with regard to the following:

- Potential demand for the services of three-wheelers in Delhi and the extent of the increase in their numbers to be allowed
- A composite plan on how would these be deployed in case of further expansion in their numbers.
- Innovative models possible for short-haul/feeder services of these vehicles especially in the context of Metro Rail's expansion plans and decongesting the main arterial road**s**,
- Incentive schemes for encouraging phasing in of battery operated three-wheelers.

C. Bypassing of goods vehicles

This is a report on the status of the implementation of the Supreme Court orders on preventing truck traffic from entering Delhi that are not destined for loading or offloading in the city. The Hon'ble Court has passed three orders so far on this matter. These are the following:

1. The order of December 6, 2001

> "It appears that vehicles which transit through Delhi do not adhere to the vehicular standards which are applicable in Delhi, namely they are not Euro II compliant nor are they using low sulphur and low benzene fuel. There is no reason why very large number of goods vehicles should transit through Delhi thereby adding to the pollution level and traffic on road.
>
> It is therefore, proposed that with effect from 15th January 2002 no heavy, medium or light goods vehicles will ply on inter-state routes by passing through Delhi or New Delhi. It is only those goods vehicles, which on payment of octroi/toll tax carry goods to or from Delhi, which would be allowed to ply.
>
> The Commissioner of Police directed to formulate a scheme in this behalf and give due publicity to all concerned and implement the same."

2. The order of July 15, 2002

> We are informed by the learned counsel for the NCT of Delhi that despite the order of this Court in 2001 no heavy vehicles in transit have been stopped at the border and all of them are allowed to pass through Delhi. Learned counsel states that a Scheme is prepared which of course, is not disclosed to the Court. How any Scheme prepared by the Department will supersede an order of this Court is difficult to comprehend. If the said Scheme permits any trucks in transit to Delhi, Police Commissioner to show cause why the compliance of this Court's order dated 6th December, 2001 has not been effected and the NCT of Delhi and the Police Commissioner are directed to show cause why the plying of all heavy vehicles through Delhi which do not comply with Category-II norms should not be stopped especially when no effective steps have been taken by the respondents to comply with the orders of this Court of December, 2001.
>
> We further make it very clear that there can be no corridor or bye pass joining different national highways through Delhi. The corridors if and when proposed and constructed will have to by pass Delhi. To come up on 29th July, 2002.

Court hearing on December 16, 2002

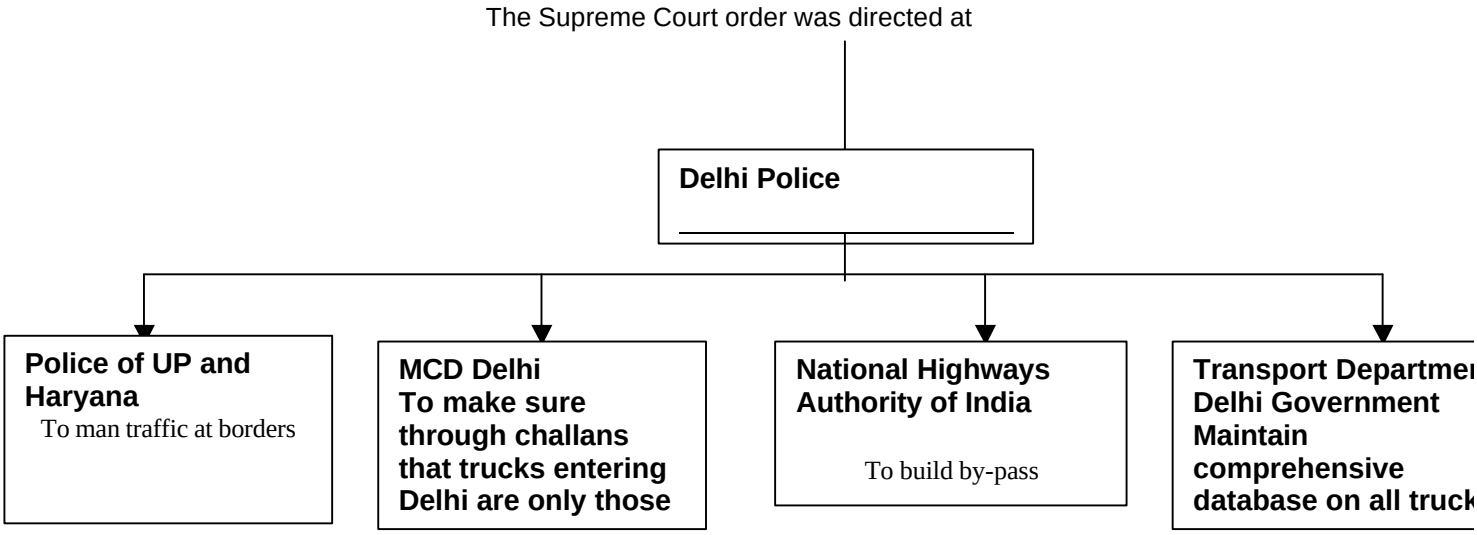
> The matter of bypassing of trucks was discussed in this hearing. Delhi traffic police was directed to file a status report on this matter.

Environment pollution (Prevention and Control) Authority (EPCA) has monitored the status of implementation of these orders through surprise inspections at the entry points for trucks into the city and discussions with the traffic police that were made responsible for the implementation of the orders. EPCA members also visited Badarpur and Mehrauli border at night for on site observations.

EPCA has investigated the following:

1. Status of implementation of the Court order on bypassing the truck traffic and the impediments to its implementation
2. Implementation of compliance with Euro II standards for heavy-duty vehicles that are in Delhi or enter Delhi.

The following organogram shows the multiplicity of authorities, which are involved in the implementation of the order.



Difficulties faced in bypassing trucks

In its affidavit of February 4, 2002, to the Supreme Court the traffic police had listed the following alternate routes that have been identified so far for by the department for bypassing trucks:

Route 1: Ghaziabad (UP) to Punjab via Sonepat (Haryana) and vice versa
Route 2: Punjab, Sonepat (Haryana) – Gurgaon (Haryana) and beyond
Route 3: Gurgaon to Faridabad
Route 4: Faridabad to Noida – Ghaziabad and beyond

They had further listed the following reasons for not being able to bypass trucks immediately after the Supreme Court order of December 6, 2001.

1. The alternate routes cannot bear the full load of the truck traffic as they are badly developed and single lane roads
2. Need widening and repair work in sections, which fall under the purview of Haryana and Uttar Pradesh government
3. Very heavy congestion thus difficulty in diverting traffic
4. Could lead to more accidents due to bad maintenance
5. No provision of 'U' turn on some roads and thus traffic cannot be asked to turn back

The Supreme Court on July 29, 2002 had given gestation time to the traffic police during which they could allow large goods vehicles entry into Delhi after issuing a warning if they are not able to take 'U' turns at the borders due to lack of road worthiness. The Court had also asked the police to file in court what directions they would want to be given to the adjoining states for

speedy implementation of their orders. No other affidavit was available to EPCA at the time of compilation of this report.

Discussions with the traffic police made it clear that no single agency is taking the initiative to coordinate with the concerned authorities in the neighbouring states to expedite the court order on building of new bypasses or improving or repairing the existing ones.

Observations of EPCA

1. No single authority is taking responsibility for the effective implementation of the order.

Two agencies are responsible for implementation of the Supreme Court orders at the various entry points.

1. Delhi Police
2. Toll booth Staff (Municipal Corporation of Delhi)

EPCA's investigation showed that multiplicity of authority in this area is compounding the problem of implementation. While the Supreme Court has designated traffic police for the implementation, the department alleges that adequate legal provisions have not been made to make the traffic police responsible. According to the MCD staff at toll centre in Badarpur toll point, it is the duty of police to check the consignment slip of the goods vehicle which shows whether it has any work in Delhi or not, it is not the duty of the toll staff who only collect tolls and taxes from any vehicle that enters Delhi. Traffic police claims since the MCD is responsible for checking all the requisite papers should also be asked to get involved in the process of verification.

2. Ways and means of bypassing the Supreme Court order

EPCA conducted surprise inspection at Badarpur border on ---- and talked to the goods vehicles transporters, toll collection officers and police officers at entry point to checkout how the Supreme Court orders were being implemented. It was clear that the order was being flouted openly.

Most transporters and truck drivers are aware of court orders that those vehicles, which do not have any work in Delhi will not ply in the city.

- The easiest way of bypassing the court order is to purchase a delivery receipt slip from any company located in Delhi. This, when shown to the police at the entry points is enough to prove that the goods vehicle has work inside the city.

- As observed in the borders it is possible to come in by paying a bribe even if the papers are not in order.

Those goods vehicles which visit Delhi frequently for loading and offloading of goods, obtain a pass/sticker from the toll tax booth. These passes can be obtained on a daily/monthly or quarterly basis. **But there is a loophole in this system.** A lot of vehicles are taking passes/stickers on a monthly or quarterly basis but once they have got the sticker pasted on the windscreen, they are not checked whether they have any work each time they are entering into the city. For example, a truck may have got a sticker for a month but it may have work in Delhi for only 15 days but the rest of the days it might just be using Delhi as a bypass to go to some other state.

3. There is no clear estimates on the number of trucks passing through Delhi

Investigation into the problem shows that there is no comprehensive record of how many trucks are actually plying in the city or have been given permits by the Delhi government to move in and

out of the city. Moreover, there is no clear estimate of trucks that pass through Delhi without any work in Delhi.

The estimates for the number of trucks passing through Delhi has come down dramatically ever since the Supreme Court has started taking interest in the matter. According to earlier estimates available from the traffic police nearly 40,000 to 50,000 trucks passed through Delhi. But latest available estimates from the traffic police seem like a gross underestimate. Their estimates based on the toll collection from the goods vehicles for a limited period show that on an average about 10,000 trucks enter the city daily.

Table 1: Estimate of number of goods vehicles entering Delhi

Date	**Number of goods vehicles entering Delhi from various borders for which toll tax labels have been issued by the MCD**
20.7.2002 – 26.7.2002	1,09,964
27.7.2002-2.8.2002	91,166
3.8.2002- 9.8.2002	83,781
10.8.2002 – 16.8.2002	74,708

Source: Submission to EPCA by Delhi traffic police, January 4, 2003

Table 2: Number of trucks turned away at various borders from July 27, 2002 to November 30, 2002.

Date	**Non destined goods vehicles turned away**
27.7.2002 – 31.7.2002	7104
1.8.2002 -- 31.8.2002	3637
1.9.2002 -- 30.10.2002	2495
1.10.2002 – 31.11.2002	1939
1.11.2002 – 30-11-2002	1165
Total	16340

Source: Submission to EPCA by Delhi traffic police, January 4, 2003

It is also not very clear how many vehicles registered in Delhi operate on interstate routes. As per regulations, only vehicles that are registered in Delhi can obtain national or city permits from the State Transport Authority in Delhi. As of December 24, 2002 a total of 31,947 live permits are on record of the state transport authority. Out of these 9045 are for heavy-duty trucks, and only 5418 of these operate on national permits.

Clearly, there is need for thorough verification and independent survey of the volume of through traffic in Delhi.

4. Status of implementation of the order on Euro II compliance for heavy duty vehicles

It further emerged that most transporters prefer registering their goods vehicles outside Delhi because they have to buy Bharat stage II vehicles, which are costlier if they want to register their goods vehicles in Delhi. Many transporters are buying non-bharat stage II vehicles because of the price barrier and getting them registered in adjoining states. But transporters, truck drivers,

toll tax collectors, and even the police seemed ignorant about the order that only Bharat II stage compliant goods vehicles should be allowed to enter Delhi. Non-Bharat stage II goods vehicles are not being stopped at the borders and are entering freely.

Some critical issues in controlling emissions from in-use truck fleet

Dealing with the through traffic poses a serious challenge, as there is wide divergence between emissions regulations in force in Delhi and outside the city. Both CNG and Euro II diesel are available in Delhi but not outside. The incoming fleet therefore is more polluting and contribute considerably to the pollution load in the city – which is the concern of the Hon'ble Court as well.

While the immediate strategy should be to prevent the vehicles from entering the city if they do not have any business here, in the long run more attention would have to be paid to making the incoming fleet as clean as the Delhi fleet. Given the nature of the truck traffic that traverses across the country dealing with them is going to be very complex. In some cities like Bangalore efforts are on to regulate entry of these vehicles on the basis of age, barring entry to 20 year old. But enforcement can be quite a problem in the absence of proper database on the number and age of trucks especially for those coming from outside. In cities like Mumbai pollution under control certificate (PUC) is a pre-condition to entry into the city. But there are serious problems with this strategy too. The current smoke opacity tests for in-use diesel vehicles that are conducted under the PUC programme are inappropriate to detect gross polluters. Improved test procedures that require testing on a chassis dynamometer in centralised testing facilities on the basis of commensurate norms are still not in place. Regulating emissions from trucks without a proper inspection and maintenance programme makes the entire exercise meaningless. EPCA is looking into these issues in detail and will file a report on a comprehensive strategy shortly.

EPCA also feels that even within Delhi there is need to move the existing commercial light, medium and heavy-duty vehicles to clean fuels like CNG or make them compliant with more stringent emissions standards for maximum emissions benefit. After moving the bus fleet to CNG goods vehicles have emerged as one of the major source of particulates in the city. EPCA will examine this issue and report back on how appropriate strategies can be devised to move heavy, medium and light duty commercial vehicles operating within the city to CNG. EPCA will also examine how improved quality of diesel can be phased in throughout the country to remove the current discrepancy between the city fleet and the incoming fleet. .

Recommendations:

Recommendations

EPCA has examined the complexity of the problem of transit traffic in detail to understand the control strategies in coming commercial traffic into the city. This is a very difficult problem to control largely because of lack of uniformity of emissions norms across the country that allows more polluting vehicles to be registered outside Delhi, poor enforcement capacity to check and stop the transit vehicles, multiplicity of authorities that compound the problem of enforcement, and lack of synergy of action among the concerned state governments to deal with the problem collectively. EPCA recommends that all serious efforts be made to implement the Hon'ble Court's order on bypassing the incoming goods traffic that do not have business in the city by providing alternative routes outside the city.

The key recommendations are as follow:

1. The National Highways Authority of India (NHAI) should be directed to coordinate with the state governments in the NCR to speed up construction and alignment of the bypasses and submit a firm schedule for completion to the Hon'ble Court: The National Highways Authority of India should be directed to coordinate with the Chief Secretaries of the neighbouring

states of Haryana, Rajasthan, Uttar Pradesh and Punjab to expedite this matter and a firm schedule for completion should be presented to the Court by NHAI.

2. Reinforce directions to the Traffic Police to ensure that there is no entry of trucks into the city, except those genuinely destined for Delhi.

3. Direct the Municipal Corporation of Delhi (MCD), through its Municipal Commissioner, to set up a system for verification and management of the truck entry into the city. Currently, MCD charges a toll tax from the trucks, based simply on the number of wheels of the truck. However, this toll tax should only be for trucks entering the city for loading and unloading. The MCD has to be responsible for ensuring that the trucks have genuine business in the city and maintain details accordingly.

D. Safety inspection of CNG buses

The *Amicus Curiae*, had submitted an application to the Hon'ble Court on 15 July 2002 and raised the following issue with regard to safety of CNG vehicles:

> "*The ministry of road transport and highways had issued a notification (no GSR 853 (E) which codifies the safety code of practice AIS – 028, on November 19, 2001. This notification lays out the emission standards mandatory for all new CNG buses and for converted buses. It also lays out the safety procedures necessary for these vehicles. This notification came about as a result of the Hon'ble court's concern about emission norms and safety standards. It may be recalled that the court had directed the EPCA to submit a report on these issues. This report was then used to amend the earlier notification of the ministry. However, it has been learnt that this critical notification will only come into effect on November 18, 2002. Therefore all buses new and converted which are currently coming on to Delhi roads do not meet the norms, safety standards* and inspection procedures laid out in this notification."

Further the application stated, "It is therefore prayed that this Hon'ble Court may:

> *"Direct the immediate implementation of the aforementioned notification (No. GSR 853 (E)), alongwith the appended safety code of practice (AIS-028)."*

Department of transport NCT Delhi filed an affidavit on 26 July 2002 in response to the Amicus *application that stated:*

> *"It is a matter of record that the new CNG powered buses are fitted with CNG kits at the manufacturers end as per specifications detailed in GSR 853 (E) which codifies safety code of practice AIS-028. The diesel buses which are converted to CNG mode by way of retrofitment of CNG kits by the installer also comply the safety norms as the CNG kit supplier/installer are approved by Ministry of Road Transport and Highways on the recommendations of ARAI/VRDE/IIP/. Moreover, any bus either new or retrofitted with CNG kit is inspected by the Board of Inspectors at the Vehicle Inspection Unit, Burari for grant of fitness certificate as per law before its registration or ply on roads."*

Union government filed an affidavit on 25 July 2002 in response to the Amicus *application that stated:*

> *"The notification GSR No 853 (E) dated 19.11.2001 on the safety norms for CNG vehicles has already come into force from 19.5.2002. The new safety norms for CNG are tighter than the earlier CNG Notification of 9.2.2000. The new CNG buses or the buses in which the existing diesel engines have been replaced by a dedicated CNG engine have to meet the revised norms with effect from 19.5.2002. However, the conversion kit manufacturers have been given a time limit of six months i.e. upto 18.11.2002 to get their certificates updated/re-certified. The new CNG buses and retrofitted CNG buses plying on Delhi roads thus have to meet the new norms with effect from 19.5.2002. Only the converted buses fitted with conversion kits would be covered from 19.11.2002."*

Following these submissions the Hon'ble Supreme Court gave the following direction.

Order of July 29, 2002:

> "There is no reason as to why unsafe vehicles which do not meet the safety norms, should be allowed to ply on the road. We, therefore, direct that with effect from 5th

August, 2002, no retro-fitted or converted CNG bus will be allowed to ply unless and until the Director, Transport Department, NCT of Delhi is satisfied and certified that the vehicles confirmed with the safety norms of 19th November, 2001."

EPCA's mandate

The Hon'ble Supreme Court in its order of February 14, 2003 has directed Environment Pollution (Prevention and Control) Authority (EPCA) to examine the following:

I.A No. 179: The Bhure Lal Committee is requested to submit a report within four weeks.

In view of this EPCA has reviewed the status of safety inspection of CNG buses initiated by the Delhi transport department.

The Court order of July 29, 2002 was issued when it was brought to the attention of the Hon'ble Court that safety inspection for CNG buses was very inadequate and that the government had not yet set up appropriate inspection and testing facilities for monitoring and enforcement of safety standards for CNG buses in Delhi. The evaluation of the safety related engineering issues showed that there were serious lapses and compromises in safety features, which were going undetected due to lack of inspection.

Moreover, at that time CNG buses were still carrying the type approval certificates issued under the old notification of February 2000, which only required that the converted buses meet the emissions standards in force during the year of manufacture of the diesel bus being converted.

Also problems regarding inadequate safety inspection and inappropriate emissions standards came to light from the two independent technical evaluations that assessed safety related engineering issues in CNG buses, safety standards and inspection requirements for CNG buses in Delhi, commissioned by the Centre for Science and Environment. These studies were conducted, following a series of CNG bus fire incidents in the city.

EPCA has done this report in two parts.

Part A: This section deals specifically with the issues related to safety inspection of CNG buses in Delhi directed by the Hon'ble Court in the order of July 29, 2002.

Part B: This section draws the attention of the Hon'ble court to the examines the issues related to

Current status of safety inspection following the court order of July 29, 2002

The Court order led the Delhi government to defer all further registration of CNG buses, both new and converted, and make pre-registration inspection mandatory from August 5, 2002. All concerned agencies jointly instituted an independent inspection system specially designed for CNG buses in Delhi.

Since the issue of the order of July 29, 2002 EPCA has been monitoring the progress of implementation of safety inspection systems for CNG buses in Delhi. In this connection EPCA has held periodic discussions with the concerned agencies.

Action initiated by the Delhi Transport Department after the July 29, 2002 court order:

- Setting up of a safety council to deal with CNG related safety matters.
- Appointment of the Association of State Road Transport Undertakings (ASRTU), as the agency for third party inspection of CNG buses in the Burari inspection center.
- New checklist for inspection according to new safety norms.

- Training of inspectors in Burari inspection center.

Thus, in accordance with the Supreme Court order of 29, July 2002, department of transport, NCT Delhi has since instituted a Third Party Technical Inspection (TPTI) committee which undertakes critical safety checks/inspection of each and every converted CNG Buses going for fitness for the first time as also old converted buses going for re-fitness after expiry of one year from the last fitness.

Delhi Transport Department has given the following status as in February, 2003 with regard to the third party inspection of CNG buses:

- Out of the total of about 1800 CNG buses which was furnished by the Transport department TPTI of nearly 1300 buses are complete. The remaining would be complete by March 2003. TPTI is being carried out according to the checklist prepared on the basis of the Notification No 853 (E) of the Ministry of Road transport and Highways.

- All converted/retrofitted buses which have been registered and issued permits to ply on the roads of Delhi on or after 20th May, 2002 till date will also have to undergo TPTI in pursuance of the orders of the Supreme Court.

- All permit holders were given notice to get the third party inspection of their buses carried out before March 31, 2003.

- Once ASRTU completes the TPTI of the CNG converted/retrofitted buses for which the transport department is making the payment as part of the compliance of the directions of the Hon'ble Court dated July 29, 2002, it should be requested to take up the inspection of safety aspects of other CNG and OE buses/converted/retrofitted buss which become due for fitness check between 1.4.2003 to 31.3.2004.

EPCA's observation

In the context of development in safety related issues, raised above, EPCA has examined the contention of *Amicus* and so also the Hon'ble Court order dated July 29, 2002. EPCA has also looked into the business of conversions and has come across various discrepancies.

Department of transport had provided details to the EPCA in November 2002 with regard to the non-compliance features in CNG buses as observed during safety inspection. Details were made available for 101 buses. Of these 12 were new buses and 89 were converted buses.

Problems detected during inspection of CNG buses at Burari are classified as follows:

- Design flaws that seem to occur in almost all buses and cannot be rectified immediately. This would require modifications in type approval norms for CNG buses. Some examples include CNG fuel lines that are covered with PVC sleeves and cannot be checked for corrosion, CNG filter is provided inside the regulator, hence cannot be checked separately etc.

- Failures that can be rectified like gas leakage, inadequate clamping of wires etc

- Inadequate documentation. This includes brand name of cylinder not available, no proof of bus body builder provided etc.

- The problem of leakage from high-pressure pipes reported in both new and converted buses.

- Almost 90 per cent of buses inspected and listed in the report have been found to have some non-compliance feature or the other.

According to the department of transport authorities most of the non-compliance flaws are being reviewed by the steering committee formed by the department of transport. The important point to take note from this submission to the EPCA is that higher proportion of converted buses amongst those inspected and for which the results were available, showed number of flaws and non compliance. Converted buses with flaws constituted around 87 per cent of the total buses that were inspected till November 2002. EPCA is aware of various discrepancies in bus conversion, the type approval certificate issued by the testing agencies compromising the quality of conversion both in terms of emissions and safety.

EPCA would like to make the following recommendations:

Safety inspection

Delhi government may be directed to prepare a schedule of safety inspection of all the CNG buses that are already plying on the road and not wait for the buses to come up for their routine annual schedule of fitness check. This is necessary to ensure compliance with the new safety notification.

In addition to the annual safety inspection at the Burari inspection centre, introduce a supplementary system where trained teams of inspectors can visit bus operators or depots and carry out inspection at those premises or at other suitable locations. It is possible to carry out the checks at the existing DTC stations. Increase the number of approved and competent teams to carry out the checks and their training should be given very high priority.

Auditing of the entire safety inspection process must be carried out on a regular basis to improve the system further.

Emissions inspection for CNG buses

This issue has been discussed in some detail in the section on PUC. But in this section it is important to highlight some special concerns regarding the emissions performance of the CNG vehicles. EPCA would like to reiterate the fact that CNG is a clean technology that has been introduced to improve emissions levels drastically in the city. Maintaining the quality of the programme is therefore essential to get the full environmental benefit from it. But in the absence of effective vehicle inspection programme to check on road deterioration and durability, technology may deteriorate fast and nullify gains. It is important to note while particulate emissions benefit will always remain, other gaseous emissions may become unstable. This may happen especially if emissions control technology like catalytic converters deteriorate.

As mentioned earlier in the CSE report the idle CO emissions data for CNG buses available at Burari inspection center in Delhi shows unacceptably high emissions levels in the fleet that is relatively new**.** Statistics of 300 emissions measurements conducted at Burari at the time of the study shows that 18 per cent of the tested buses had CO idle values of more than 3.0 per cent and about 60 per cent of the buses had CO values of more than 1.0 per cent. Experts noted that maximum idle CO of 3.0 per cent for CNG buses were too lenient, especially when all buses are equipped with catalytic converters. In the US a maximum of 0.5 per cent CO at idle is accepted for CNG buses, as compared to 3.0 per cent in India. According to the experts idle CO levels higher than 1 percent indicate that the catalytic converters are not working. It is advisable to reconsider the present limit value of 3.0 per cent. CSE technical report points out that in the

absence of effective emissions inspection system, many CNG buses are coming in with after-treatment devices with poor durability. Catalytic converter is included in the exhaust emission control system by CNG engines manufacturers' in order to fulfill the standards for new vehicles/engines. But the performance warranty of converters is only 72,000 km. This should be compared with the European requirements for manufacturers' responsibility and warranty, which is eight years or up to 500,000 kms. The report states "what happens after this limit is unclear; according to our knowledge there is no requirement for changing the converter at specified driving distances and no specific control is carried out during the annual fitness check."

Apart from the CNG buses, it has also been brought to EPCA's notice that some three-wheelers plying on CNG are emitting excessive white smoke. EPCA has looked into this problem. Inferior quality piston ring that wears off fast leads to leakage and high consumption of lube oil that cause excessive smoke. Poor maintenance also compounds the problem.

EPCA therefore would like to emphasise that both new and in-use emissions standards for CNG buses and other CNG vehicles be made tighter and inspection procedures made more rigorous to improve the quality of the CNG technology.

Experts have also recommended a special focus on CNG vehicles inspection (safety and emissions). CNG buses should be brought within the ambit of centralised vehicle inspection system immediately. The test procedure for emission measurement should be transient loaded mode test focusing on measurement of NOx.

It is important to note that CNG technology per se should not earn a bad name for administrative lapses, weak regulations and enforcement.

Conversion of old diesel buses to CNG through kit installation

Delhi transport department has informed EPCA that the phase out plan for diesel buses mandated by the Hon'ble Court was completed in November 2003 when the last diesel bus had gone off the road. Delhi government had given some more time till March 31, 2003 to the CNG kit installers to complete conversion of some of the old diesel buses. The process of conversion of old diesel buses is now complete in Delhi.

EPCA therefore observes there are no further need for conversion of old diesel buses. **So further conversion through kit installation process in old diesel buses can be stopped.**

For future expansion of the CNG programme only new OEM made CNG buses should be allowed registration in Delhi for best emissions results. As mentioned earlier converted buses can have very unstable emissions on road and it is also very difficult to monitor quality of conversion and assure long term durability.

Expand the CNG programme in Delhi to include light and medium duty goods vehicles: EPCA notes that the Court mandated CNG programme has been implemented successfully in Delhi. But to maximize the benefit of the programme that has been fully established in terms of infrastructure requirement and commercialization of CNG technology, it is now possible to further upgrade and expand the programme to include other polluting categories of vehicles in Delhi. The immediate target of expansion should be the medium and light duty commercial vehicles in the city that are still running on diesel. It is important to develop a replacement scheme for these vehicles based on CNG. But this further expansion should be encouraged only with new and dedicated CNG vehicles and not simple conversion old and existing vehicles.

Further upgradation of the CNG programme in Delhi: EPCA understands that a huge corpus fund has been created from the daily penalty on diesel buses in response to the Hon'ble Court order of April 5, 2002. It is learnt that the department of transport, Delhi has collected a sum of around Rs 30 crore as fine from diesel buses that had continued to ply beyond 31st January 2002,

violating the Hon’ble Court’s deadline. This sum should be utilized to buy the Delhi government for further upgradation of the CNG programme and other abatement strategies. Delhi government be directed to develop specific schemes for which this fund can be utilized.

E. Interstate bus terminals

On 15 July 2002, the *Amicus Curiae* for the ongoing public interest litigation on air pollution in the National Capital region of Delhi had submitted an application to the Hon'ble Supreme Court. In this application the *Amicus Curiae* had raised the following issue with regard to pollution control certificate programme (PUC) and sought directions from the Hon'ble Court:

> "The Hon'ble Court had by its order dated July 28th 1998 *inter alia* directed the setting up of interstate bus terminals so as to ensure that buses do not enter the city. It is necessary to direct a status report on the compliance of this order since it has been reported that the terminals have not as yet been set in place."
>
> "Direct the Delhi police and the Delhi transport department to file a status report as to the compliance of the orders from the Hon'ble court dated November 20th 1997, December 16th 1997 and July 28th 1998 indicating the extent of compliance and in particular clarifying the matter relating to the number of three wheelers that have been permitted to operate and the establishment of the inter-state bus terminals." (IA 179 on July 15, 2002 *para-4*)

To examine these issues EPCA has reviewed the earlier relevant Court orders. It has further reviewed the submissions of the central and the state governments filed in response to the IA 179, to assess the status of current level of policy and implementation and consider if these are adequate to address the issue.

Relevant Court orders till date:

> **November 20 1997:** This order had first directed setting up of ISBTs in Delhi. (Details of the Court order to be taken from CPCB).
>
> **July 28, 1998**: "New ISBTs to be built at entry points in North and South-West to avoid pollution due to entry of inter-state buses" Deadline: March 31, 2000
>
> This order had taken cognizance of the EPCA recommendation in the first progress report filed in June 1998. EPCA had discussed this matter in their 14th meeting and decided that the Government of Delhi should be persuaded to implement ISBTs at Dwarka in South East area and Nangloi in Northern area at an early date so that state buses do not travel long distances inside the city. The issue of constructing two more ISBTs at the periphery of Delhi was proposed to decongest Delhi roads by converting the then ISBT at Kashmere gate for local buses once the two new ISBTs became operational.

Response of the government to the IA 179 of July 15, 2002
Following the submission of the IA 179 the Delhi government has filed affidavits in the Supreme Court on July 26, 2002 respectively.

Responses from Delhi government are listed below.

Application on behalf of Amicus Curiae IA 179 of July 15, 2002 and prayer	**Response of Govt of NCT of Delhi in their affidavit of July 26, 2002**
"The Hon'ble Court had by its order dated July 28th 1998 *inter alia* directed the setting up of interstate bus terminals so as to ensure that buses do not enter the city. It is necessary to direct a status report on the compliance of this order since it has been reported that the terminals have not as yet been set in place." (*para-4* Application on behalf of the *amicus curiae* in IA 179 of 2002) "Direct the Delhi police and the Delhi transport department to file a status report as to the compliance of the orders from the Hon'ble court dated November 20th 1997, December 16th 1997 and July 28th 1998 indicating the extent of compliance and in particular clarifying the matter relating to the number of three wheelers that have been permitted to operate and the establishment of the inter-state bus terminals."	It is submitted that the process for construction of ISBTs at entry points in Delhi in North and South West Delhi has been started. **For construction of ISBT at entry point in South West** in Sector 22, Dilbagh, Dwarka, 16.11 hectares of land has been acquired from DDA at the cost of Rs 8.16 crores and has been handed over to PWD of GNCTD for construction. As requested by PWD, funds have been given to them for construction of tube wells, site office and for soil investigation, site survey plan and security. The PWD, GNCTD has reported that all these works will be completed on schedule. **The project is being monitored closely and is expected to be complete in three years time.** Land and Building Department (L&B) of GNCTD has issued notification for integrated freight complex at Holambi Kalan Narela on August 22, 2001. DDA has informed L&B department that ISBT at Narela forms part of integrated freight complex. The government of Delhi has obtained the approval of Hon'ble Lieutenant Governor of Delhi for the issuance of notification under section 6. A design competition has been held to finalise the design for both Dwarka and Narela ISBTs. The GNCTD has informed in their affidavit that **as soon as the land acquisition proceedings are completed for ISBT at Narela, the project will be completed on fast track basis.**

EPCA's observations

Summary of information from the status report filed and additional information available from the Delhi government:

i. To restrict the movement of inter state buses in the city four ISBTs have been planned at the periphery of Delhi. Two ISBTs one at Anand Vihar in the East and another at Sarai Kale Khan in the South have already been established. Delhi government has also issued a public notice on December 31 1997 to inform that inter state buses currently destined for ISBT, Kashmere Gate, would be diverted to Anand Vihar and Sarai Kale Khan to decongest Kashmere Gate ISBT.

Department of transport has defined terminals/routes for buses having interstate permits and national permits and have restricted their operations to 10 routes.

ii. Status of the two terminus in north and south-west of Delhi:

ISBT at Dwarka (South West Delhi): Construction has started at Sector 22, Dilbagh, Dwarka, on 16.11 hectares of land. Land has been acquired from DDA at the cost of Rs 8.16 crores and has been handed over to Public Works Department (PWD) for construction.

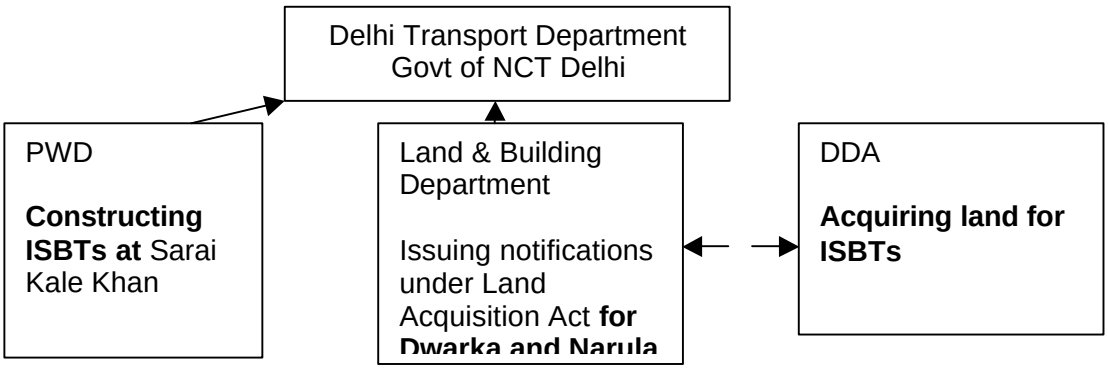
Delhi government has given the funds to PWD for construction of tube wells, site office, soil investigation, site survey plan and security. This ISBT is likely to be completed in three years time.

ISBT at Narela (North): Delhi government is following this with Land and Building Department (L&B) and DDA. Narela ISBT is part of the integrated freight complex. Government of Delhi has obtained approval for the project from the Lieutenant Governor of Delhi. According to the affidavit of July 26, 2002 "as soon as the land acquisition proceedings are completed for ISBT at Narela, the project will be completed on fast track basis".

Delhi Government has further submitted that it is upgrading the existing ISBT at Sarai Kale Khan and constructing two more ISBTs to stop interstate diesel buses from coming into the city.

EPCA's observations

There has been considerable delay in completing the ISBTs directed by the Hon'ble court. There appears to be serious problem of coordination among the concerned implementing agencies. The concerned agencies involved in this project are as follow:



In view of this the Delhi government be directed to submit a project schedule and state the dates of completion of these bus terminus.