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DISCUSSION PAPER

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Who Changed Delhi's Air?

The Roles of the Court and the Executive in Environmental Policymaking

Urvashi Narain and Ruth Greenspan Bell

1616 P St. NW
Washington, DC 20036
202-328-5000 www.rff.org

RESOURCES FOR THE FUTURE

Who Changed Delhi's Air? The Roles of the Court and the Executive in Environmental Policymaking

Urvashi Narain and Ruth Greenspan Bell

Abstract

Although there is general public approval of the improvements in Delhi's air quality in the recent years, the process by which this change was brought about has been criticized. A common perception is that air quality policies were prescribed by the Supreme Court, and not by an institution with the mandate for making environmental policy. A careful review of the policy process in Delhi suggests otherwise. We find that the government was intimately involved in policymaking and that the main role of the Supreme Court was to force the government to implement previously announced policies. A good understanding of what happened is essential, as the Delhi experience for instituting change has become a model for other Indian cities as well as neighboring countries.

Key Words: air quality, Supreme Court, compressed natural gas, Delhi

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Who Changed Delhi's Air? The Roles of the Court and the Executive in Environmental Decisionmaking

Urvashi Narain and Ruth Greenspan Bell*

Introduction

Delhi has, in the past few years, made surprising strides toward improving its air quality. Data collected by the Central Pollution Control Board (CPCB) suggest that levels of suspended particles, possibly one of the main indicators for respiratory health, have at least stabilized and possibly even fallen (World Bank and Central Pollution Control Board, 2005). Despite popular resistance and widespread protests in 2001, when all public transport–related commercial vehicles were ordered to convert to compressed natural gas (CNG), residents of Delhi today believe there has been significant change, and they approve of it. In a survey conducted prior to the November 2003 state elections, it was noted that the improvement in air quality was one of the main achievements of the ruling Congress government for Delhi state, and quite likely a factor that contributed to the re-election of the incumbent government (Anon., 2003).

Although elected politicians now claim credit for air quality improvements, Delhi's dramatic evolution from the world's fourth-most polluted city more often is attributed to decisions of the Supreme Court. Observers have argued that the desired improvements were dictated by the Supreme Court, which is constitutionally an adjudicator, not an environmental policymaker. Some critics of the mandated CNG conversion have gone even further, arguing not only that the court overstepped its bounds, but also that it dictated policies that were inefficient. The 2003 *India Infrastructure Report*, published by the 3iNetwork,[1] contends,

> …mandatory conversion to CNG by all vehicles is not necessarily the most efficient way to bring down emission levels. Other options could have been

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[1] The 3iNetwork comprises the Infrastructure Development Finance Company, the Indian Institute of Management, Ahmendabad, and the Indian Institute of Technology, Kanpur.

> considered such as changing the composition of diesel or eliminating fuel price distortions that flow from the system of administered prices and so on. The decision on the appropriate technology should have ideally been made by the executive using a body of experts, which would be in a position to take into account all relevant scientific and statistical data, and such decisions need to be flexible to changes in technology and external conditions. (3iNetwork, 2003)

These are not academic arguments or theoretical debates but real concerns, as the high courts for numerous other cities in India are considering instituting similar reforms and other countries are watching India's experience. That alone makes it urgent to understand whether the Supreme Court in fact improperly asserted authority to make environmental policy decisions. Since several other policies, not just the conversion to CNG, contributed to the change in air quality, what role did the Supreme Court play in implementing these other policies? What was the role of the government in the development of these policies? In this paper we answer these questions and examine the role of the Supreme Court and the government by looking at the process by which air pollution policies evolved in Delhi.

Our examination leads us to the following conclusions. Although the Supreme Court played a central role in the welcomed changes, especially the conversion of all commercial vehicles to CNG, it was not the source of most of the policies. The court's important contribution was to push the government in two significant ways: to implement existing policies and to develop new policies to deal with air pollution. In our view, and contrary to the general perception, the court did not exceed the traditional role of a common law court, and in fact acted in some ways like courts in the western democracies that force governments to implement enacted laws.

The court did, however, prod the government at critical points to get past partisan politics and bureaucratic logjams, and it provided a form of protective cover that allowed the government to avoid taking direct responsibility for implementing controversial policies that had previously been subject to political attack.

The executive branch of the government was the chief driver of the policymaking process. When we say this, we want to distinguish clearly between policymaking and policy implementation. Although it vacillated in implementing its own policies to curb air pollution in Delhi, the government was clearly the policymaker. It did this directly, through its various

central and state-level ministries, and indirectly, through statutory committees it was asked by the Supreme Court to set up under Section 3(3) of the Environment (Protection) Act of 1986.

The process of policymaking to reduce air pollution, with the involvement of state, statutory committees, and the Court, continues even today and appears to be an effective driver of change. Until the state steps up and directly assumes its responsibilities, and as long as the existing process is transparent and participatory, the existing process may be the only viable way to achieve policy reform.

How It All Began

The Supreme Court's involvement in policies to curb air pollution in Delhi began with public interest litigation brought to the court by M.C. Mehta in the form of a petition no. 13029 filed December 17,1985. Concerned about rising levels of air pollution and the government's apparent lack of interest in dealing with this growing problem, Mehta asked the court to direct various government ministries and departments to implement the Air Act of 1981 in Delhi.

The Air Act gave the government authority to take action. Specifically, the Air Act contains authority for CPCB to 'lay down standards for the quality of air', to 'advise the Central Government on any matter concerning the improvement of the quality of air and the prevention, control, or abatement of air pollution', and to 'perform such other functions as may be prescribed'.[2] In 1986, in response to Mehta's petition, the Supreme Court directed the Delhi administration to file an affidavit specifying the steps it had taken to reduce air pollution.

Quite likely as a result of the court's involvement, the Delhi administration and the central government started to pay attention to the problem of air pollution. Some have asserted that the Delhi administration and the central government took steps to curb pollution on their

[2] In litigation, government officials at various points argued that they lacked legal authority to institute specific reforms that were being discussed and also complained about inadequate implementation and enforcement resources. For example, regarding car registration in Delhi, then-Secretary of Transportation Kiran Dhingra noted the need for amendments to the Central Motor Vehicles Act of 1988 and notification by the central government to enable the state government to act. She also described the inadequate number of inspectors, among other obstacles (Kiran Dingra Affidavit, 1996). One interpretation of these arguments is that though adequate authority existed, it may not have been delegated to the most appropriate level.

own initiative, without the court's order. In fact, in a July 2003 interview, Dilip Biswas, then chairman of CPCB, said that the central government had set vehicular standards in 1990 on its own initiative. Given the timing, however, and the volume of correspondence between the court and the government at this time, it is hard to imagine that the court's involvement was not a precipitating factor.

After Mehta's petition to the court, several new environmental laws were enacted, as were policies to curtail tailpipe emissions from vehicles and to move polluting industries from Delhi. However, these policies were rarely implemented, and those that were can be characterized as largely piecemeal. There was no evidence of a comprehensive plan to tackle the growing problem of air pollution.

New legislation included the 1986 Environment (Protection) Act, an amendment to the Air Act in 1987, the Motor Vehicles Act of 1988, and the Central Motor Vehicle Rules of 1989. The 1988 Motor Vehicles Act and the 1989 Central Motor Vehicle Rules specifically added authority to set standards for vehicular emissions for manufacturers and users. As a result, in 1990 vehicular exhaust emissions standards were set, imposing some obligations on owners to maintain their vehicles so that they would not emit smoke, visible vapor, grit, sparks, ashes, or cinders[3] (Agarwal et al., 1996). Ambient air quality standards were also prescribed for Delhi at this time by the Ministry of Environment and Forests (MoEF) (*The Statesman–Calcutta*, January 2, 1991). Finally, a committee was set up in April 1991 under Professor H.B. Mathur, of the Indian Institute of Technology in Delhi, to recommend vehicular mass emissions standards for 1995 and 2000 (Anon., 1996). The standards were to replace a voluntary program in which manufacturers self-certified their vehicles' performance (*The Sentinel*, May 31, 1989).

In late 1987, the Delhi administration began a campaign to educate its residents about air pollution and to encourage them to have their vehicles voluntarily checked for smoke emissions (*Times of India*, September 21, 1988). Also at this time, the Delhi traffic police announced its

[3] Owners of four-wheel petrol vehicles had to ensure that their vehicles did not exceed idling carbon monoxide (CO) emissions levels of 3% by volume; the figure was 4.5% for two- and three-wheelers. Diesel vehicles had a smoke density level at 5.2 Bosch unit and 75 Hartridge unit for vehicles carrying a full load at a speed of 60% to 70% of the maximum rated engine speed, and a 65 Bosch unit limit for free acceleration (Agarwal et al., 1996).

first crackdown on vehicles emitting excessive exhaust, especially diesel vehicles (*Indian Express*, February 24, 1988). In a study, Professor Mathur found that the Delhi traffic police prosecuted 2.5 times more vehicles emitting excessive exhaust in 1988 than in 1987. His study also found that despite these efforts, the level of pollution in Delhi far exceeded safe limits. Then, in 1989, the central government raised the penalty on vehicle owners guilty of breaking the pollution law to Rs. 1,000. However, the State Transport Authority for Delhi was unable to enforce these new penalties, saying that it could not do so until there were sufficient service stations to install equipment to measure vehicular exhaust (*The Sentinel*, May 31, 1989).

Starting in the late 1980s, the Delhi administration also began to consider the impacts of industrial pollution in Delhi. In 1988, the administration identified firms in Delhi that were causing pollution and promised to relocate these firms to newly developed industrial areas (*Times of India*, February 28, 1988). About a year later, the administration announced a policy that would allow only 'clean' small industries with low power requirements to operate in the city (*Indian Express*, November 25, 1989). To the best of our knowledge, this policy was never implemented. In 1990, the central government approved the Second Master Plan for Delhi. It identified category 'H' industries—those that were large and associated with hazardous emissions—that needed to be shifted out of Delhi within three years—that is, by 1993.

The Court Pushes Harder

Nevertheless, pollution continued to rise. Possibly responding to this, in early 1991, the court asked MoEF to set up the first of what turned out to be three statutorily based authorities charged with the responsibility of devising policies to curb air pollution in Delhi. Authority for this is found in Section 3(3) of the Environment Protection Act, which allows the central government to 'constitute an authority…for the purpose of exercising and performing much of the powers and functions (including the power to issue directions under Section 5)[4] of the Central Government…' By asking for the establishment of such authorities, whose sole purpose

[4] CPCB, for example, derives its power to prosecute polluting units under Section 5 of the Environment Protection Act.

was to devise policies to curb air pollution, the court signaled that the government needed to pay more attention to the problem of air pollution. But the court was also motivated by its own recognition that the matters before it were highly technical, and therefore beyond its area of expertise. The court needed a group of experts to assess the issues and advise it.

The first of these committees was constituted in March. The court explained its purpose in an extended judgment dated March 14, 1991. The court expressed concern about the adversarial nature of the hearings and the highly technical issues before it. Specifically, the court asked counsel to 'come forward with useful deliberations so that something concrete could finally emerge'.[5]

This committee came to be known as the Saikia Committee, after its chairman, former Justice K.N. Saikia, who had recently retired from the Supreme Court. Other members of the committee were M.C. Mehta, N.S. Tiwana (then-chairman, CPCB), and S. Girdharlal (representative of the Association of Indian Automobile Manufacturers). The court directed the committee to (i) assess technologies available for vehicular pollution control elsewhere in the world and in India; (ii) assess low-cost alternatives for operating vehicles at reduced pollution levels in Indian metropolitan areas and make specific recommendations on the administrative and legal regulations required for implementing these alternatives; and (iii) make recommendations on how vehicular pollution could be reduced in both the near term and the long run.

One of the Saikia Committee's first recommendations was to phase out leaded petrol in Delhi by April 1, 1992 (Saikia Committee on Vehicular Pollution, 1991). As if to demonstrate why a firmer hand was needed in these matters, MoEF argued against the lead phase-out policy before the Saikia Committee (Saikia Committee on Vehicular Pollution, 1991) even though in late 1989 it had announced a plan to introduce unleaded petrol throughout the country (*Times of India*, December 31, 1989).

[5] The second of these statutory committees, the Shukla Committee, named after its chairman, retired Justice Shukla, was constituted in the mid-1990s. Little is known about the workings of this committee, which speaks to its ineffectiveness.

The committee also recommended the use of CNG as an alternative vehicular fuel for three reasons: it polluted less, cost less, and was more widely available in the country than petrol or diesel. It is notable, however, that this was not the first official discussion about the use of CNG in transportation in policy and government circles. That began as early as 1988, when a World Bank study urged the Indian government to use natural gas for transportation. Also at that time, the Oil and Natural Gas Commission introduced CNG on an experimental basis in its own vehicles, with encouraging results (*Hindustan Times*, February 28, 1988). In 1992 the Gas Authority of India Limited (GAIL) and the Indo-Burma Petroleum Company Limited tried to popularize the use of CNG in petrol-driven vehicles in Mumbai, Baroda, and New Delhi. GAIL announced its long-term plan to convert bus fleets in cities along the Hazira-Vijaypur-Jagishpur pipeline to CNG (Delhi is on the Hazira-Kota pipeline). And the Delhi Transport Corporation (DTC) was said to have converted five buses to CNG (Cherail and Warrier 1992). By 1994, after the success of a pilot project involving 40 vehicles, DTC called CNG commercially viable in Delhi, and DTC added a sixth CNG bus to its fleet (*Times of India*, April 30, 1994).

In September 1994, Parliament passed the Motor Vehicles Amendment Act to promote the use of alternative fuels, such as batteries, solar power, and CNG. Motorists using these alternative fuels were not required to obtain permits from the state transport authorities and, for a specified period, were allowed to determine their own freight, fares, and hours of operation.

These incentives were meant to encourage commercial vehicle operators to switch to alternative fuels. The Delhi government also announced its intention to promote the use of CNG as an alternative fuel by opening more CNG outlets and possibly subsidizing the cost of CNG conversion kits (Anon., 1994b). On the suggestion of the Saikia Committee that CNG be used as an alternative fuel, in early 1995 the Supreme Court ordered that all government cars switch to CNG or install catalytic converters and use unleaded fuel *(Indian Express*, February 4, 1995). Despite this flurry of activity in 1994, most of which originated with the government, use of CNG in commercial vehicles did not become a reality for almost a decade, in part because little effort was made at this stage to build the infrastructure needed to make an alternative fuel viable in the city.

There was action with respect to other fuel issues, however. On the recommendation of the Saikia Committee, on August 12, 1994, the Supreme Court mandated the phase-out of leaded fuel in Delhi, Mumbai, Calcutta, and Madras by April 1995 and for the entire country by April 2000 (court order, October 21, 1994). The deadline to supply unleaded petrol in Delhi was met on time.[6] During this period the Supreme Court also ordered that the sulfur content in diesel supplied in Delhi be reduced from 1% to 0.5% by April 1, 1996, and to 0.25% by April 1, 1998 (Environment Pollution (Prevention and Control) Authority, 2001). This was the first time that the Supreme Court issued fuel quality specifications.

In the early to mid-1990s the Supreme Court also got much more involved in the relocation of polluting industries from the interior of Delhi, but again, in response to policies devised earlier by the government. A 1962 master plan[7] called for the closure of such industries, but this provision received no further attention from the Delhi administration for almost three decades. In 1990 a revised master plan for Delhi was approved that reiterated the need to close down hazardous and noxious industries as well as heavy and large industries. The plan gave the administration another three years to implement this provision. This deadline to relocate category H industries also came and went without any response. Starting in 1996, the Supreme Court began to act to force the government to implement its relocation policies. Because of the court's persistence, polluting category H firms were finally relocated by 1997 (see Appendix 1). At the same time the court also got involved in the issue of relocating industrial units operating in residential areas, but this process took longer and is still ongoing.

Also in the early 1990s, MoEF proposed that all vehicles have compulsory catalytic converters by April 1, 1995. It is conceivable that MoEF was prodded by the Supreme Court to adopt this policy. Inferential evidence is found in a court order dated November 14, 1990, indicating that in that month the Supreme Court brought catalytic converters to the ministry's

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[6] Although the deadlines for the introduction of unleaded petrol were met in time, there was still concern about the benzene content of the unleaded petrol. Benzene was kept at 5%, not 3% as had been recommended by CPCB (*Economic Times*, June 24, 1998).

[7] Master plans for Delhi are developed by the Delhi Development Authority, a Delhi state government body but must be approved by the central government.

attention. In 1995 the Delhi government announced that it would subsidize the installation of catalytic converters in all two- and three-wheel vehicles to the extent of 1,000 Rs. within the next three years (*Indian Express*, January 30, 1995). Furthermore, the Petroleum Ministry banned the registration of new four-wheel cars and vehicles without catalytic converters in Delhi, Mumbai, Chennai, and Calcutta effective April 1, 1995 (*Telegraph*, March 13, 1995). This directive was implemented, although it is alleged that some vehicle owners had the converters removed illegally (court order, February 14, 1996).

Vehicular mass emissions standards issued by MoEF in 1993 were another set of initiatives to address pollution from vehicles. In response to pressure from industry, though, the standards that emerged were fairly lax. MoEF's proposals were a diluted version of the 1991 Mathur Committee recommendations and even more lenient than the initial proposal by CPCB (*Indian Express*, July 23, 1993). The Mathur Committee had recommended 5.0 to 9.0 gm/km for carbon monoxide (CO) and 2.0 to 4.0 gm/km for hydrocarbon (HC) and nitrogen oxide (NO_x) emissions, according to the reference weight of petrol vehicles. Following this, MoEF first agreed to 7.4 gm/km for CO and 1.97 gm/km for HC and NO_x as a single standard for all vehicles, regardless of their weight. But under political pressure and pressure from the auto manufacturers, the ministry subsequently finalized the figures at 8.68–12.4 gm/km for CO and 3.0–4.36 gm/km for HC and NO_x, according to the cubic capacity of the vehicles. Also responding to automobile industry lobbying, the deadline for these standards was extended a year, to April 1996 (Agarwal et al., 1996). The automobile industry was reported to have continued to lobby the Surface Transport Ministry to further relax the emissions standards set for 2000 (*Business Line*, September 25, 1996).

During this time the government also flirted with policies to reduce pollution from thermal power plants. However, few initiatives went beyond the planning stage, and the few that did were scuttled after they were announced. In 1995, MoEF, 'with a view to check pollution and discourage thermal power plants from using coal with high ash content', was said to be preparing draft guidelines for a tax on fly ash and working on plans to approve new thermal plants only if they were linked to coal pithead washeries, which cut down the ash content (Anon., 1995). In July 1996, it was reported that the central government was about to require all thermal power

stations to switch to washed coal by 2000 (*Financial Express*, July 22, 1996). This notification was abandoned after the coal ministry objected (*Business Standard*, August 3, 1996).

In summary, there were a plethora of environmental plans to reduce Delhi's air pollution policies, each of them announced by the government and then abandoned or ignored. These included policies to relocate industry, to improve fuel standards and to encourage the use of CNG. Announced one by one, the initiatives had no particular coherence, and there was no effort to take a comprehensive approach to reducing air pollution in Delhi. Starting from the early 1990s, however, the court began to push the government to make good on its promises. The court's efforts included direct orders and the appointment of the Saikia Committee. The city's air quality nevertheless continued to deteriorate,[8] and on November 8, 1996, the Supreme Court issued a *suo moto* notice to the Delhi government to submit an action plan to control the city's air pollution (Agarwal et al., 1996).[9]

Comprehensive Policy Development

In 1996 and 1997, in response to direct orders of the Supreme Court, both the Delhi government and the central government finally developed action plans to curtail pollution in Delhi. These were the first comprehensive policies on air pollution control.

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[8] The plight of traffic police appeared to get some attention during this period. In 1992, it was reported that police officials decided to issue masks to traffic police at 40 intersections because of concerns about increasing pollution levels. The masks, though, proved ineffective against dangerous pollutants, such as nitrogen oxides and carbon monoxide; furthermore, they were in short supply, and they prevented the police from blowing their whistles (Anon., 1992). A few years later, it was reported that traffic police in Delhi would be granted an allowance for breathing polluted air. The compensation would vary according to rank, ranging from Rs. 100 for constables to Rs. 200 for inspectors. A study conducted by the capital's Central Road Research Institute and the All India Institute of Medical Sciences concluded that traffic police develop chest and lung abnormalities because of high pollution exposure. Another study, conducted by the Vallabhai Patel Chest Institute and commissioned by police authorities, revealed respiratory problems, including inflammation of the lungs and bronchial hyperactivity, which causes asthma. The studies found that pollution was highest at intersections in Old Delhi, Azad market, and Bahadur Shah Zafar Marg (Anon., 1994a).

[9] According to Anumita Roychowdhary, of the Center for Science and Environment, Justice Kuldeep Singh issued the *suo moto* notice after reading *Slow Murder*, the center's first book on air pollution in Delhi. It blamed urban air quality problems on bad vehicular technology, poor fuel quality, poor vehicle maintenance, and nonexistent traffic management.

Delhi government. The action plan developed by the Delhi administration was articulated in an affidavit filed with the Court on November 18, 1996, by Kiran Dhingra, the then-commissioner-cum-secretary of the Transport Department, Government of National Capital Territory of Delhi. In it, she outlined a pollution control strategy for Delhi. Dhingra was asked by the court to respond to the following ideas:

1. Freeze or restrict the registration of all types of motor vehicles for the next two to three years.
2. Freeze the registration of three-wheelers and not renew the existing permits.
3. Retire all public buses at five to seven years.
4. Restrict driving such that one-third of registered vehicles are kept off the road on a particular day.

Although these suggestions were offered by the court, it isn't clear who devised them. They seem to demonstrate that the court wanted to engage the executive branch in a dialogue about appropriate policies, not impose policies of its own. The court appeared to be trying to build consensus around pollution control policies.

In her affidavit, Kiran Dhingra said that urban transport policy should give priority to a mass rapid transport system[10] and that a bypass should be constructed around Delhi. The former would deal with the growing need for transportation and help slow the increase in private vehicles; the bypass would reduce the impacts from trucks and buses that currently had no choice but to pass through Delhi. Other components of her strategy were better technology for new vehicles, improved fuel quality, restrictions on excessively polluting in-use vehicles, improvements to the existing public transport system, construction of passenger and freight terminals on the outskirts of Delhi, improved monitoring of ambient air quality, further

[10] Previously, two other proposals for public transportation had been discussed in policy circles. In 1994, the Union Ministry of Surface Transport had proposed to bring back tramlines to Delhi to reduce congestion, as a stopgap measure until the Mass Rapid Transit System was completed. Dinesh Mohan of IIT and Lieutenant Governor P.K. Dave did not consider the scheme viable (Bhattacharya, 1994). A few years later, at a two-day workshop on the Delhi transport system, Transport Minister Rajendra Gupta suggested that a high-capacity bus system be developed (*The Pioneer*, June 8, 1996). Delhi today has the Mass Rapid Transit System but no trams or high-capacity buses.

'greening' in Delhi, and efforts to increase public awareness (see Appendix 2). She suggested that a task force comprising representatives of relevant government departments and civil society draw up a plan of action and a schedule based on the pollution control strategy outlined in the affidavit.

What stands out from the affidavit is its comprehensive nature and its level of detail. Not only did Kiran Dhingra include a variety of policies to deal with vehicular pollution (from strengthening public transportation to improving fuel quality to placing some restrictions on in-use vehicles), but she also suggested specific policies to meet these goals: increasing the use of CNG and propane, for example, and retiring old vehicles. She indicated that the government was already in the process of introducing CNG buses.

It isn't clear whether the affidavit submitted by Kiran Dhingra was ever converted into an action plan by the Delhi administration. Contemporary press accounts allude to an action plan, but the policies discussed in the press were not as comprehensive as those outlined in the affidavit. On January 3, 1997, it was reported that the central and Delhi administrations had devised an action plan to curb pollution in Delhi. In it, the minister of MoEF is said to have asked the Delhi government to add more private buses to the transport system and phase out old Delhi Transport Corporation buses. In the same plan, the Delhi chief minister urged the central government to consider his request for as many as 3,000 new buses. There were suggestions for improving the quality of diesel and imposing stricter emissions norms on vehicles but no schedule for specific policies (*Business and Political Observer*, January 3, 1997).

Confusion continued about government policies and what would, or could, be implemented. A few weeks later, the Delhi government was reported to have decided to introduce new vehicular standards for the capital in 1998 instead of 2000.[11] Three other measures were announced. First, all vehicles fitted with two-stroke engines were to be banned. Second, use of propane in three-wheelers was to be made mandatory beginning in April 1997. Third, all diesel vehicles were to be fitted with 'diesel converters' (*Business and Political Observer*,

[11] Apparently, instructions were also issued on March 12, 1996, concerning emissions standards for vehicles. And the Delhi Pollution Control Board set emissions standards for vehicles on August 8, 1997.

January 20, 1997). None of these three additional policies had been mentioned in the affidavit, and none were ever implemented.

The central government promulgated emissions standards for 2000 in March 1977. The minister of MoEF announced that the Ministry of Surface Transport has been asked to order the Delhi Transport Corporation to retire polluting buses from Delhi's roads, along with those under lease by the state transport commissioner (*Hindustan Times,* February 22, 1997). In January 1977, the Delhi administration also announced that the next month it would impound or heavily fine smoke-spewing heavy motor vehicles entering Delhi (*Times of India,* January 17, 1997). These policies were later shot down by the Law Ministry on the grounds that giving the Delhi Transport Department the power to impound polluting vehicles would circumvent the Motor Vehicles Act (*Statesman,* April 13, 1997).

The one part of the affidavit that became a working policy directive from the Delhi administration dealt with phasing out old vehicles and encouraging the use of CNG. On August 11, 1997, the lieutenant governor of Delhi issued time-bound instructions to the state transport commissioner for the retirement of old vehicles and technological advancement of the new fleet. These instructions were issued under Section 20 of the Air Act 1981. The new fleet of three-wheelers would include some vehicles operating on alternative fuels (others would be operated on petrol), and the fleet of taxis would move to alternative fuels only (electricity, battery, CNG, LPG, propane, and solar power). There was no mention of trying to convert the bus fleet to alternative fuels. In all cases, the newer vehicles would meet higher emissions standards. Appendix 3 lists the specific instructions for buses, three-wheelers, and taxis.

In the same pattern, the Delhi government responded to pressure from the Supreme Court and in October 1997 developed a policy to phase out old vehicles and encourage the use of CNG. But with elections looming, it withdrew this policy on February 4, 1998. Once again the Supreme Court stepped in and forced the Delhi government to act on the policy it had announced (see Appendix 4).

Central government. On December 3, 1997, a year after the Dhingra affidavit, MoEF issued the 'White Paper on Pollution in Delhi with an Action Plan' (Ministry of Environment and Forestry, 1997). The white paper was the culmination of a series of meetings between May 5

and August 8, 1997, with 'concerned government agencies, NGOs, experts and citizens'. The white paper proposed policies to curb not only vehicular pollution in Delhi but also all types of pollution, thus going beyond the pollution control strategy suggested by Kiran Dhingra in her affidavit. However, its air pollution control policies were fairly similar to those in Dhingra's affidavit.

In the white paper, the ministry listed measures and a timetable for controlling vehicular pollution, said to be responsible for 67% of Delhi's pollution; industrial pollution (coal-fired thermal power plants were responsible for 13% of the total pollution, and industrial units, 12%).[12] Like Dhingra's affidavit, the white paper called for phasing out old vehicles (including buses more than five years old), possibly phasing out two-stroke two- and three-wheelers, preventing the overloading of buses and trucks, improving traffic flow, building a bypass around Delhi, building a mass rapid transport system, improving the quality of fuel, and introducing CNG buses.

Measures for controlling vehicular pollution were divided into three categories, those for (i) in-use vehicles (Table 1), (ii) traffic management (Table 2), and (iii) fuel quality and types (Table 3). The white paper also discussed the need for further delegation of statutory powers to functionaries of the Delhi government to carry out enforcement functions for controlling pollution—for example, checks to detect vehicles not complying with emissions norms.

On January 7, 1998, soon after the release of the white paper and seemingly also in response to the Dhingra affidavit, the Supreme Court directed the central government to set up the third of the statutory committees established under Section 3(3) of the Environment Protection Act. This was called the Environment Pollution (Prevention and Control) Authority (EPCA).[13] According to Harish Salve, who acted as amicus curiae to advise the court in the Delhi litigation, EPCA was set up directly in response to government complaints that the

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[12] The other 8% of the pollution is said to be from domestic sources; there appears to be no policy to curb such pollution.

[13] In April of the previous year, the Supreme Court had expressed dissatisfaction over the control of vehicular pollution in Delhi and proposed establishing an interdisciplinary panel of 10 to 15 experts to suggest pollution control measures (*Business Standard*, April 26, 1997).

Supreme Court was exceeding its authority and making policy decisions in place of the government. EPCA was asked to monitor the progress of the white paper, develop new policies to curb vehicular air pollution, and serve as a fact-finding body for the court.[14]

On January 29, 1998, MoEF issued an order constituting EPCA and nominated Bhure Lal (then-Central Vigilance Commission), Dr. Biswas (then-chairman, CPCB), Anil Agarwal (chairman, Center for Science and Environment), Jagdish Khattar (director, Maruti Udyog), and Kiran Dhingra (then-commissioner, Delhi Transport Department).[15] Bhure Lal was nominated to serve as chairman, and hence EPCA is also called the Bhure Lal Committee. EPCA held its first meeting on February 26, 1998, and met once a week thereafter. It submitted progress reports to MoEF and the Supreme Court at regular intervals as well as specific reports on matters referred to it by the court.

In its very first progress report, EPCA suggested additional pollution policies for Delhi (Environment Pollution (Prevention and Control) Authority, 1998a).[16] These policies built on the action plans of the Delhi administration and MoEF, but they were bolder and more specific. Whereas the other plans talked about encouraging the use of clean fuels in public

[14] EPCA was empowered to direct (i) closure, prohibition, or regulation of any industry, operation, or process; (ii) stoppage or regulation of supply of electricity, water, or any other service; (iii) the establishment of procedures and specifications to prevent environmental accidents, and to ensure safe handling of hazardous substances; and (iv) the fitting of vehicles with the proper pollution control equipment and the accurate calibration of these instruments to ensure proper emissions testing (*Business Standard*, February 14, 1998). Clearly, the role that EPCA eventually played went well beyond these responsibilities.

[15] Kiran Dhingra was nominated as an individual, not as the commissioner of the Delhi Transport Department. Consequently, she still serves on EPCA even though she is no longer the Transport commissioner. After Anil Agarwal, Sunita Narain was nominated to EPCA, and sometime in 2002, three other members were added: a medical doctor, a representative of the Ministry of Petroleum and Natural Gas, and the Delhi Transport commissioner.

[16] In the minutes of the third meeting, Bhure Lal stressed ‘the need for ascertaining the various possibilities for pollution control with particular focus on cost effective solutions’. He added that EPCA’s role was to update knowledge and come up with ‘cost-effective solutions to the problem’ (Environment Pollution (Prevention and Control) Authority, 1998a).

transportation,[17] EPCA proposed to switch all taxis and autos to a clean fuel, ban all eight-year old buses except those on clean fuel, and gradually move the entire bus fleet to a single fuel—CNG. Whereas the white paper defined clean fuels as fuels such as CNG and propane, the Delhi government included electricity, batteries, LPG, and solar power as well. EPCA did not define what it considered clean fuel.

EPCA concluded that pollution control measures already undertaken by the government[18] were having only a limited impact on air quality because of the number of old vehicles and the rapid increase in new vehicles. EPCA expressed concern about the 'lack of action…by implementing departments and the need to focus on effective measures to have an impact in the short run'.

In its first report, EPCA listed measures from the white paper and the Dhingra affidavit on which there had been no progress:

1. ban on commercial vehicles more than 15 years old (to have been implemented by April 1, 1998);
2. setting up of automated facilities for inspection and maintenance of vehicles;
3. formulation of incentive schemes for registration of autos and taxis with clean fuel[19];
4. ban on alteration of vehicles by replacing petrol engines with diesel engines (to have been implemented by December 31, 1997);

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[17] In February 1998, the ministry was said to have proposed a separate transport network, running on CNG, in Delhi. The CNG-based network would be completely separate from the standard bus network and would provide better service at higher tariffs. The Delhi government expressed its willingness to accept the CNG-based bus proposal (*Business Standard*, February 18, 1998). Neither the ministry nor the Delhi government thus proposed a complete switch to CNG.

[18] Six policies had already been undertaken by the government: (i) unleaded petrol introduced for new cars; (ii) passenger cars equipped with catalytic converters, beginning April 1, 1995; (iii) compressed natural gas kits for government vehicles (about 800 government vehicles are said to have been converted to CNG; *Asian Age*, March 18, 1998); (iv) exhaust emissions standards progressively tightened; (v) fuel quality specifications published; and (vi) specification of 2T oil to be used sent to MoEF for notification.

[19] State Transport Minister Rajendra Gupta was reported as saying that the cost of the conversion kits was deterring people from using CNG and suggested that the government provide financial incentives to encourage the use of CNG. The same article also noted that six years after the introduction of CNG, only about 200 private vehicles had switched over (*Asian Age*, March 18, 1998). No specific policy was suggested.

5. restriction on driving goods vehicles during daytime (to have been implemented by December 31, 1997);
6. expansion of premixed oil dispensers to 50% (to have been implemented by June 1997); and
7. ban on supply of loose 2T oil at petrol stations and service garages (to have been implemented by December 1, 1997).

From the minutes of the first report, it appears that EPCA believed that more drastic measures were needed to reduce pollution, including the use of CNG, and that the conversion of buses, taxis, and autos could take place without significant additional cost to vehicle owners.

Any additional costs could be met through state subsidies.[20] Table 4 compares the EPCA proposal with the white paper and the Dhingra plan.

[20] According to the minutes, in the second meeting of EPCA, B. Sengupta of CPCB described the current status of air quality in Delhi and measures required to control vehicular pollution. In the third meeting, Sengupta is said to have reported on the effect of different policy options on reducing pollution. During the discussion that followed, EPCA was informed that the Delhi government was about to purchase 1,500 diesel buses. Sengupta's presentation made it clear that if Delhi had buses running on cleaner fuels, such as CNG, a significant reduction in pollution would follow. The capital cost of running buses on cleaner fuels was said to be less, and the per-km running cost of diesel and CNG buses was said to be the same. Sengupta also pointed out that three-wheelers running on CNG were less polluting. In the 11th meeting, EPCA discussed the possibility of replacing diesel taxis with CNG taxis by providing a subsidy. It is not possible to retrofit diesel engines with CNG kits; hence the need for new taxis. EPCA then reported this to the Delhi government. Also during this meeting, EPCA decided to request the lieutenant governor to implement the decision taken on the purchase of new buses with Euro-I norms. During the 13th meeting, Anil Agarwal discussed the need to popularize the use of CNG and change over buses to CNG on a priority bases. At this point Kiran Dhingra raised some issue of change in the Motor Vehicle Act by the Parliament to implement such a switch. Jagdish Khatter and Kiran Dhingra then made a presentation on phasing out two-stroke three-wheelers and suggested that a subsidy be provided to three-wheeler owners to purchase new vehicles retrofitted with CNG kits and that the cost of this subsidy be met through a levy on diesel and petrol (the kit was to be subsidized and additional capital cost provided through loans). EPCA decided to find out whether such kits were commercially available. Khatter and Dhingra discussed replacing taxis with new vehicles with CNG kits. During the 14th meeting (May 25, 1998) there was further talk about providing subsidies to three-wheeler and taxi owners to phase out old vehicles. A date for mandating use of CNG for three-wheelers and taxis was to be worked out in consultation with the Gas Authority of India, Ltd., and providers of CNG kits. In the interim taxis were to be allowed to operate only on unleaded petrol with catalytic converters. The government of Delhi would be requested to add new buses either on CNG or Euro-I norms only to DTC, and the possibility of subsidizing the retrofitting of CNG kits in existing DTC buses was also considered. Also, it was decided to persuade the Delhi government to register buses (both new and upon change in ownership) operated on CNG and Euro-I norms (this applied to private buses) and to phase out all buses older than eight years by 2000. In the 16th meeting (June 8, 1998), EPCA decided that any new registration or re-registration of commercial vehicles should apply only to CNG vehicles (Environment Pollution (Prevention and Control) Authority, 1998a).

EPCA's plan was converted into a mandate by the Supreme Court in its order dated July 28, 1998. As a direct result of this order, over the course of the next four years, the commercial vehicles of Delhi were gradually converted to CNG. Progress was uneven for a variety of reasons, including the availability of CNG fueling stations, parts, and buses, and the reluctance of various key players at critical points. There were rough patches. When bus operators who had failed to order CNG buses or convert to CNG were not allowed to operate, the public expressed its concern through strikes and protests. And various high-level commissions and committees made last-minute efforts to head off the Supreme Court's orders. The court refused to reconsider its basic decision, however, and as a result had to referee such issues as which sectors had priority access to CNG supplies in case of shortages. Non-complying diesel buses were subject to fines, and by December 2002, all diesel city buses converted to CNG.

Conclusion

Most critics of the Supreme Court's role in phasing in CNG have focused on its order dated July 28, 1998. This is the principal piece of 'evidence' that the court was engaged in activities that went beyond its judicial mandate and appropriate role in Indian political life.

Our review of the record shows that the policies ordered by the court, including those in the July 28 order, were in fact suggested by EPCA, a representative body of the central government. Furthermore, EPCA's policy recommendations either derive from or build directly on policies formulated and announced by the Delhi government and by MoEF.

The court did force the government to carry through its announced policies when the government retreated or wavered. But our extensive review of the process of policy evolution finds little evidence that court devised the policies themselves.

The pattern observed in Delhi—in which the agencies of elected government announce policies, then withdraw them until forced by the court to implement them—suggests that the road will be similarly rocky for the eight other Indian cities that have announced the need to address their urban air quality and currently look to the Delhi experience for guidance: Ahmedabad, Kanpur, Lucknow, Pune, Sholapur, Hyderabad, Chennai, and Bangalore. The Supreme Court proved itself to be sufficiently above the day-to-day pressure of politics that it could stand firm

on the remedies recommended to it by EPCA, and at the same time it made some reasonable, short-term adjustments to adapt to various realities during the difficult transition to CNG. This combination of steadfastness and adaptability helped ease a complicated political and economic shift. It is currently unknown whether the high courts for those cities are capable of playing the same role as the Indian Supreme Court did for Delhi, or what the path of that policy process will be.

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Appendix 1: Policies to Relocate Category H Industries

1990. A revised master plan for Delhi is approved by the central government. The plan repeated prohibitions contained in the 1962 plan and gave them and new industries located in defiance of the ban three years to shift. The list of industries prohibited in the 1962 master plan was expanded and included under the title 'Hazardous and Noxious Industries' as Section A in the H-category. Industries already identified as 'undesirable' in 1962 were listed in Section B in the H-category, under the category 'Heavy and Large Industries'. No new industries of these types or the 81 types of 'Extensive Industries' included in the F-category were henceforth to be allowed in Delhi. Existing heavy and large industries were to be shifted out while existing F-category industries in inappropriate areas were to be relocated.

July 8, 1996. The Supreme Court orders 168 hazardous industrial units in Delhi to shut down and relocate by November 30, 1996, and asks the Delhi Pollution Control Committee (DPCC) to publicize this order (*Business Standard,* September 7, 1996).

October 10, 1996. The Supreme Court orders the closure of 39,000 illegal industrial units operating in residential areas by January 1, 1997, and the closure of 46 hot-mix (asphalt) plants by February 28, 1997 (*Tribune,* October 10, 1996).

November 1996. The Supreme Court orders the closure of 243 brick kilns and their relocation from Delhi by June 30, 1997. It also orders the closure of 21 arc-induction furnaces by March 31, 1997 (Ministry of Environment and Forestry, 1997).

November 30, 1996. The Supreme Court declines the central government's plea to defer the November 30 deadline to relocate 168 hazardous industries (*Indian Express,* November 30, 1996).

Appendix 2: The Dhingra Affidavit

Fuel quality. Sulfur content in diesel supplied to Delhi be reduced to 0.25% sooner than had been mandated by the Supreme Court. Encourage the use of CNG and propane by increasing the number of CNG dispensing stations, providing incentives to set up CNG conversion kit centers, providing sales tax exemptions and soft loans for installing CNG conversion kits (this policy was already under consideration), and asking the Ministry of Petroleum to allow propane use by motor vehicles.

Vehicular technology. Implement mass emissions standards proposed for the year 2000 in Delhi as soon as possible, without dilution.

Pollution from in-use vehicles. Enforce tailpipe emissions standards by increasing the number of inspection centers and inspectors, stiffening the penalties for vehicles in violation, and controlling the overloading of vehicles that pass through Delhi. In the absence of a technological solution to control pollution from existing vehicles, restrict their availability and use.

Three-wheelers. Go beyond existing suspension of registration of new three-wheel vehicles between May 1996 and November 1996 to restrict the number of petrol and diesel three-wheelers to the number that had been registered by May 1996, encourage the registration of CNG and propane three-wheelers, phase out 10-year-old three-wheelers by 2000, and provide incentives to existing three-wheel permit holders to replace their vehicles with CNG vehicles.

Taxis. Allow no vehicle older that two years to be registered, phase out 10-year-old taxis by 2000, cut fares of diesel taxis to encourage drivers to use petrol and CNG vehicles, fix fares of CNG taxis on the basis of petrol costs (along with other incentives) to encourage CNG taxis, ban six- to eight-seat three-wheelers *(phat-phats)* from the city, and encourage registration of six- to eight-seat taxis.

Other vehicles. Ban registration of army disposable vehicles, army and government auctioned vehicles, and commercial goods vehicles older than eight years, phase out trucks older than eight years by 2000, and require annual inspection and certification until older trucks are phased out. Ban the practice of altering a vehicle by replacing its engine with an old one.

Buses. Retire after eight years all buses other than those operated by the Delhi Transport Corporation. This apparently was already the case with stage carriage buses but not with contract carriage buses. Phase out buses older than eight years by 2000 and improve the design of buses (low floors, automatic doors, automatic transmission, power steering, and rear engines) to increase safety and comfort. The affidavit suggested, however, that DTC not be asked to retire its buses after eight years, as this would disrupt public transport.

The affidavit added that before the Delhi administration could impose restrictions on in-use vehicles, the Central Motor Vehicles Act of 1988 and Central Motor Vehicles Rules of 1989 would need to be amended, and powers would have to be delegated to the administration of the National Capital Territory under Sections 5 and 20 of the Environment Protection Act.

Public transport. The affidavit cautioned that public transport had to be made more effective before the government could place any restrictions on private cars and scooters, such as keeping one-third of the registered vehicles off the road on a particular day. To make public transport more effective, the affidavit called for a mass rapid transit system and, until it could be built, more buses. The affidavit informed the court that the government was also considering providing electric trolley cars and CNG and battery-operated buses.

Restrictions on private vehicles. The affidavit advised that a freeze on the registration of private cars would be hard to implement, since owners would start registering their cars in neighboring states, where vehicles were not even required to have catalytic converters. To make the ban effective, all the neighboring states would have to adopt similar policies. If the government still wanted to restrict the registration of cars, it was recommended that the government restrict the manufacture and sale of vehicles that did not meet the 2000 emissions norms but grant registration to vehicles operating on CNG. Also, the government could place restrictions on the manufacture of two-stroke vehicles to force the industry to hasten technological advances. Finally, the government could extend the requirement for catalytic converters in new vehicles to cover the entire capital region.

Appendix 3: Instructions of Delhi's Lieutenant Governor, August 11, 1997

1.Buses

a. Buses are to be phased out in the following manner:

By March 31, 1998 > 15 years

By March 31, 1999 > 12 years

By March 31, 2000 > 10 years

By March 31, 2001 > 8 years

b. Registration of new buses:

By April 1, 1998, 1996 mass emissions norm compliant

By April 1, 1999, 2000 mass emissions norm compliant

2. Three-wheelers

c. Three-wheelers are to be phased out in the following manner:

By March 31, 1998 > 15 years

By March 31, 1999 > 12 years

By March 31, 2000 > 10 years

d. Replacement of phased-out vehicles by the following:

After April 1, 1998, with four-stroke three-wheeler petrol engine with catalytic converter 1996 mass emissions norm compliant or three-wheeler vehicle operating on alternative fuels or four-wheeler petrol engine with catalytic converter 1996 mass emissions norms or four-wheeler vehicles operating on alternative fuels.

After April 1, 1999, with four-stroke petrol engine with catalytic converter 2000 mass emissions norm compliant or vehicle operating on alternative fuels or with four-wheeler petrol engine with catalytic converter 2000 mass emissions norm or four-wheeler vehicles operating on alternative fuels.

3. Taxis

e. Taxis are to be phased out in the following manner:

By March 31, 1998 > 15 years

By March 31, 1999 > 12 years

By March 31, 2000 > 10 years

f. Registration of new taxis:

By April 1, 1998, 1996 mass emissions norm compliant or vehicle operating on alternative fuels

By April 1, 1999, 2000 mass emissions norm compliant or vehicle operating on alternative fuels

By April 1, 2000, only vehicles operating on alternative fuels

Appendix 4: Development of Policy to Retire 15-Year-Old Vehicles

January 17, 1997. Delhi administration is reported to be considering banning the registration of old vehicles (*Times of India,* January 17, 1997).

October 1997. Notification is issued by the Delhi administration to phase out commercial vehicles in stages. Those older than 15 years are to be phased out by March 1998; those older than 12 years, by March 1999; those older than 10 years, by March 2000; and all medium and heavy vehicles older than 8 years, by March 2001 (Tiwari and Roychodhury, 1998).

February 4, 1998. With Parliamentary elections and protests looming, the Delhi government withdraws the initiative to retire 15-year-old vehicles by March 1998 and says it will 'take an objective decision later' (Katariya and Mahapatra, 1998).

February 13, 1998. An article blames a strong and organized lobby of three-wheeler unions, taxi drivers' unions, and commercial vehicles unions for the rolling back of an important pollution control decision by the Delhi Transport Ministry. The government is reported to have scrapped its plan to remove 15-year-old vehicles from the roads, adding that 'the fitness of vehicles should be the criterion not old vehicles as these can be fit and non-polluting'. However, none of the vehicles could pass the fitness tests (*The Pioneer,* February 13, 1998).

February 19, 1998. Private bus operators protest against other commercial vehicle associations that have opposed banning vehicles older than 15 years. Ved Pal Mallik, general secretary of the Bus Operators Welfare Association, argues that it is very expensive to install a new, less-polluting engine on a vehicle that is 15 years old and states, 'most operators would prefer phasing out these vehicles'. He also argues that the resistance to phasing out old vehicles is politically motivated and will not benefit any of the operators, although small operators could suffer from a phase out (*Times of India,* February 19, 1998).

March 27, 1998. EPCA urges the Delhi lieutenant governor to immediately implement the government's plan to phase out 15-year-old vehicles (*The Hindu,* March 28, 1998).

July 28, 1998. On EPCA's recommendation, the Supreme Court issues an order to phase out commercial vehicles older than 15 years by October 2, 1998. In reference to the Supreme Court's order, it is reported that pressure from taxi, bus, and auto operators and drivers had

dissuaded the state government from carrying out its plans to phase out 15-year-old vehicles (*Telegraph,* July 29, 1998).

August 1, 1998. In a move attributed to upcoming assembly elections and the threat of a strike by transporters just prior to the February vote, the Delhi government plans to file a review petition before the Supreme Court asking for more time to phase out all commercial vehicles older than 15 years (*Times of India,* August 1, 1998).

September 22, 1998. The Supreme Court relaxes its October 2 deadline banning 15-year-old commercial vehicles. The new date is December 31, 1998. The court also rules that commercial vehicles over 20 years old will be banned starting October 2, 1998, and 17-year-old vehicles will be banned starting November 15, 1998. The court extends these rules to vehicles entering from other states. The deadline is relaxed after Solicitor General Santosh Hegde argues that vehicle owners might have a hard time switching over to new vehicles (*Indian Express,* September 23, 1998). The court also orders a ban on commercial vehicles older than 15 years from entering Delhi after December 31, 1998. In an editorial, the Center for Science and Environment attributes the government's request for a delay to political motives: 'The ruling BJP party does not want to earn the ire of those who would be affected by the Court order and wants to dump the problems on the next government' (*Business Standard,* September 22, 1998).

October 2, 1998. About 9,350 20-year-old commercial vehicles go off the road, and thousands of transporters protest in a demonstration organized by the Federation of Transport Unions Congress. Devinder Puri, general secretary of the federation, states that 300,000 families are affected because of Delhi government policies and adds that more than 2 million city transporters have decided not to vote for BJP in the upcoming Assembly elections. Pawan Arora, convener of the federation, says that more than 1 million people will be unemployed because of the vehicle phase-out (*Hindustan Times,* October 3, 1998).

October 29, 1998. The Supreme Court rejects a plea by the Delhi government and declines to extend the November 15 deadline for retiring vehicles more than 17 years old. Solicitor General Santosh Hegde tells the court that the banning of 20-year-old and older vehicles has already been implemented.

December 1, 1998. The Supreme Court is informed that the order banning all commercial vehicles 17 years old and older is being ‘fully implemented’ (*The Hindu*, December 2, 1998).

January 1999. The Delhi government is said to have devised an incentive scheme for phasing out vehicles older than 15 years, with exemption from the 8% sales tax and a subsidy of 4% on the interest rate of the loan (Environment Pollution (Prevention and Control) Authority, 1998b).

Tables

Table 1: Measures for In-Use Vehicles

Measures	*Agency*	*Timeframe*
Taxis to be phased out in the following manner: By 3/31/98 > 15 years By 3/31/99 > 12 years By 3/31/00 > 10 years	Govt. of National Capital Territory of Delhi (GNCTD)	3/31/93–3/31/00
Ban registration of army disposal vehicles, government-auctioned vehicles, commercial goods vehicles (i.e., diesel trucks), and passenger vehicles (i.e., buses and taxis) beyond a specified life span[21] and make renewal of permits contingent on passing emissions control inspection	Transport Dept.	12/31/97
Ban alteration of vehicles by replacing petrol engines with diesel engines	Transport Dept.	12/31/97
In the absence of technological breakthrough on conventional two-stroke engine, consider phasing out two-stroke two- and three-wheelers	—	—
Prevent overloading of passengers on buses and goods on trucks: (i) introduce high-capacity buses; (ii) enforce law relating to overloading of trucks	—	—
Establish automated testing stations to check vehicles for pollution	—	—

[21] For buses the recommended age is apparently four to five years. The white paper states that two-thirds of the DTC fleet is older than that, and some buses are even older than eight to ten years.

Table 2: Measures for Traffic Management

Measure	*Agency*	*Timeframe*
Improve traffic management of most-polluted intersections and areas in Delhi with synchronized signals, area traffic control, and central control room for diversion of traffic based on air quality monitoring data	Central Road Research Institute, Institute of Road Traffic Education, CPCB	
Provide bicycle tracks and increase use of existing tracks	Traffic Police	4/1/98–4/1/99
Display halting times at major traffic intersections	Traffic Police, Petroleum Conservation Research Association	4/1/98
Restrict the driving of goods vehicles during the day by further tightening of regulations	Traffic Police	12/31/97
Coordinate urban and suburban mass transit rail system on the ring rail with the road transport system	Railways, GNCTD	12/31/99
Construct road bypass for Delhi	GNCTD, Public Works Dept. (PWD)	—
Construct expressways	Ministry of Urban Affairs and Employment MoUAE), GNCTD, PWD	12/31/99–2010
Metropolitan Rapid Transport System[22] implementation and integration with Regional Rapid Transport System	MoUAE, GNCTD, National Capital Region Board	—

[22] In 2003, after many delays, the first segment of the Mass Rapid Transit System became operational. In early 1998, it was reported that the plan was still not complete, three decades after being proposed. The main inhibiting factor was the huge cost, and at that time it appeared that the government had abandoned the project (*Rashtriya Sahara*, February 1, 1998).

Table 3: Measures on Fuel Quality and Types

Measure	*Agency*	*Timeframe*
Increase supply of low-sulfur diesel (0.25%) and further lower sulfur content of diesel.[23]	Ministry of Petroleum and Natural Gas (MoP&NG), Oil Companies	4/1/99
Increase use of premixed fuel-oil: (i) expand premixed fuel outlets by 50% by 12/1/97; (ii) ban supply of loose 2-T oils at petrol stations and service garages; (iii) direct that two- and three-wheelers obtain fuel only from premixed fuel outlets	MoP&NG, Oil Companies, Association of Indian Automobile Manufacturers (AIAM)	12/1/97
Prevent fuel adulteration	Food and Civil Supplies Dept, MoP&NG	Regular
Promote alternative fuels: (i) await outcome of pilot project on the use of propane in auto-rickshaws; (ii) set up additional on-line CNG stations (MoPNG with cooperation of the local authority); (iii) introduce buses with dedicated CNG engines and cars running on bi-fuel mode	GNCTD, Ministry of Science and Technology (MoST), MoP&NG, GAIL, New Delhi Municipal Council, Municipal Corporation of Delhi, Delhi Development Authority, Land and Development Office	12/31/98
Expand outlets supplying unleaded petrol in entire national capital region and trunk routes	MoP&NG	4/1/98

[23] On August 14, 1997, diesel with 0.25% sulfur content was introduced in some outlets in Delhi (*Business and Political Observer*, January 1, 1998).

Table 4: Comparison of EPCA Plan with MoEF White Paper and Dhingra Action Plan

EPCA Proposal	*White Paper, Action Plan*
4/1/01: Augmentation of public transport to 10,000 buses from the existing 6,600 buses	Action plan discusses increasing buses by 3,000. White paper discusses introducing high-capacity buses but does not specify numbers.
9/1/98: Elimination of leaded petrol from Delhi	White paper discusses expansion of outlets in the entire national capital region but not elimination.
12/31/98: Installation of premixed fuel dispensers for supply of only premixed petrol in all petrol stations to two-stroke engines	White paper discusses expansion as well as ban.
3/31/00: Replacement of all pre-1990 autos and taxis with new vehicles using clean fuel	White paper discusses phasing out pre-1990 taxis by March 31, 2000, and possibly all two-stroke three-wheelers but not replacement with clean fuel. August 1997 plan discusses phasing out all pre-1990 autos and taxis by March 31, 2000. It discusses replacement of autos initially with those that are 1996 mass emissions norms compliant or running on clean fuel and later with 2000 mass emissions norm compliant or running on clean fuel and replacement of taxis eventually with those running on clean fuels. Dhingra plan discusses providing incentives to autos and taxis to convert to clean fuel.
3/31/01: Replacement, with financial incentives, of post-1990 autos and taxis with new vehicles on clean fuel	Neither the white paper nor the August 1997 plan discusses replacement of post-1990 autos and taxis. August 1997 plan discusses upgrading taxis and not registering taxis more than 2 years old. Dhingra plan discusses providing incentives to existing autos and taxis to convert to CNG.
4/1/00: Ban on operating buses more than eight years old except on clean fuels	White paper discusses the ban (possibly including buses more than 5 years old) but not clean fuel. August 1997 and Dhingra plan discusses phasing out buses more than 8 years old by April 1, 2001, but not clean fuel.
3/31/01: Gradual conversion of entire city bus fleet (DTC and	White paper discusses increasing use of CNG in buses. August 1997 plan

private) to CNG	discusses upgrading the bus fleet and registering initially 1996 mass emissions compliant buses and then 2000 mass emissions compliant.
3/31/00: New interstate bus terminal to be built at north and southwest borders of national capital region to stop entry of interstate buses	Mentioned in the Dhingra plan but not in the white paper.
3/31/00: Gas Authority of India Ltd. to ensure availability of CNG by increasing city's CNG supply outlets from 9 to 80	Mentioned in white paper but without numbers.
6/1/99: Two independent fuel-testing laboratories to be established for monitoring fuel quality specifications and adulteration	White paper discusses preventing adulteration without any specific plans.
Immediate: Automated inspection and maintenance facilities to be set up for commercial vehicles in coordination with private sector	Mentioned in white paper and Dhingra plan.
4/1/00: CPCB and DPCC to set up new air quality monitoring stations and strengthen existing air quality monitoring stations for critical pollutants, including benzene	New measure.