Centre for Science and Environment joined hands with Indian Council for Medical Research and Indian Medical Association to organize a dialogue with the noted doctors – (respiratory physicians, cardiologists, pediatricians, oncologists), the air quality regulators, and health experts to track the newer concerns over health risks of polluted air.

This well attended gathering initiated a conversation involving the Secretary, Department of Health Research and Director General, Indian Council of Medical Research, Secretary, Ministry of Environment and Forests, Doctors of Indian Medical Association, international experts and EPCA. The noted doctors from All India Institute of Medical Sciences, Sitaram Bhartia Institute of Sciences and Research, Vallabhbhai Patel Chest Institute, Chest Research Foundation, Pune, Heart Care Foundation Post Graduate Institute of Medical Education & Research, Chandigarh and international experts.

Doctors have made a strong plea for integration of health information into decision making on air pollution control.

**Stunning evidences**
The dialogue also brought to light new dramatic evidences of how much we inhale while traveling in Delhi. Researchers from the University of California, Berkeley, have traveled in auto-rickshaws during the months of February and May on a fixed route in South Delhi in 2010. They measured the actual particle concentration inside the vehicle while moving with the traffic. They found commuters breathe far more harmful particles inside vehicles while traveling compared to the ambient concentration. The PM2.5 concentrations inside vehicles can be 1.5 times higher than the surrounding background air and ultra-fine levels about 8.5 times higher. In fact the short-term peaks during travel can go above 1000 microgramme per cum – nearly 16 times the daily limit. This indicates all road users and those living close to roads are at serious health risk.

This is further supported by the estimates of Health Effects Institute that about 55% -- more than half of Delhi’s population live within 500 meters from arterial roads in Delhi that is the direct influence zone.

This shifts focus to how much we inhale. This approach will be important for health risk assessment in the future to guide action. Equally important will be concern over multiple pollutant crisis, vulnerability of children and poor, increased linkages between non-communicable disease burden and air pollution for second generation environmental health risk management in Indian cities. This has emerged from the review of the health studies on air pollution by the Centre for Science and Environment.

**What has CSE review revealed?**

- **Indian cities have generated valuable local health evidences**: Over the last two decade consistent efforts have been made at local levels to assess the health impacts of air pollution. More than 70% of the studies have been done during the decade 2000-11 that also coincides with the growing unrest in major cities over the polluted air and growing health scourge.
These studies have generated very valuable data to drive action. There are a few studies by the international agencies including the World Bank and Health Effect Institute.

- **Majority of India studies done by the doctors themselves:** Most stunning finding is that most of the studies in India have been carried out by the doctors themselves – who understand our health and are concerned from what they are observing from their clinical experiences. This is a very encouraging trend that makes doctors the most important stakeholder. Their evidences have helped to move the policies. 53% of the studies have been done by the doctors themselves; 15% doctors along with other researchers and 1% doctors along with the municipal corporations.

- **Health studies published almost every year in major cities during the last decade:** the community has also been quite prolific. In the cities like Delhi, Kolkata, Hyderabad studies have been published almost every year during the last decade.

- **Both mega cities as well as smaller cities have tracked health effects of air pollution:** The mega cities that were also the most polluted during the eighties and nineties took the lead to study health effects. But as the pollution crisis spread to other cities more local level studies have happened in smaller cities and towns as well – Bikaner, Amritsar, Varanasi, Puducherry, Mandi-Gobindgarh, Kanpur etc. This is an important development.

- **Studies keep pace with the changes in air quality trends – more pollutants assessed:** While studies in the eighties were predominantly focused on suspended particulate matter and sulphur dioxide, the key pollutants of concerns then (making up for 33% of total studies), the basket has widened in the in the subsequent years to include other pollutants – finer particulates, NOx, ozone, VOCs and PAH etc. This clearly shows that Indian health community is aware and responding to the multi-pollutant crisis.

- **Looking beyond lungs to other health effects:** Studies are dominated by the focus on respiratory symptoms. But in the recent years they have begun to include more diverse health end points – cardiac cases, cancer, mutagenic effects, etc. Though this investigation in India is still very nascent global studies have shown more robust linkages with a wide range of health endpoints – diabetes, stroke, hyper tension, effects on brain, effects on fetus etc.

- **Doctors have focused on the vulnerable sections** – Studies have put a spotlight on the most vulnerable in our cities -- urban poor, children, elderly and those suffering from asthma, respiratory and cardiac ailments etc.

- **Children and air pollution:** Children are especially vulnerable to urban air pollution. This is serious as the future urban growth will see more young people in our cities. In Bangalore children from heavy traffic region and low socioeconomic classes had much higher prevalence of respiratory symptoms. A 2010 study of Chittaranjan National Cancer Research Institute (CNCI) shows respiratory symptoms in 32% of children examined in Delhi, in contrast to only 18.2% of the rural children. Lung function reduced in 43.5% school children in Delhi as compared to 25.7% of control group. PM10 level associated with restrictive, obstructive and combined types of lung function deficits. Also Attention-deficit hyperactivity disorder (ADHD) has been noticed in children chronically exposed to high level of vehicular pollution (CNCI 2010). ADHD 4.1 times more prevalent among school children of Delhi .... PM10 was positively and strongly associated with ADHD prevalence. Air pollution even affects vitamin D status of infants and toddlers in Delhi (2002). Etc.

- **Serious concern over growing burden of non-communicable diseases in India and environmental health risks:** Indian Council of Medical Research (ICMR) has assessed the disease burden of non-communicable diseases. Also according to the recent estimates from the the World Bank non-communicable diseases impose the largest health burden in India. In terms of the number of lives lost due to ill-health, disability, and early death NCDs accounts for 62% of the total disease burden. NCDs largely affect middle aged and older populations, the groups growing the fastest, which will lead to future increases. Cardiovascular diseases cancer, respiratory Diseases, and diabetes are the major NCDs in India. A range of factors including genetic, and lifestyle may contribute but as a public policy the role of the environmental risks should be minimised.
Globally, studies are being carried out to understand the link between non-communicable diseases and air pollution including hypertension, stroke, diabetes etc. Toxic PAH is also known to affect the fetus. India needs to strengthen this line of enquiry.

• **Worries about growing toxic risk:** Given the fact that endpoint of all toxic risk is cancer, all environmental risk factors should be minimized. This is particularly serious in India that reports overall more than 700,000 new cancer cases and National Cancer Control Programme (NCCP) forecast that by 2026, more than 1.4 million people will be falling in the grip of the disease. NCCP has listed greater exposure to environmental carcinogens as one of the most important reasons. Though there is no one but the mitigation strategy must reduce environmental risk from all factors – air pollution is one of the important factors. Numerous studies in the West assessed the causes such as genetic susceptibility, environment factors and lifestyle. Found overwhelming influence of environmental factors. In one of the earlier studies of the Department of Preventive Oncology of Tata Memorial Centre in Mumbai, had found incidence of cancer in the city’s slums very high. Air pollution plays a role in enhancing this risk. Impact on urban poor can be quite devastating.

Also India is motorising at a level of technology and fuel quality that can compound health risks. There are special concerns about growing use of poor quality diesel. Several international and national health agencies have also reviewed relevant data on diesel exhaust and have classified either the exhaust mixture or the particulate component as probable human carcinogen. Diesel exhaust includes a large number of toxic compounds that cause cancer, reproductive abnormalities and other toxic impacts.

• **More interest in how much we inhale.** Researchers are looking not just at the effect of the ambient air quality – which is the quality of the surrounding air – but at the actual exposure – how much we inhale in proximity to a source like traffic. Nearly 60% of the studies are traffic exposure that include studies on occupationally exposed group like the traffic policemen, petrol pump worker and also roadside. These are the first indicators of how much we are exposed while traveling. But now we have more evolved studies from University of California and Health Effect Institute that have estimated the actual exposure.

Such evidences have serious implications for the road users, public transport users, walkers and cyclists.

• **Special concern over traffic pollution:** Cities have many sources of outdoor air pollution and all require mitigation action. But vehicles pose a special challenge. In the future cities will witness rapid increase in vehicular traffic. Cities are not expected to locate new industry or power plants inside the city. Vehicular emissions contribute to significant human exposure. Pollution concentration in our breathe is 3-4 times higher than the ambient air concentration.

• **International agencies have tracked the effect of polluted air on illnesses and premature deaths in Indian cities.** The US based Health Effect Institute study in Delhi estimates approx.0.15% to 0.17% increase in mortality per 10 μg/m3 PM10 (~0.3%/ 20 μg/m3). In Delhi where overall deaths are 100,000 annually even this increase can translate into 3000 additional premature deaths annually due to air pollution related diseases. Similar studies have been carried out in Chennai.

**Studies of massive scale carried out in other parts of the world prove beyond doubt that air pollution has definite and insidious health effects:** Studies of this nature and scale have not been possible in India yet.

**Act now to reduce exposure and toxic risk**

India cannot afford to ignore the ominous evidences any more. There is enough evidence for us to act urgently to reduce the public health risks to children, elderly, poor and all of us. India will have to take action now to reverse the trend of short term effects as well as the long term toxic effects.

Stringency and pace of action should be guided by the health risks consideration. The ongoing preparation for the 12th five year plan, expansion of the air quality monitoring programme, city initiatives on clean air action plans, framing of the post-2010 emissions regulations for vehicles
are the opportunities to integrate health criteria to make air quality management more relevant to public health.

**Set targets to meet air quality standards in cities:** Enforce National Ambient Air Quality Standards. The quantum of central assistance to states for implementation of the city action plan for clean air should be linked with the progress in implementation of pollution control measures. For this verifiable benchmark and monitoring system should be developed.

**Strategy for vehicular pollution control:** It is unacceptable that while health risks are increasing the post-2010 emissions standards roadmap for vehicles have not been decided yet. Quickly phase in the tighter emissions standards of Euro V/VI nationwide by the end of 12 five-year period. Ultra-low sulphur diesel along with advanced emissions control technologies should be implemented nation-wide. Simultaneously improve public transport, promote walking and cycling, and reduce dependence on cars.

**Account for the health cost in decision making:** A better valuation of acute and chronic illnesses linked to air pollution needs to be carried out in India and integrated with decision making. Other governments integrate such criteria. This justifies the investments. A few studies that have emerged in India assessing the cost associated with health impacts but they have rarely been able to influence policy decisions, even though they show high economic costs of pollution.

**Scale up health studies and track health effects on an ongoing basis** to inform air pollution mitigation policies. Support medical and other health research institute to initiate health studies on air pollution.

**Need strong baseline data on diseases and deaths as well as robust protocol to support health risk assessment:**

**Air quality monitoring to enable and support health assessment:** Air quality monitoring should be well designed to enable such studies.

**Build public information system on daily air quality with health advisories:** Globally, governments have developed air quality index to inform people about the daily air quality through easily understood air quality bands and issue health advisories for those who are especially those who are vulnerable to air pollution. Some governments even frame pollution emergency measures to reduce the pollution peaks to more tolerable level.