FOREWORD

The *National Conference on Health and Environment* was organised by the Centre for Science and Environment (CSE) from July 7 to 9, 1998 at the India International Centre, New Delhi. The conference was timely as issues of environmental health are gaining momentum the world over. This is the first time that such a conference on environmental health was organised in India and its purpose was not just to review the state-of-the-art research in this area but also to build a network of people working in the field.

The presence of the Vice President of India, Shri Krishan Kant, Minister of Environment and Forests, Shri Suresh Prabhu, and the participation of over 80 scientists and environmentalists turned the event into a memorable one. The role of Dr V Ramalingaswami, CSE's chairperson and the doyen of India's health scientists, and 13 eminent people who chaired various sessions enabled us to pilot the conference in a way to bring out the common wisdom of the conference captured in its Statement of Shared Concern.

The conference attracted some of the finest medical scientists, public health specialists, environmentalists and educationists from India and some from abroad. Of the 93 eminent people who had agreed to make paper presentations at the conference, 82 were present in 11 sessions. These sessions were water pollution and health; environmental management of disease vectors; environmental toxins and health; ambient air pollution; environmental changes and health with special reference to the effects of deforestation on women's work burden, and aerobiology; indoor air pollution and health; health effects of lack of sanitary and waste disposal facilities; industrial accidents and health; environmental changes on nutrition; radiological pollution and health; and, noise pollution and health.

We are grateful to the members of our health advisory committee who helped us to identify the participants and the issues to cover in the conference. The following eminent scientists were part of the advisory committee: V Ramalingaswami, National Research Professor and Conference Chairperson; S K Chhabra, Vallabhai Patel Chest Institute, New Delhi; N Kochupillai, All India Institute of Medical Sciences, New Delhi; V Kochupillai, All India Institute of Medical Sciences, New Delhi; P K Ray, Bose Institute, Calcutta; V P Sharma, Malaria Research Centre, New Delhi; Mira Shiva, Voluntary Health Association of India, New Delhi; and, C K Varshney, Jawaharlal Nehru University, New Delhi.

The Statement of Shared Concern is an outcome of the comments received from the Chairperson of the conference, the Chairs of various sessions, and from the participants. In addition to the papers that discussed the scientific issues, the conference emphasised policy issues in environmental health. The chairpersons of various sessions were requested to document the key policy recommendations that emerged in their sessions. Subsequently, a discussion including the chairpersons, Dr V Ramalingaswami and CSE's director was organised on July 8 evening at the India Habitat Centre, New Delhi. The recommendations were sent to all the participants for their final comments. Dr V Ramalingaswami as well as all the 13 chairs of various sessions approved the statement. The statement has gone through several stages of editing, redrafting, expansion and modification. We are really grateful for the perseverance and tolerance shown by our conference chairperson, the chairs of various sessions and participants.

We are hopeful that the Statement of Shared Concern issued by the conference will open up debate among grassroots workers, researchers and policy makers so that appropriate policy formulation and action will follow.

Priti Kumar
Coordinator
Health and Environment Team
Centre for Science and Environment

Inaugural speech of

SHRI KRISHAN KANT

Hon'ble Vice-President of India
on Tuesday, July 7, 1998, India International Centre, New Delhi

Sometime ago, when Shri Anil Agarwal approached me to address this Conference, the details of the theme "Health and Environment", struck me as being too specialised. At the same time, given my old acquaintance, I could not turn down Anil's invitation.

Today, I wish to focus on some basic issues underlying the problems of environment and health, namely, (1) the question of technology choices, (2) the problem of urbanization, and (3) the need for changing human habits, attitudes and behaviour patterns for better environment and health conditions.

The Question of Technology Choices

All living systems and production activities generate wastes. These wastes then enter the natural ecosystems where nature's cycles break them down, thereby enabling the ecosystems to assimilate and absorb them. Hence, the disposal of wastes can be managed in an ecological friendly manner so long as the natural restorative cycles are not overburdened.

It is said that the quantum of industrial production in the last fifty years has exceeded all the industrial production in human history before then. This has created so much waste and environmental pollution that the natural restorative processes are unable to cope with it. Another unique aspect of industrial production and society based on it in this period is the bulk manufacture of synthetic chemicals. Nature is virtually defenceless against these hitherto unknown substances. It is difficult for natural cycles to decompose them and hence they remain in the natural ecosystems for long periods. In our technological arrogance, we have turned against Mother Nature herself.

Slow but steady exposure to these new substances affects us too. Many of them are toxic or carcinogenic. Very often now, strange, unheard-of diseases creep up on us silently. We discover them only at a stage when no remedies are possible. Another threat is that of chemical imbalances in the human body leading to diseases like cancer and neurological disorders. In India, very often even doctors fail to recognize the symptoms of these diseases. The treatments, if any, of such diseases are extremely expensive. Hence, the poor are likely to suffer the most from the ecological changes that are taking place.

The issue, therefore, is one of making prudent choices: What all should we

Conference Chairperson Dr V Ramalingaswami, Vice-president Shri Krishan Kant and CSE Director Shri Anil Agarwal (left to right) at the inaugural session of the conference.

manufacture and how much should we produce? We certainly need to think of alternatives to such products that cannot be decomposed by nature or those that will eventually end up poisoning us. These choices can be determined by societal, and hence our collective attitudes to nature and living beings. It should be possible to use some of the instruments of environmental management, such as, public education, research, economic measures and legislation to create preferences for safer processes and products. The surest way to ensure that prudent choices of technologies, processes and products are made, is to ensure that the potential victims of any likely disaster or pollution hazard have the most significant say in making the choice. This requires transparency in decision-making and participation of the potential victims in the decision-making process. Such participation through transparency in decision-making strengthens self-governance and provides the key not only for a greener, safer environment and good health, but also for all-round progress.

Our urban population is growing to an enormous size, the number of urban centres is increasing rapidly and the sizes of cities are exploding. If the UN projections on India's urbanization are to be believed, nearly three-quarters of our population will be living in towns and cities by the middle of the next century. As you are all aware, our cities are bedeviled by air pollution, poor municipal services and infrastructure. Even as we are unable to cope with the present set of urban problems, we have to plan for an unprecedented urban growth in the next century.

I would like to share with you fragments of a debate that took place in 1945 between Mahatma Gandhi and Jawaharlal Nehru. They were discussing the kind of India that should be built after independence. It may provide some useful insights when planning for India's future urban growth. In a letter to Pandit Jawaharlal

Nehru, in October 1945, Mahatma Gandhi prophesized, and I quote: "I am convinced that if India is to attain freedom and through India the world also, then sooner or later the fact must be recognised that people must have to live in villages, not in towns and palaces. Crores of people will never be able to live at peace with each other in towns and palaces. They will have then no recourse but to resort to both violence and untruth." "I hold that without truth and non-violence there can be nothing but destruction for humanity. We can realise truth and non-violence only in the simplicity of village life…."

Jawaharlal Nehru contested some of the points of Gandhi including truth versus untruth and non-violence versus violence but came to write and I quote: "There Is today in the world a tremendous acquisitive tendency, both in individuals and groups and nations, which leads to conflicts and wars. Our entire society is based on this more or less. That basis must go and be transformed into one of cooperation, not of isolation which is impossible." "…Many of the present overgrown cities have developed evils which are deplorable. Probably we have to discourage the overgrowth and at the same time encourage the village to approximate more to the culture of the town…."

After further talks between the two, Gandhiji summed up their agreement. Out of the four points of agreement, I give below two points that are relevant here, and I quote:-

"1. There should be equality between the town dwellers and villagers in the standards of food and drink, clothing and other living conditions. In order to realise this equality today people should be able to produce their own necessities of life i.e. clothing, foodstuffs, dwellings and lighting and water.

2. Man is not born to live in isolation but is essentially a social animal independent and interdependent. No one can or should ride on another's back. If we try to work out necessary conditions for such a life, we are forced to the conclusion that the unit of society should be a village or call it a manageable small group of people who would in the ideal, be self sufficient (in the matter of their vital requirements) as a unit and bound together in bonds of mutual cooperation and interdependence."

Gandhiji hoped to take the discussion further in his communications and talks. But his untimely death prevented the discussion from moving any further. But what we are able to see clearly is how both Gandhi and Nehru were evolving personalities. The concept of "village" evolved into a "manageable group of people" who could be self-sufficient in basic needs, not necessarily in all needs.

That incomplete discussion between Gandhi and Nehru must be resumed now in the present India and global context, keeping in mind the human experience of the past fifty years. This conference should attempt to take the unfinished discussion of Gandhi and Nehru further.

In the earlier times, cities and towns envisaged as, and consequently grew as,

centres of governance, trade, business and manufacturing. As they grew with a purpose, they managed to retain a character and preserve their communities. Yet, a city can grow organically, while preserving its communitarian character, only up to a point. Beyond that communities begin to break down and relationships become impersonal. We often seem to forget this fundamental reality.

Our unrestrained faith and reliance on technology and the consequent material uplift has resulted in creating monstrous cities, bulging and gasping for breath, virtually collapsing under their own weight. As cities become bigger and bigger and mega and may be ultra-mega, even water, the second most freely available natural resource has to be imported. Can we accept as a basic principle, when trying to determine the optimum size of a city, that human beings must not be alienated from their fellow beings? That human relations must be strengthened, not weakened. Impersonal relations lead to lack of consideration for our fellow beings. Then it is only a short step to littering the streets with garbage, dirtying the streams and tanks, polluting the air and creating various other forms of social nuisances. Gandhi and Nehru's concept of interdependence can be fostered in communities where there are functioning relationships between producers, consumers and providers of services, that should determine the size of the city. If the size of a city is too large, people often think that solving its problems is beyond their individual capabilities. They begin to feel powerless, helpless and finally alienated. Then they begin to expect that everything will be done by the government. In India, such expectations from the government by the common people are now becoming all - pervasive. Hence, if we are going to try and reduce the role of the government in our daily lives, then we will have to determine an optimum size for manageable communities.

Changing Human Attitudes and Behaviour

Among the basic factors which affect the relationship between environment and health are our habits, attitudes and behaviour patterns in daily life, in relation to work in our homes, surroundings, offices, factories, roads, hospitals, towns, cities and villages. We often ignore these key factors or give very little importance to them. Gandhiji gave them the utmost importance.

Gandhiji often said in his later years that 'either freedom is coming too late or too soon'. If freedom had come in the first decade of this century, then the problem of communalism would not have come up. For that, freedom came too late. In the thirties, he started formulating his Constructive Programme as a package of activities to orient the psyche of the people towards resolving the problems of the country by their own effort. He was not able to deepen the foundation of this programme before independence. In that sense, freedom came too early. In another sense also it came too soon. He wanted to deepen and spread the habits, attitude to constructive work which in economic terms is now begin described as social

CSE deputy director Sunita Narain presenting a memento to Vice-President, Shri Krishan Kant, at the inauguration of the conference.

capital. He was constantly adding new activities to it in the different phases of the nation's struggle. Two items in the Constructive Programme were village sanitation and education in health and hygiene. Of these, he said, and I quote:

"1. A sense of national or social sanitation is not a virtue among us. We may take a kind of bath but we do not mind dirtying the well or the tank or river by whose side or in which we perform ablutions. I regard this defect as a great vice which is responsible for the disgraceful state of our villages and the sacred banks of the sacred rivers and for diseases that spring from insanitation.

2. In a well ordered society the citizens know and observe the laws of health and hygiene..... *Mens sana in corpore sano*, is perhaps the first law of humanity. A health mind in a healthy body is a self-evident truth."

I will now share a personal experience with you, in order to elaborate upon this issue. When the plague hit Surat, the fear of its spread was capturing various cities. I was at that time the Governor of Andhra Pradesh. I suggested to the Minister of Health that we do something to clean Hyderabad city. I suggested starting with the hospitals of the city where the patients would be taken. Some people had complained to me that the Infectious Diseases Hospital was very dirty - - rather than fighting infection, it was increasing infection. The Health Minister agreed and informed the hospital authorities about my impending visit. As usual, the hospital authorities along with the minister were there to receive me with a programme of visiting the wards and planting a tree as a memory of the visit. As my car entered the hospital premises, I chanced to see dirt and garbage strewn around on both sides of the road. I immediately stopped my car, got down and started picking up

the garbage lying around with my hands and putting it at one place. The Minister and the doctors were waiting at a distance. When they saw me, some of them joined.

A few steps further, I saw a very small image of God in a walled enclosure on a cement platform, where the junior staff probably paid floral obeisance. I started picking up all the dirt around the temple and then I placed the whole pile before the temple God, where there were already a few flowers. The onlookers were dumbfounded. I understood the questions in their eyes. I told them, "God is omnipresent and knows us inside out. In the temple we surrender ourselves before God and offer all that we have to get his blessings. We cannot surrender what we do not have. We have garbage and dirt lying around us, so I have offered whatever we have. We cannot deceive God." I gave a shock to some of them. Then the pace of cleanliness increased. I did not plant any tree on that visit. I inspected the latrines, which were choked; the flush was not working; some wards were clean, others dirty. Water in the grassy ground was breeding mosquitoes. I told the minister, doctors and officials that choked and broken flushes in the latrines must be changed within two days and the leaking pipes replaced. Otherwise, when I come in next two days I will clean them with my own hands along with all of them. Fortunately, when I went on the targeted day, everything had been repaired and cleaned.

This challenge helped me to improve my surroundings in the Raj Bhavan also. I recalled that Gandhiji believed in capturing the hearts of the people, before capturing their minds. I decided to go to the area where the Raj Bhavan employees lived and check their latrines, grounds, etc. I was shocked. I found that I too had been negligent. I called a meeting of all the residents and declared myself guilty. The Governor, being the head of the state, can not be punished by any authority of the judiciary or government. So I fined myself Rs. 1000 for my dereliction of duty towards my people and the environment in the Raj Bhavan.

A committee was formed to look after the cleanliness in the Raj Bhavan area. I visited two other hospitals after two days. The stinking latrines of the government offices and the secretariat were all cleaned. The news media covered the events. Within a week, all the government hospitals were clean and shining. Newspaper reports welcomed this shock treatment. But this has to be part of our habits, attitudes and behaviour patterns. We Indians can be very efficient when there are emergent situations or projects to implement. But we relax soon after. That is why Gandhiji wanted to embed these aspects as a part of our psyche — the psyche of our families, children, youth, elders, neighbourhood, society and the nation through a Constructive Programme. I submit that besides technology and the vision of small manageable urban communities, as thought of by Gandhi and Nehru, we must seriously think of people's action plans. That is the most difficult issue. After independence an attitude has been created that the government should do every-

thing. “Since we have given them our votes, our responsibilities end here”. But that is dependence (on government), not independence.

Gandhian plans cannot be formed for cities and villages in a routine or ritualistic manner sitting in offices, without touching the inner-being of our citizens. Transforming the human being is essential for this. I would like to suggest that you try to devise an appropriate Constructive Programme or Social Capital for environmental workers and enthusiasts. It should develop habits in individuals to conserve the environment and generate a sense of community. Hygiene, cleanliness, civic sense and social discipline are as much a part of the image of a modern nation as computers, satellites, photovoltaics and genetic engineering.

I know that many of the ideas that I have expressed here for implementation are easier said than done. But I am confident that this august gathering can come up with recommendations that are innovative, yet practical and desirable for a safer and better governed environment and good health. Gandhi and Gandhian constructive workers can not be made to order or manufactured. They are the product of an inspiring challenge and a brighter vision of society. The tempo for this approach can be built up if some of your sensitive participants have come to realize that until now it is business, trade and technology that have determined the type of individuals and communities that have evolved. We have wrongly assumed that business, trade and technology are our slaves. In fact, we have become their slaves. So determined souls have to devise a new vision where technology, trade and business become our servants and are used as instruments to achieve our vision.

Valedictory speech of

Shri SURESH PRABHU

Hon’ble Minister of Enrionment and Forests, Government of India

Mr Anil Agarwal, Dr V Ramalingaswami, Dr Jacob John and friends. I really thank Mr Agarwal for organising this conference on a topic of such interest, probably the first of its kind, and for bringing together so many people from different walks of life as well as from different disciplines, to produce a cohesive plan of action. I really tend to agree with him. He wanted to know from me as to what I have understood from this conference. Let me start from there first.

I have really not understood much for a simple reason. We have been talking about looking at health from a scientific point of view. We have also been saying that there is a direct correlation between public health and environmental decay. This fact has been overemphasised now and again but now the scientific correlation has been established as a consequence of this conference. But what I really would like to be enlightened more about is that if science is a cure then what is the cause of environmental decay? For example, we are saying that pesticides are the cause of environmental decay, but some few years ago we were patting our backs to say that pesticides are a big breakthrough of science. This means we are now turning around and saying once again that science and technology is going to find solutions and cure to many of the ills that plague our public health system. If this is a fact then what is the cause is something that also needs to be explained. This would avoid my confusion. I would like to be enlightened more as an ordinary citizen of the country now responsible for the environment and forest policy of the country. This would help me to address these issues in a more straightforward way within a policy perspective.

I am very happy that we will be able to now react and also participate with the scientific community and the NGOs involved in the health sector to find solutions to this problem. Science always shows the way and the government creates a legal framework to implement scientific findings to find solutions for the people who face these problems. In India, public health is in a mess because of a variety of reasons. One of them is the effect of pesticides on public health. Even infants are facing this problem. It is, therefore, for the government to decide the right solution which does not become a cause for another environmental problem years from now. We really need to be sure that the scientific solutions we propose are durable and proved beyond doubt, and those which are not going to be debated in another seminar as a cause for public health.

Let us work together and try to find solutions to the issue. The government, as

an agent of society, is not immune to this problem but is also a party to the problem in some way. We are willing to participate with you and join hands with the scientific community to take it further. What has really gone into the conference should be taken to its logical conclusion and so let me take on the responsibility of appointing a committee of scientists which would have a time-bound task to provide a policy framework. We will give it a legal framework within the shortest possible time. I would also set up simultaneously an inter-ministerial group of secretaries who can work on the recommendations provided by the conference so that we can take them forward.

We have just set up an authority to look at environmental issues, and not just environmental issues but also little larger issues, pertaining to Mumbai. As we know there are various authorities working in the country. There is an authority for Delhi which was created by the order of the Honourable Supreme Court. But for the first time, without such mandates from a court, the government has voluntarily created an authority to deal with environmental issues for Mumbai. But what is the use of an authority? There are authorities and there are laws and regulations but how do you implement them. We have to reconcile and accept one fact that we ourselves also have to shoulder the responsibility of implementation. Let me elaborate this a little more. Chloroflurocarbons (CFC) are the principal cause of the depletion of the ozone layer and are also responsible for changing our climate. Having accepted this, the government is being called upon to implement a particular provision and take it to the logical conclusion. But without government regulation, by voluntary complaints, can we switch over from CFC to non-CFCs? Where do we get to by creating this authority or by creating that regulation when we ourselves are not willing to follow? This is one of the areas in which NGOs can join hands with the government to create awareness in the minds of people. I am sure with the scientific community on one side, NGOs on the other, and government on the third side, we will be able to deliver the type of goods that people expect.

We are now in a situation in which the government alone cannot just be called upon as a custodian of environmental concerns of the world. This is not relevant to government of India only. Governments worldwide have come to this realisation. In fact only in those countries where environmental concerns are deep-rooted in the minds of the common person, compliance with environmental laws is at its maximum. Here, instead of creating that awareness and ingraining this in the minds of people, we just work at the policy level. This will work as a superficial interaction and really not result in the type of results that we are really looking for at this late stage of development. So if we all try to blame each other we will not be able to solve the problem that needs to be solved. Let us work together to educate and create awareness in the minds of people and that is the only way, everlasting way, that solutions can be found which do not not lead to further problems as we have seen in the past.

HIGHLIGHTS OF THE CONFERENCE

This conference aims to usher in a new era of environmentalism, firmly based in science and with a focus on community participation and municipal governance.

V Ramalingaswami, *CSE chairperson, New Delhi.*

Scientists and environmentalists working in the area of environmental health are few. Their numbers must grow. And their science must keep us on our toes. This is an issue about life and death.

Anil Agarwal, *Director, Centre for Science and Environment, New Delhi.*

By international standards, India has a disproportionately higher burden of health due to air pollution.

Kseniya Lvosky, *Environmental Economist, World Bank, Washington, USA.*

Fifty per cent of the malaria cases are human-made. Government spreads malaria by policy.

V P Sharma, *Former Director, Malaria Research Centre, Delhi.*

Plague will erupt in small pockets along the Indira Gandhi canal (in the Thar Desert). I hope it does not happen.

Ishwar Prakash, *Rodent expert, Zoological Survey of India, Jodhpur.*

Research has shown that environmental degradation has been a major factor contributing to the drop in sperm count.

K Gopalkrishnan, *Deputy Director, Institute for Research in Reproduction,* Mumbai.

In India, there is enough scope for reducing the exposure to radiation, without losing the benefits of nuclear energy. Unfortunately, the regulatory mechanisms are almost non-existent.

A Gopalakrishnan, *Former Chairperson, Atomic Energy Regulatory Board, Hyderabad.*

The women of Uttarakhand do all the heavy work on farm and forest until the last minute of their pregnancy. Load lifting stresses the internal organs to the extent that the unsupported uterus collapses downward. Sometimes to the extent that even coughing, sneezing or squatting brings it out.

Jashodhara Dasgupta, Sahayog, Almora, Uttar Pradesh.

It is easier to design a nuclear reactor than a smokeless chulha.

Madhu Sarin, *Architect and Consultant (who has worked on improved cooking stoves), Chandigarh.*

RECOMMENDATIONS

of the CSE National Conference on Health and Environment, New Delhi, July 7-9, 1998

1. THE CHALLENGE AHEAD

Health and development are so intimately connected that the state of health within a country is one of the revealing indicators of its development. Yet, environment and development rarely receive high priority in health policies. Whenever people think of health, they think of drugs, doctors and hospitals. Nothing could be farther from the truth. Health is a state of well-being which arises out of the quality of one's environment — clean air, clear water and clean food — and the quality of one's lifestyle. A human being remains healthy most of the time because of the body's own self-healing capabilities. Even when people fall ill, drugs, doctors and hospitals basically help the body's self-healing capabilities to fight the disease. It is, therefore, essential to ensure a clean environment for a healthy life.

The environment is today under attack from all sides, from all the three components of modern economic development — industrialisation, urbanisation and agricultural modernisation. Industrialisation and urbanisation are both affecting clean air and clean water. While industries pump in a lot of chemicals into the air, into the rivers, and, increasingly, into groundwater sources, cities, which have sewers, pump in a lot of germs into rivers and groundwater sources. Urbanisation brings with it motorised transport and high levels of chemical pollution in the air. Modern agriculture pumps in a lot of chemicals into soils and water sources. Intensive agriculture also means that the soils steadily get depleted of micronutrients — that is, elements like copper and molybdenum — which are essential for human nutrition. As a result, the quality of our food is going down because it does not have the same levels of micronutrients. Irrigation, urbanisation and other economic changes are in several cases introducing into our ecology new conditions that promote breeding of disease-spreading agents like mosquitoes.

Slow and steady exposure to chemicals will lead to cancer, to heart related problems, to air pollutant-related respiratory problems, to brain-related disorders, to hormone-related problems, to reproductive problems, and even to changes that will affect our children and their children. Many chemicals pass through the placental barrier in the womb and affect the foetus — the unborn child. All these problems creep upon us slowly and we learn about them, like cancer, only when they have a reached a point at which precious little can be done and the medical costs for the management of the survivors will be very high.

It has been pointed out by experts that India is going to face a serious double

burden of disease. Most of the old diseases like malaria, filariasis and kala-azar, have not yet disappeared from India; some, in fact, have rebounded back. In the meantime, new health problems like cancer, heart problems and AIDS are emerging.

What is worse is that an environmental health policy is almost non-existent in India. Current health policies emphasise capital-intensive and curative approaches to health care rather than more cost-effective preventive strategies. Moreover, little cognizance has been given to integrating health policy with the country's development efforts. Skills and curative health efforts are concentrated on the urban population. Alternative approaches do not receive attention from health care managers.

Further, research in disciplines like environmental management of vectors, toxicology and epidemiology is poorly represented in India. Institutes like National Environmental Engineering Research Institute, Industrial Toxicological Research Centre and National Institute of Occupational Health are doing work on environmental and health issues. However, their greater involvement in policy matters and generating public awareness is desired.

A direct result of the above is that policy makers, professional groups and the lay public remain almost completely ignorant about the growing and changing threats to public health resulting from environmental change.

Keeping all this in mind, Centre for Science and Environment organised a National Conference on Health and Environment from July 7 to 9, 1998 at the India International Centre, New Delhi. This is the first time that such a conference on environmental health was organised in India and its purpose was to determine the state-of-the-art in the area with a view to understand how the changing environment and increasing pollution is going to or is affecting public health. Further, the conference also aimed to build a network of people working in the field of environmental health.

2. THE AGENDA FOR ACTION

We, the participants of the CSE National Conference on Health and Environment (New Delhi, July 7-9, 1998), conclude the following:

At present, there is no institutional mechanism to deal with environmental health. These issues fall between the Ministry of Environment and Forests and the Ministry of Health and Family Welfare and need to be addressed on high priority. There is also no coordination mechanism or institution to ensure that environmental health issues are addressed. Apart from these two ministries, there is also an urgent need for concerted participation of and networking between other relevant ministries. For example, the health fallout of water pollution and proliferating vectors cannot be reduced unless the Ministry of Water Resources ensures compliance through good water management, the Ministry of Industry promotes the use of technology that is least polluting, and the Ministry of Urban Affairs ensures proper urban

planning and development. There is therefore an urgent need to establish an agency which has the ability to coordinate the entire government machinery on matters of environmental health. *We strongly recommend that an Environmental Health Protection Authority with nationwide jurisdiction be established under Section 3 of the Environment Protection Act, at least for the metro cities immediately.*

Our detailed recommendations are as follows:

2.1 WATER POLLUTION AND HEALTH

2.1.1 Summary of issues

- Water degradation results in the highest health toll in India accounting for health costs worth a stupendous Rs 19,950 crore (US $ 5.7 billion) per year, or about 59 per cent of the total environmental costs.[1, 2]
- River waters in India have been found to contain a wide spectrum of bacteria. The primary source of these bacteria into the water is domestic sewage, open defecation and dumping of solid waste. For instance, everyday 630 million litres of untreated or partially treated sewage enter into the river Yamuna.[10] In India, unsafe drinking water accounts for 60-80 per cent of diseases such as diarrhoea, dysentery, typhoid, jaundice and cholera.[11] A high percentage of infant mortality is associated with water-borne infections.[2]
- Although not proved conclusively, overdrawal of groundwater by tubewells is affecting drinking water quality. In several areas where the water table is going down, the concentration of fluorides in drinking water is going up. Fluorosis, a disease of the bones which is caused by excessive intake of fluorides, is endemic in 16 states of India. An estimated 62 million rural population is affected by fluorosis of which 6 million are children. The disease presents itself in a variety of forms causing irreversible damage to teeth, bone and soft tissues.[3]
- Arsenic has been found in the groundwater of 8 districts of West Bengal. About 1.5 million people are estimated to be drinking arsenic contaminated water above the maximum permissible limit of 0.05 mg/l. Some 2,00,000 people are showing arsenic related skin manifestations, neuropathy and muscle wasting on their bodies. Long term exposure to arsenic causes severe forms of cancer.[4]
- High levels of pesticides, fertilizers and heavy metals have been found in river waters and groundwaters of India.[5] The poisoning of the groundwater of Punjab with nitrates is an example. These toxic chemicals are used indiscriminately in agriculture and industry and ultimately find their way into the drinking water and then the human body. Studies conducted in India provide evidence that dangerous amounts of pesticides are ingested by Indians and deposited in the body.[6,7,8,9]
- Most rural Indians drink water before any treatment. City dwellers get treated water but the treatment systems cannot get rid of chemicals. For example, there is evidence that the Yamuna river contains unsafe level of pesticides. Further, treatment facilities do not address removal of these toxic chemicals.[10]

There is an urgent need for high quality of monitoring and surveillance of surface and groundwaters to improve compliance with standards and regulations.

2.1.2 POLICY ISSUES

Action for health management

The growing threat of fluorosis and the new threat of arsenic in groundwater are having extremely serious effects on public health. The growing reliance on the deeper layers of the groundwater aquifer, as compared to the earlier dependence on rainwater and local runoff, has aggravated these problems. In areas where the groundwater is contaminated with toxic chemicals, rain water is an ideal alternative to ground water for purposes of consumption. We believe it is essential to promote on a nationwide basis community and household involvement in water management and give greater importance to extending and improving local water harvesting systems through techniques such as rooftop water harvesting, storage of local runoffs and recharge of groundwater aquifers. Community action backed by an appropriate legislative framework can play a key role in preventing overexploitation of groundwater resources. *Agency: Ministry of Rural Development/State Governments*

In places where fluoride and arsenic content in groundwater is high, making the water unfit for drinking, alternative sources of drinking water should be identified for communities, at least until these communities benefit from the development of rainwater harvesting systems. Similar efforts, in the interim, should be directed towards installation and maintenance of defluoridation methods in households, in a sustainable manner. *Agency: Central Groundwater Board/Ministry of Water Resources/Ministry of Rural Development/State Governments*

Treatment facilities, such as those envisaged under the River Action Plans, are not capable of addressing a number of important water quality parameters. For example, toxic chemicals such as pesticides and bacteriological indicators like total and fecal coliforms are not addressed during treatment. It is therefore likely that pesti-

Removal of excess groundwater has not only reduced the amount of water available but has led to a major public health problem in West Bengal resulting from arsenic poisoning of the groundwaters. Rainwater harvesting should be promoted on a nationwide basis to reduce overdependence on groundwater.

cide traces and unsafe level of some microbial pollutants continue to be present in drinking water. This is a matter of serious concern. It is, therefore, recommended that construction of treatment facilities and development of appropriate technologies be promoted to eliminate contamination of drinking water. *Agency: Ministry of Urban Affairs/Municipal Corporations/Ministry of Health and Family Welfare*

Action for research

There is no information available on the extent of population exposed to fertilizers, pesticides and heavy metals in groundwater. Also, there is no information to assess the effects of contaminated surface and groundwater on human health. Therefore, there is a need to conduct epidemiological studies to assess the exposure and health effects resulting from contaminated groundwater. *Agency: Ministry of Health and Family Welfare/Indian Council of Medical Research*

Action relating to legal issues

Under the water pollution control act, there is no provision which takes into account the effect of agrochemical use on groundwater quality. As a result, there are no measures taken to mitigate aquifer pollution through regulation of toxic agrochemicals that permeate the ground. At present, agrochemicals are applied indiscriminately and have contaminated both groundwater and surfacewater beyond safe limits. There is an urgent need to improve the law so that the application of agrochemicals is regulated and groundwater protection zones are established. Use of agrochemicals can be regulated by establishing safe levels of application which incorporate state-level realities such as hydrogeological conditions and soil conditions that can accelerate aquifer leaching and contamination. *Agency: Ministry of Water Resources/Ministry of Environment and Forests*

Action relating to education and training

Water resources assessment requires the establishment and maintenance of a body of well-trained and motivated staff sufficient in number to undertake various activities. Education and training programmes designed to ensure an adequate supply of these trained personnel should be established or strengthened at the local, national, subregional and regional level. Training programmes on water pollution and health-related topics with an environment and development context should become mandatory for all categories of staff involved in water resources assessment activities, using advance education technology, where appropriate, and involving both men and women.

Action for monitoring

Limited data is available on the quality of surface and groundwaters. Data which is available indicates that both are becoming increasingly contaminated by chemicals at selected sites and microbes coming from human and animal excreta. Monitoring of drinking water has been done on and off and not at all sites. There is, therefore, a need to establish networks for high quality monitoring and continuous surveillance of surface and groundwaters and drinking water on a nationwide basis to improve compliance with standards and regulations. The data obtained as a result of the monitoring should become public information. *Agency: Ministry of Water Resources/Ministry of Environment and Forests*

Action for public awareness raising

There is a lack of public awareness and education about surface and groundwater resource protection and human health effects. A preventive approach is, therefore, crucial to avoid the costly subsequent measures to rehabilitate, treat and develop new water supplies and technology. We believe that regular bulletins on groundwater quality should be compiled, at least for the major industrial sites and land sites growing major cash crops, and made available to the public by the Central and all state governments. *Agency: Ministry of Water Resources/ State Governments*

Action for inter-ministerial and Centre-State coordination

The environmental and health assessment of the country's water resources calls for extensive coordination between a number of ministries such as the Ministry of Health, Ministry of Environment and Forests, Ministry of Rural Development,

Ministry of Urban Affairs and other relevant ministries and state governments. This coordination is currently non-existent. A mechanism is needed to develop and sustain the coordination by setting up a National Environmental Health Authority. *Agency: Ministry of Environment and Forests/ Ministry of Health and Family Welfare/ Other Central and State governments*

Action relating to institutional issues

The Central and State Groundwater Authorities and the Water Pollution Control Boards have been monitoring the groundwater quality in different parts of the country. The groundwater authorities have been entrusted with the responsibility of survey and exploration of groundwater, the Water Pollution Control Boards are responsible for control of overall water quality. Thus, in practice protection of groundwater from contamination has remained unattended by government approved authorities. There is no authority who sets the standards for chemical concentration in groundwater specifically. The Indian Council of Medical Research and the Bureau of Indian Standards set the standards of overall drinking water quality, following the guidelines of the WHO and the USEPA. *Agency: Ministry of Water Resources/ Central and State Groundwater Authorities/ Water Pollution Control Boards/ Ministry of Environment and Forests/ Ministry of Health and Family Welfare/ Indian Council of Medical Research*

2.2 VECTORS AND ENVIRONMENTAL MANAGEMENT

2.2.1 Summary of issues

- Changes in the environment because of poor urban infrastructure, bad practices during construction, waterlogging and drainage congestion in and around cities create conditions which help mosquitoes to breed in large numbers.
- Building of dams and canals can lead to increased waterlogging which facilitates breeding of mosquitoes leading to malaria. The malaria epidemics around the Indira Gandhi Canal in Rajasthan and Bisalpur dam in Madhya Pradesh are two examples.[12]
- Malaria is a major disease in India. It poses a major challenge today. The mosquito is becoming resistant to pesticides. The malaria parasite is becoming resistant to the medicines. In 1994, reported incidence of malaria was almost 2 million cases per year and deaths due to malaria claimed some 1000 lives.[13] It is an open secret that a number of malaria cases and deaths go unreported and that the reported figures are highly underestimated.[14]
- More than 90 per cent of the kala-azar cases in India come from Bihar. But now experts say that the sandfly vector could be acquiring new foci in Gujarat, Uttar Pradesh and the sub-Himalayan belt. Even though the disease vectors are spreading to new regions, no epidemiological work is being conducted to understand the transmission dynamics of the vector.[15,16]
- Studies conducted by Indian scientists show that it is possible to reduce breeding sites of malaria and filariasis mosquitoes, which can bring down the disease incidence dramatically. But this kind of non-chemical control (called bioenvironmental control) requires public participation and highly committed sanitary departments which keep drains flowing and take care of the environment.[17, 18]
- In 1996, the dengue haemorrhagic fever epidemic hit Delhi. A much bigger epidemic is said to have hit the Bangalore region of Karnataka just prior to this. Over the last four decades, geographic prevalence of dengue activity has expanded to nearly all urban areas as well as rural communities. Dengue haemorrhagic fever, however, is a newcomer to India and is likely to become a killer of children in the future.
- Japanese encephalitis has shown dramatic and disconcerting shifts in its geographic prevalence in India. In the past decade, outbreaks have occurred in Haryana, Maharashtra, Goa and Kerala.

2.2.2 POLICY ISSUES

Action for environmental management

Adverse environmental change has resulted in the resurgence of vector-borne diseases. Major disease such as malaria and filariasis can be controlled by bioenvironmental control methods such as the use of larvivorous fishes and environmental modifications. However, chemical control methods are given higher priority in the governmental agenda. In this context, there is urgent need to clarify the role of insecticides for vector control versus bioenvironmental management. It is important for the government to address whether it is possible to do without insecticides completely. Further, bioenvironmental management should be promoted on a nation-wide basis. *Agency: Ministry of Health and Family Welfare/ Panchayati Raj institutions/ Municipalities*

Action for preventive health management

Pyrethroid impregnated bednets can serve as an alternative to chemical control of vectors. Although some field trials on the feasibility of bednets have been conducted in rural areas by the government and few NGOs, a nationwide strategy for the distribution of bednets is still not established. Though debatable, impregnated bednets may be safer from a health point of view than spraying of chemicals. If this is true then a definite strategy which takes into account the pricing, publicity and marketing of bednets should be developed in order to promote their use on a wider scale in both rural and urban areas. *Agency: Ministry of Health and Family Welfare/state governments*

In the early 1980s, the Malaria Research Centre had managed to mobilise community participation to control malaria without chemicals. Bioenvironmental management of vector should be promoted on a nationwide basis.

Basic chemicals used for formulating mosquito mats, coils and aerosols are synthetic pyrethroids such as allethrin compounds Animal studies have confirmed that long term exposure to these chemicals result in the accumulation of chemicals in the body. No studies on the safety of these products to high risk groups like infants, pregnant women and to people with certain disease conditions such as allergies, bronchitis, tuberculosis, asthma, cardio-vascular diseases and neurological disorders have been conducted. However, low dose exposure can lead to high concentrations of these chemicals in the body with subsequent ill-health effects. The government should therefore develop a public awareness campaign to promote the use of biological options such as neem oil repellents, instead of mosquito coils, in both urban and rural areas. *Agency: Ministry of Health and Family Welfare/state governments*

Many development projects initiated by the government have created ideal conditions for growth of vector-borne diseases in the surrounding areas. Therefore, there is a need for a policy to ensure that development projects are evaluated for their health impact before the projects are initiated. Such health impact assessment studies should be integrated with environmental impact assessment studies. *Agency: Ministry of Health and Family Welfare/Ministry of Environment and Forests*

There is no programme on Japanese Encephalitis immunisation in India, while excellent vaccines are available in China and Japan. Due consideration should be given to vaccine development and initiating an immunisation programme in India. *Agency: Ministry of Health and Family Welfare*

Action for health management

Building of dams, canals, power projects and construction sites can lead to increased waterlogging which facilitates the excessive breeding of mosquitoes leading to mosquito-borne diseases like malaria. The malaria epidemics around the Indira Gandhi Canal in Rajasthan and Bisalpur dam in Madhya Pradesh are two examples. Therefore, environment and health impact assessment of all major water resource development projects that can potentially impair water quality and enhance the prevalence of mosquito-borne and water-associated diseases should become mandatory on a nationwide basis. *Agency: Ministry of Water Resources/Ministry of Environment and Forests/Ministry of Health and Family Welfare*

Action for research

Epidemiological work in the area of vector-borne diseases is more or less non-existent. As a result very little is known about the transmission dynamics of disease vectors. For effective vector control, there is an urgent need to establish pragmatic disease surveillance and to conduct studies to better understand the epidemiology of vector-borne diseases. *Agency: Ministry of Health and Family Welfare/Indian Council of Medical Research*

Action relating to institutional issues

In urban and rural areas, effective vector control is lacking because of the absence of concerted intersectoral action and development of viable partnerships among different stakeholders such as municipal corporations, water supply and sewage boards, planning departments, departments of health, departments of environment, and, above all, the community and its representatives from various settings and levels of civil society. Therefore, an institutional structure is needed to ensure that various institutions collaborate on relevant projects. Bioenvironmental control is possible only if there is sustained community participation. An institutional mechanism to initiate and sustain community involvement needs to be developed by extensive training in community mobilisation of agencies responsible for vector control, such as the National Malaria Eradication Programme. *Agency: Ministry of Urban Development/ Ministry of Health and Family Welfare/Ministry of Environment and Forests/Ministry of Rural Development*

The magnitude of vector-borne diseases can be greatly reduced if prompt and adequate measures are taken by the state government and local administration. At present, there is inadequacy of trained medical personnel, surveillance and primary health care centres, a lack of application of environment management methodologies, and slowness in early detection and prompt treatment of cases which is largely attributed to inadequate funds in the health sector. We believe that financial problems can be overcome with more cautious management of funds at the state and

local levels. There is a need to develop institutional arrangements so that state governments recognise their role in reducing the enormous burden of disease, manage funds more appropriately and are held accountable for their performance. *Agency: Ministry of Health and Family Welfare/ Minister of Environment and Forests*

Action for monitoring

The present surveillance system is very poor and practically non-existent. Past outbreaks of vector-borne diseases such as plague and dengue could have been better managed, perhaps even prevented, with effective surveillance. There is an urgent need to develop a practical disease surveillance system in order to predict and minimise future epidemics. *Agency: Ministry of Health and Family Welfare*

Action for public awareness raising

There is need to spread awareness on how urban and rural communities can take action themselves to manage their environment, reduce vector breeding sites and protect their health. The health ministry should start a healthy cities and healthy villages movement which can operate with the involvement of the government and NGOs. For instance, a concerted public awareness programme on diarrhoea was conducted by the Madhya Pradesh Rajiv Gandhi Mission for Diarrhoea Control from 1994 to 1997 which brought down diarrhoea incidence in Madhya Pradesh by 90 per cent in just three years. Similar programmes should be undertaken on a nationwide basis. *Agency: Ministry of Health and Family Welfare/State governments*

Regulatory measures and setting standards

The lack of enforcement of existing regulations such as byelaws for construction sites contribute to the increase in mosquito breeding sites at the household and community level, especially in urban settings. It should become mandatory for Municipal Corporations to enforce the regulation at the expense of the builder. At present the regulation is weak in that the penalty imposed on the builder is low. Further, the byelaw is being enforced only in Mumbai and that also to a partial extent. Measures are needed to modify the byelaws appropriately and enforce it comprehensively with a view to control urban malaria, dengue and filariasis. *Agency: Ministry of Health and Family Welfare/Ministry of Urban Development/Municipalities*

2.3 AIR POLLUTION AND HEALTH

2.3.1 Summary of issues

- The World Bank estimated that, in 1991-92, some 40,000 people died from air pollution (caused only by high levels of poisonous particles) in the 36 cities for which air pollution data was available. If data had been available for pollutants like ozone and benzene, the death rate would have been even higher.[19]

- In most of the 23 Indian cities each with million-plus people, air pollution levels exceeded WHO recommended health standards.[2]
- When CSE repeated the exercise using air pollution data for 1995, it found the total death count had gone up to 52,000 deaths. Delhi alone had recorded an increase from 7,491 in 1991-92 to 9,859 in 1995. The estimated number of episodes of illness resulting from air pollution went up in Delhi from 4 million to 5.2 million.[20] People are, thus, already paying a very heavy price for the deterioration of the urban environment in India.
- India's Gross Domestic Product (GDP) increased by 2.5 times from 1975 to 1995, while the total pollution load in the air and water from industrial activity alone increased four-fold. This clearly indicates that India is growing in economic terms but it is also becoming increasingly polluted.[21]
- A major problem in India is the type of vehicles we use. A very large proportion of the urban population uses non-motorised transport or public motorised transport. But with growing wealth, especially in the absence of good public transport, more and more people are moving towards private motorised transport. As they cannot afford cars, they go in for two-stroke engine-operated scooters. In 1996, India only had 4.19 million cars compared to 23.11 million scooters. These scooters are highly polluting.[22]
- Not surprisingly, very high levels of benzene have been found in Delhi's air in the only study that has been done uptil now. It found benzene levels 12 times higher than the European standards.[23] This is because Delhi had about 1.74 million scooters or about 7.54 per cent of the country's two-wheelers jammed into it. Benzene is an extremely potent carcinogen and is known to cause blood

Deisel emits small particulate matter which is known to cause cancer. There is a need for an urgent policy to control deisel use in cities and promote the use of alternative fuels.

cancers. Despite the dangerous profile of benzene, it is not being monitored by regulatory authorities.

- The difference between petrol and diesel prices is posing another serious problem for public health. India is the only country which uses seven times more diesel than petrol.[24] And the diesel it uses is far below the international quality standards. Scientists are increasingly finding newer and frightening evidence that diesel produces extremely poisonous fumes. It produces very fine particles that go straight into lungs and stay there for long. These particles are coated by highly carcinogenic substances. In fact, because of the lower use of diesel in the West less attention has been paid to its toxicity. A Japanese scientist recently reported that he had found the world's most carcinogenic substance in diesel fumes.[25]
- Apart from the transport sector, a variety of sources such as industrial boilers, household and commercial stoves, municipal refuse burning, are responsible for the problem of air pollution in highly polluted cities around the world, and especially in Asia and India. Each of these sources contribute to the levels of particulates in air. Urban air pollution and associated health impacts are therefore inherently of cross-sectoral nature. India — given the phenomenally high levels of particulates in the air of many of its cities — simply can not afford to ignore people's exposure to urban air pollution. [25a]

2.3.2 Policy issues

Action for environmental management

The biggest air polluters are scooters with two-stroke engines, heavy vehicles and old vehicles. A legislation to ban old vehicles, phase out two-stroke engines and prohibit the movement of heavy vehicles during the peak traffic hours is needed. *Agency: Ministry of Surface Transport/Ministry of Industry/Ministry of Environment and Forests*

Four major culprits are responsible for vehicular pollution in the country — i) outdated vehicle technology arising from vehicle manufacturers' unwillingness to keep abreast of clean technologies; ii) poor fuel quality produced by public sector refineries; iii) poor vehicle maintenance by indifferent consumers and an economic structure that keeps vehicles on the road long after they should have been junked; and, iv) poor traffic planning. For instance, vehicular traffic in most cities is disproportionately dominated by extremely polluting vehicles. Further, the type of fuel being promoted – diesel – poses the maximum health risk. There is need to develop a national air pollution management plan. Further, this plan should incorporate transport and fuel policies that are based on health considerations. *Agency: Ministry of Health and Family Welfare/Ministry of Environment and Forests/Ministry of Petroleum/Ministry of Surface Transport*

Poor fuel quality is to a large extent responsible for high vehicular emissions. The outdated and inefficient refining process in India is largely responsible for the bad quality fuel. But despite the growing body of evidence about the serious health risks from poor quality diesel and gasoline, the oil bureaucracy is showing no interest in evolving a proactive agenda to improve the refinery technology. For instance, at present, sulphur content in diesel is 1 per cent, while the target for 2000 has been set for 0.25 per cent. Even diesel at 0.25 per cent sulphur is 250 times dirtier than the world's best diesel. A policy is needed to reduce sulphur content in diesel and make the refineries gear up to meet more stringent standards for fuel quality. *Agency: Ministry of Environment and Forests/ Ministry of Petroleum and Natural Gas*

Since gasoline and diesel emit a number of harmful pollutants, a policy is needed for the introduction of alternative fuels such as CNG, mainly methane, which is less polluting, in larger quantities. Alternative fuels should be promoted, instead of diesel, in commercial vehicles. *Agency: Ministry of Environment and Forests/Ministry of Petroleum and Natural Gas*

There is an urgent need for (a) integrated urban air quality management; (b) facilitating a switch to cleaner fuels by households and small businesses; and, (c) slum upgrading and poverty reduction programs. Without these (and without addressing transport pollution issues), it is not possible to mitigate the impact of urban air pollution on health on a significant scale. *Agency: Ministry of Environment and Forests/ Ministry of Petroleum and Natural Gas/Ministry of Mining and Industries/Ministry of Surface Transport/Ministry of Health and Family Welfare*

Action for research

In India, hardly any epidemiological studies have been conducted to assess the health effects of air pollution. As a result, there is substantial uncertainty about the effects of air pollutants at concentrations typical of metropolitan cities of India. For instance, despite the air pollution status of Calcutta and Delhi, nobody knows how cancer and heart disease risks and respiratory problems are growing in these cities. Therefore, there is an urgent need to conduct epidemiological studies on a nationwide basis. Data obtained from these studies can be used by policy makers to establish and enforce preventive policies in air pollution. These studies will not only help them in understanding the consequences of human exposure to air pollution but also help to distinguish real from imagined hazards, important risks from negligible risks, and can pave the way for more rational allocation of resources. Because of the lack of data on the effects of air pollution on the health of the people, key decision-makers are ignorant about the magnitude of the problem and prepare no solutions. *Agency: Ministry of Health and Family Welfare/Indian Council of Medical Research*

Air pollution standards should be based both on health impact and anticipated economic benefits. More studies are needed to estimate the total magnitude of economic and health costs associated with air pollution in India. Such studies will contribute to defining how priorities for policy action should be developed. For instance, a World Bank-aided study to assess the health and economic costs has already been done. There is a need for public health specialists and economists to converge their approaches for measuring the economic and health burden of disease. *Agency: Ministry of Health and Family Welfare/ Indian Council of Medical Research*

Action for fiscal issues

Diesel emits small particulate matter which is known to cause cancer. But despite the deadly profile of diesel particulates, diesel prices are much cheaper than petrol, which is promoting the use of the former. It is no longer true that the government policy to keep diesel prices low helps in agricultural production and public transport as data indicates that the biggest benefactors of cheap diesel and subsidised kerosene are the urban consumers. In fact, cheap diesel and lax emission standards for diesel cars make diesel models very attractive. Therefore, there is an urgent need for the government and industry to recognise the health fallout of harmful diesel emissions and establish a rational fuel pricing policy. *Agency: Ministry of Environment and Forests/Ministry of Petroleum and Natural Gas/ Ministry of Finance*

Action for monitoring

Air quality monitoring in India leaves much to be desired in terms of the number of pollutants being monitored, selection of monitoring sites, methods of monitoring pollutants, and sophistication applied in collection of data and quality control of data. For instance, critical air toxins such as small suspended particulate matter less than 10 and 2.5 microns in size (PM10 and PM2.5) and volatile organic compounds (VOCs) like benzene and ozone, which have serious bearings on health, are not monitored. It is still not known how much of these toxins are present in the ambient air. The need to monitor benzene in ambient air arises as two-stoke engines which comprise majority of the vehicles in India release 20 to 25 per cent of their fuel unburnt increasing the benzene content in air. There is need for an effective air quality management system which consists of a good air quality monitoring network, comprehensive and up-to-date emission inventories, air quality modelling studies to evaluate the effect of policy measures and effective action plans with clear air quality targets. Data obtained as a result of the monitoring should be made public and available to scientists for raising awareness and stimulating corrective actions. *Agency: Ministry of Environment and Forests/ Ministry of Health and Family Welfare*

Action for public awareness raising

In western countries such as USA and Germany, the government has developed

Because of the lack of data on the effects of air pollution on health, key decision makers are ignorant about the magnitude of the problem in India and prepare no solutions.

smog alert systems by which people are alerted whenever levels of air pollution become dangerously high. For instance, in California, asthmatics are encouraged to carry pagers so that the government can alert this high-risk group during periods of high pollution. There is a need to develop appropriate smog alert systems in our country as well, as the high-risk group which includes infants, pregnant women, asthmatics and others is substantially high. For the development of smog alerts, an appropriate action plan must be included, as in all the advanced countries of the world. The lack of smog alert system is equivalent to a conspiracy of silence. *Agency: Ministry of Environment and Forests/ Central and State Pollution Control Boards/Ministry of Health and Family Welfare*

Regulatory measures and setting standards

The present system of setting separate higher air quality standards for industrial zones as compared to residential zones is inappropriate as industrial zones often have higher population density, therefore, resulting in higher exposure of the population. There is no country in the world which has separate standards and in India too there should be uniform air quality standards. *Agency: Ministry of Environment and Forests/ Central Pollution Control Board*

Studies done around the world have established that illness and mortality from respiratory and cardiovascular conditions can increase even when levels of particulate matter are much below safe limits, such as the World Health Organisation (WHO) limits. Similarly, health problems were observed in Mumbai suburbs even when air pollution levels were below WHO standards. National air quality standards in India

allow higher levels of pollutants compared to the guidelines of WHO. Air quality standards and guidelines are designed to protect people from exposure to pollutants. Therefore, there is a need to make air quality standards stricter based on health considerations specific to the Indian scenario. *Agency: Ministry of Environment and Forests/ Ministry of Health and Family Welfare*

2.4 ENVIRONMENTAL TOXINS AND HEALTH

2.4.1 Summary of issues

- Pesticide production in India went up by some 200 per cent between 1978 and 1998. In 1994-95, India produced almost all the pesticides it consumed — some 80,000 tonnes in the agricultural sector. Controls over pesticide use in agriculture are lax.[7]
- Studies carried out in the former Soviet Union where large quantities of pesticides have been used on cotton show that pesticides are capable of suppressing the immune system, which then makes people more susceptible to various infectious diseases and even cancers.[7]
- Studies have shown that people in Delhi have one of the world's highest levels of DDT accumulated in their body fat. Even though DDT has been banned in agricultural use, human breast milk samples from Delhi have shown that DDT and HCH levels had not declined over the past decade, and were comparable to levels found in Punjab, an area of intensive farming. Of greatest concern is the magnitude of exposure to organochlorine to which children and infants are subjected through human and dairy milk. It is estimated that infants ingesting breast milk in Delhi receive roughly 46 times the daily allowable intake of DDT of the FAO/WHO.[26]
- All over the world, there is evidence to show that sperm count of men has declined. In India, a study by the Indian Council of Medical Research shows that less than 30 per cent had semen with normal characteristics. Though a debatable issue, some scientists believe that this problem is the result of the increasing exposure of human beings worldwide to plastics.[27,28]
- The Yamuna river which is a major source of drinking water for Delhi was tested for its pesticide content before and after it passes Delhi by the Central Pollution Control Board. The study, carried out from 1994 to 1996 (16 months) at 19 locations of the Yamuna river, found pesticides such as DDT and HCH residues at almost all the locations.[29]

2.4.2 Policy issues

Action for health management

Malnutrition enhances the absorption of metals like lead and manganese. Adequate nutrition will prevent the susceptibility of humans to such metals. Therefore, there is an urgent need to bolster the national programme on nutrition, especially for children and women *Agency: Ministry of Health and Family Welfare*

Action for environmental management

Use of integrated pest management (IPM) which includes control by different strategies is an ideal alternative to chemical control. Although India was the first country to declare IPM as its official policy, it has made dismally slow progress as out of 5,60,000 villages in the country very few have been covered under IPM. There is need to reduce overdependence on the use of agricultural chemicals through alternative farming practices and integrated pest management on a nationwide basis with a view to move towards use of safe pesticides. *Agency: Ministry of Agriculture*

In vector control, emphasis is on pesticides, although there are methods known as bioenvironmental management to deal with vectors without relying on pesticides, which are not only toxic to humans but have long term environmental problems. There is need to promote bioenvironmental management for vector control on a nationwide basis. *Agency: Ministry of Health and Family Welfare*

While registering pesticides only the agricultural aspects, such as toxicity on the crop, waiting period and mode of application are considered. The impact on the environment is totally ignored. Environmental considerations must be given proper emphasis while evaluating a pesticide for registration. *Agency: Ministry of Agriculture*

Surveillance and monitoring of heavy metal pollution is needed around mining districts, smelting and refinery centres as well as around coal-based thermal power plants.

There is no incentive to farmers to grow organic food since the marketing system is missing. A system needs to be developed to promote organic food. *Agency: Ministry of Food and Consumer Affairs/ Ministry of Agriculture*

Action for research

In India, there is paucity of toxicological and epidemiological data to predict the effects of chemicals on human health and the environment. As a result, decision-makers do not have the required tools to adopt adequate policies and measures to reduce risks posed

by chemicals. A vast body of research exists from abroad but research taking into account local conditions is imperative for establishing effective policies from economic and health points of view. There is need to learn from international assessments of chemical risks and promote research on relevant epidemiological studies with a view to establishing a cause-effect relationship between exposure to chemicals and occurrence of certain diseases. Also ecotoxicological studies should be done with the aim of assessing the risks of chemicals to the environment. For instance, research should be directed for assessment of the risks caused by persistent insecticides, taking into account the damages caused by these chemicals on aquatic life and human health, such as loss of aquatic flora and fauna, cost of medical expenses, and loss of production due to ill-health. *Agency: Ministry of Health and Family Welfare*

Very little study is being done on the impact of toxins on human sperms. Humans are getting affected but will know nothing unless research and remedial measures are undertaken. There is a need to pursue extensive research on the impact of environmental toxins on the human reproductive system. For instance, it is important to generate national data on male reproductive health indices. Similarly, baseline data on human seminal fluid profile in normal fertile males is required. These data should be representative of a large male population in India so that research on the effects of environmental toxins on reproduction can be pursued. *Agency: Ministry of Health and Family Welfare*

Although India manufactures a number of pesticides, most of them are non-biodegradable, leaving a high residue level in the environment. There is a need to develop safer, low residue and biodegradable pesticides. *Agency: Ministry of Science and Technology/ Ministry of Chemicals and Fertilisers*

Action for fiscal issues

Most laboratories lack proper equipment and are understaffed due to inadequate funds for research. There is a need to allocate more funds for toxicological research. *Agency: Ministry of Health and Family Welfare/ Ministry of Science and Technology*.

The government does not treat organic fertilizers and biopesticides on par with chemical pesticides or fertilizers. Subsidies are only given to chemical fertilizers and pesticides. This discourages farmers from organic farming. A similar policy of financial benefits to promote organic farming should be taken in to account while developing taxation systems. *Agency: Ministry of Agriculture*

Action relating to institutional issues

Pesticides of toxicological importance, many that have been long banned, severely restricted, or withdrawn from agriculture due to health concerns in the United

States and Europe, are still widely used in India. For instance, DDT was long banned in industrialised countries but continued to be used in agriculture in India till 1989. In fact, significant amounts of DDT continue to be used for vector control in India. A policy on the production and use of DDT in India should be established and enforced immediately. We believe that it should be time-limited with selective use of DDT at the present time until alternative and affordable vector control strategies are in place. Future policies should be established and enforced regarding the use of other chemicals that are banned abroad. Further, there is need to carry out national reviews of previously accepted pesticides whose acceptance was based on criteria now recognised as insufficient or outdated and of their possible replacement with other pest control methods, particularly in the case of pesticides that are toxic, persistent and bioaccumulative. *Agency: Ministry of Health and Family Welfare/Ministry of Environment and Forests*

Action relating to legal issues

The Insecticide Act of 1968 should be amended on the lines of the Environment Protection Act (EPA). For instance, all over the world registration for any pesticide is given only for a period of time. This should be followed in India, too. No registration should be for more than five years. A change in the legislation is required to ensure that pesticides are re-registered after fresh examination by the registration committee. Further, environmental considerations must be given proper emphasis in evaluating a pesticides for registration. *Agency: Directorate of Plant Protection/Ministry of Agriculture*

Foods available in India contain high levels of pesticides. Consumers have no other choice, but to accept chemical contaminated food. There is a need for the Consumer Protection Act to be applied against food contaminated with pesticides and other chemicals such as heavy metals. *Agency: Ministry of Food and Consumer Affairs*

Action relating to education/training

Farmers do not follow the recommended pesticide doses and harvest the crops much earlier than the waiting periods. The Directorate of Plant Protection provides education and training to the farmers besides advocating Integrated Pest Management (IPM) technology on a large scale which encompasses alternative methods for pest control. However, there is a need to strengthen the programme, on a nationwide basis, to educate farmers on the use of pesticides, its ill-effects and possible alternatives. *Agency: Directorate of Plant Protection/Ministry of Agriculture/Ministry of Health and Family Welfare/Ministry of Environment and Forests/Ministry of Human Resource and Development*

Infrastructure support essential for assessment of chemical contamination in the

form of inspecting staff and laboratory facilities is poor. In addition to strengthening of laboratories, it is recommended that inspecting staff should undergo on-the-job training to acquaint themselves with the rapidly changing chemical technology. *Agency: Ministry of Health and Family Welfare/Ministry of Environment and Forests/Ministry of Human Resource and Development*

Action for monitoring

Excavations and exposures of metallic minerals and coal, disposal of their residues, tailings and ash, smelting and refining of the minerals mobilize a large amount of metallic pollutants which ultimately enter the human population through various routes. Unlike other kinds of pollutants, impact of heavy metal pollution cannot easily be detected and recognised. Surveillance and monitoring of heavy metal pollution is needed around mining districts, smelting and refining centres as well as around coal-based thermal power plants. Agency: *Ministry of Environment and Forests/Ministry of Mining and Industries*

A national monitoring system, which consists of a central reference laboratory and a network of regional laboratories, for heavy metals and pesticides has not been conceived. If such a system is allowed to develop, it would be very easy to identify the various environmental hazards and build a database on levels of these pollutants. There is also need to develop field monitoring data for toxic chemicals of high environmental importance on a nationwide basis. There is a need to regularly monitor pesticide and heavy metal residues in food products also. *Agency: Ministry of Health and Family Welfare/Ministry of Environment and Forests/Ministry of Food and Consumer Affairs*

Action for public awareness raising

The public, technocrats, policy makers and politicians are all unaware of the impact of toxins on human health. A policy to ensure that the media and the education system play an active role in educating people about environmental toxins should come into effect. The government should direct information campaigns such as regular bulletins about environmentally-safe alternatives and chemical stockpiles to the general public to increase awareness of the problem of chemical safety. *Agency: Ministry of Health and Family Welfare/Ministry of Environment and Forests/Ministry of Human Resource and Development/ Ministry of Information and Broadcasting*

Action for networking

The country has environmental laboratories in different zones working on preventive toxicology, but there is no networking among them. A national network of environmental laboratories is needed to keep abreast of and enhance research in environmental toxicology. *Agency: Ministry of Science and Technology*

Regulatory measures and setting standards

In India, a number of chemicals have not been evaluated for their acceptable exposure limits. For instance, pesticides which are in use have not been evaluated for their maximum residue limits in food. There is an urgent need to produce guidelines for a great number of toxic chemicals in use based on peer review and scientific consensus distinguishing between health or environment-based exposure limits and those relating to socio-economic factors. *Agency:Directorate of Plant Protection/ Ministry of Agriculture*

2.5 ENVIRONMENTAL CHANGES AND MICRONUTRIENTS

2.5.1 Summary of issues

- In intensively farmed areas like Punjab and Haryana there is a steady decline in the micronutrient content of the soils. By the mid-1960s, zinc deficiency had become prominent in Punjab. By the early 1980s, manganese and iron deficiencies had also become evident. In India as a whole, 47 per cent of the soil had become deficient in zinc by the early 1980s, five per cent in manganese, 11 per cent in iron. A greater incidence of micronutrient deficiency is recorded from states with large irrigated areas and intensive cropping, and which harvest high yields. Ludhiana district, which records the highest yields of many crops, also records the highest deficiency of micronutrients in soil. Most areas under intensive cultivation in India are also deficient in sulphur.[30, 31]
- Experiments in Punjab have shown that restoring the deficiency of one micronutrient by adding it chemically to the soil can lead to another micronutrient deficiency. Integrated use of micronutrients with organic manure and legumes is the best answer for a sustainable and high production system involving multiple cropping.[32]
- Micronutrient deficiency affects the quality of food which, in turn, affects human and animal health. Consumption of zinc-deficient foodgrains can lead to retarded growth and sexual development, defective wound healing and carbohydrate intolerance, according to research done by medical scientists in Chandigarh. Zinc values were also found low in diabetic and diabetic ulcer patients. Livestock too will suffer diseases because forage was also found to be deficient in zinc in Punjab and Haryana. Each one of these micronutrients is important for the body but in right quantities.[32]
- In India, as per the National Iodine Deficiency Disorders Control Programme (NIDDCP) of Ministry of Health and Family Welfare, Government of India, it is estimated 200 million are living in known iodine-deficient areas. Iodine Deficiency Disorders (IDD) have been reported as a public health problem in all States/Union Territories. Goitre is only the “tip of the iceberg”. Iodine deficiency is the single-most important cause of preventable mental handicap. Children living in iodine deficient areas on an average have 13 IQ points less them those living in iodine-

sufficient areas. Thus, iodine deficiency is responsible for child survival and child development and overall human resource development of a country.

2.5.2 Policy issues

Action for environmental management

Organic manure is an ideal alternative to synthetic fertilisers to slow down micronutrient depletion in soils. A programme for organic manuring should be promoted on a nationwide basis, especially in those areas where micronutrient deficiencies in soils have shown health problems in livestock and humans. *Agency: Ministry of Agriculture*

Effluents of industries are also contributing to changes in the trace element load in underground water and food production systems. It is therefore necessary to conduct environmental impact assessment studies of industries with regard to the trace element load in their effluents. *Agency: Ministry of Environment and Forests/Ministry of Industry/ Ministry of Agriculture*

The information available with different agencies about areas deficient in specific micronutrients and crops which have shown significant responses to external application of specific nutrients is scattered. There is a need to compile a state of knowledge document which can serve as a reference point for future reference. *Agency: Ministry of Agriculture*

Large scale deforestation causes flooding which is turn leaches out the iodine present in the soil. This phenomenon is gradually making the soil deficient of iodine. Food contributes 90 per cent of the iodine requirements. However, if the soil is iodine deficient, the food grown on this soil will also be iodine deficient. Therefore, there is an urgent need to stop deforestation and encourage planting of more trees to prevent this public health problem. *Agency: Ministry of Environment and Forests*

Action relating to education/training

The curriculum in medical colleges ignores the link between environment and nutrition. For instance, subjects such as iodine deficiency disorders are not adequately covered in the curriculum. It is therefore recommended that environment and nutrition related issues be incorporated in the medical curriculum. In addition to medical colleges, curricula of agriculture and home science for schoolchildren should also add important issues focussing on the link between environment and nutrition. *Agency: Ministry of Education/ Ministry of Health and Family Welfare*

Action for monitoring

The micronutrient content of soils has not been monitored in the several parts of

India. Application of agrochemicals without prior knowledge of the micronutrient content in soil would cause the deficiency of other micronutrients to crop up besides aggravating the existing one. Therefore, a national network for monitoring changes in micronutrient and trace elements relevant to plant, animal and human health needs to be strengthened and enlarged by ICAR and other agencies interested in human and animal health. The apex centres responsible for monitoring changes should be provided with state-of-the-art equipment and communication facilities for improving the quality of work on micronutrients/trace elements for rapid dissemination. Data from major centres should be made public and available to scientists for raising awareness and stimulating corrective actions. *Agency: Ministry of Agriculture/Indian Council of Agricultural Research*

Monitoring of changes in the quality of food, especially grains, should also be undertaken as almost no data is available on this. *Agency: Ministry of Agriculture*

In order to ensure recommended iodine in iodised salt, and to have the expected benefits of elimination of Iodine Deficiency Disorders, statewise monitoring of salt should be undertaken urgently. *Agency: Ministry of Education/ Ministry of Health and Family Welfare*

Action for research

Intensive studies by interdisciplinary teams will be necessary to build up an action plan to reduce the problem of soil micronutrient depletion. There is need for a research network mechanism to ensure more interdisciplinary research and exchange of information by soil scientists, agronomists, plant, animal and human nutritionists and public health professionals. *Agency: Ministry of Agriculture/ Ministry of Health and Family Welfare/Ministry of Science and Technology*

Regulatory measures and setting standards

Since external application of micronutrients in agriculture is becoming increasingly important, it is essential that a rigorous system be setup for quality assessment of the micronutrient products being made available to farmers to avoid the marketing of spurious material. *Agency: Ministry of Agriculture*

2.6 INDOOR AIR POLLUTION AND HEALTH

2.6.1 Summary of issues

- Poor people cannot afford to use LPG (cooking gas). They have to depend on fuels such as firewood, leaves and cowdung for cooking. The 1991 Census of India shows that 92 per cent of the rural and 39 per cent of the urban households were dependent on wood and dung.[34]

- Burning of wood and dung releases smoke, oxides of nitrogen, carbon monoxide, sulphur dioxide and particulate matter, which are responsible for indoor air pollution. Pollution caused by wood and dung in poor kitchens is contributing to blindness and acute and chronic respiratory problems. Because of poor ventilation, pollution levels in rural huts can be very high.
- Chulha smoke poses a serious threat to the health of rural women. When health effects of chulha smoke are included, some 2.2 million die because of air pollution in India every year.[35]
- A 1997 study conducted in India suggests that 18 per cent of blindness in the total population may be attributable to the use of wood and dung for cooking. This translates into 29 per cent of blindness in rural areas, and 6 per cent of blindness in the urban environment; rural areas have much higher rates of biofuel use.[36]
- A study conducted by the International Institute for Population Sciences in Bombay has revealed that one in every 15 children under the age of three suffered from acute lower respiratory infections (ALRI), marked by cough, accompanied by short, rapid breathing. The suspected contributory cause of the ailments is smoke that emanates from family kitchens.[37]

2.6.2 Policy issues

Action for environmental management

India has many years of experience with the National Programme on Improved Cookstoves and its precursors. There is yet an unmet need to develop an improved

There is still an unmet need to develop an improved and socially acceptable stove after learning lessons from the previous national improved chulha programmes.

and socially acceptable stove after learning lessons from the previous national programmes. We believe that by holding down the cost it is very difficult to maximise, simultaneously, several functions of a stove. Thus, while designing the improved stove, it is necessary to decide early on, in consultation with the intended users, whether the emphasis should be on versatility, efficiency, reduced exposures or life-span. *Agency: Ministry of Non-Conventional Energy Sources/Ministry of Health and Family Welfare/Ministry of Rural Development/ Ministry of Urban Development*

While improved technologies are no doubt important, equal attention must be given to a well-planned and executed dissemination strategy. The focus of the dissemination should be on areas where ventilation is worst, fuel scarcity is high and people are being forced to burn dung (for example) as alternative fuels are not available. A thorough understanding of diet and cooking practices as well as of the various functions performed by the traditional stove would be essential groundwork for preparing an effective dissemination strategy. *Agency: Ministry of Non-Conventional Energy Sources/Ministry of Health and Family Welfare/Ministry of Rural Development/Ministry of Urban Development/ Panchayati Raj Institutions/Gram Sevikas*

Traditional kitchens in many parts of rural India are completely enclosed with poor lighting and ventilation. Much could be accomplished in reducing the burden of ill-health by improving ventilation in the kitchen/cooking area. Little work has been done on low-cost designs based on traditional architectural styles. There is a need to promote this work by incorporating design changes in government housing schemes in both rural and urban areas. One way to draw in new minds would be to hold design competitions among architecture students. *Agency: Ministry of Non-Conventional Energy Sources/Ministry of Health and Family Welfare/Ministry of Rural Development/Ministry of Urban Development*

In the long run, to reduce exposure to indoor air pollution, alternative fuels are essential. The mixed experience so far is that biogas remains one of the most promising solutions to the indoor air pollution problem. However, the rate of market penetration of biogas has not grown rapidly with time. At this pace, decades will pass before the benefits of biogas technology can reach the poor. Although many questions can be raised about why biogas has not lived up to its potential so far, high priority should be given to identifying the constraints to increasing the rate of penetration of biogas as biogas in combination with LPG and kerosene could play a major role in reducing exposure to indoor air pollution. *Agency: Ministry of Non-Conventional Energy Sources/Ministry of Health and Family Welfare/Ministry of Rural Development/ Ministry of Urban Development*

From the point of view of reducing exposure to indoor air pollution, chimneys,

hoods and other means of removing smoke from the kitchen area invaluable. Their potential has not been adequately explored and exploited so far. There is need to promote work in this area. *Agency: Ministry of Non-Conventional Energy Sources/Ministry of Health and Family Welfare/Ministry of Rural Development/Ministry of Urban Development*

Exposure to indoor air pollution could be reduced if supply of conventional fuels — kerosene and LPG — in rural areas could be assured. We believe that even if no subsidies are offered people would be willing to shift to conventional fuels if these could be obtained regularly without long queues. It will be valuable to study whether the availability of these fuels in the parallel market is leading to significant shifts in the fuel used for cooking. Also, instead of wick stove, primus stove should be encouraged as it has fewer emissions. *Agency: Ministry of Non-Conventional Energy Sources/Ministry of Rural Development/Ministry of Urban Development/ Ministry of Health and Family Welfare*

Action for research

In India, although the burden of acute respiratory infections in children and adverse pregnancy outcomes are estimated to be extremely high due to deteriorating indoor air quality in poor households, few studies have been conducted to evaluate the linkages between exposure to indoor air pollutants and health effects. There is a need to conduct a greater number of epidemiological studies and also make inferences from research done elsewhere. *Agency: Ministry of Health and Family Welfare*

Mosquito mats and coils used in Indian households are harmful to health. Policies are needed to discourage their use and promote safe and alternative repellents.

Studies on the effectiveness of various interventions such as smokeless chulhas, clean fuels and better ventilation in minimising respiratory infections have not been explored. It is recommended that studies should be conducted to assess the effectiveness of various intervention methods. *Agency: Ministry of Health and Family Welfare*

Action relating to education/training

Without proper operation and maintenance, improved stoves are not effective. For example, it has been shown that the high efficiency and "smokeless" attributes of improved cookstoves are severely undermined if the user does not add fuel at an appropriate rate or if the flow of air is not controlled. Further, instructions on how the stove should be maintained must be given not once but repeatedly. In fact, this information should be given before the stove is constructed/installed and reinforced by demonstrations and home visits after the stove has been constructed. Therefore, there is an urgent need to design an effective user education programme on the use of improved cookstoves. *Agency: Ministry of Non-Conventional Energy Sources/Ministry of Rural Development/ Ministry of Urban Development/Ministry of Health and Family Welfare/Ministry of Education/Ministry of Information and Broadcasting*

Action for public awareness raising

People are unaware of the various possible means of reducing exposure to indoor air pollution. Therefore, there is an urgent need to create awareness through professionally prepared public advertisements on radio, television and newspapers. *Agency: Ministry of Non-Conventional Energy Sources/Ministry of Health and Family Welfare/Ministry of Rural Development/Ministry of Information and Broadcasting*

Action for interministerial coordination and Centre-State coordination

We believe that one of the limitations of the National Improved Chulha Programme is that it did not take into account the health considerations and the needs of women in the design and dissemination of the improved stoves. For successful development, dissemination and sustainability of the improved stoves, there is an urgent need for a network mechanism involving the Ministry of Non Conventional Energy Sources, Ministry of Health and Family Welfare, and Ministry of Human Resource Development for establishing and enforcing effective policies in this area. *Agency: Ministry of Non-Conventional Energy Sources/Ministry of Health and Family Welfare/ Ministry of Human Resource Development*

2.7 NOISE POLLUTION AND HEALTH

2.7.1 Summary of issues

- Increase in urbanization has led to noise pollution. Excessive burden of vehi-

cles in metropolitan cities, use of generators, and the lack of discipline regarding noise pollution are the main causative factors. Further, the lack of laws against noise pollution aggravates the problem. Exposure to noise can permanently damage hearing and have deleterious effects on the brain, heart and other parts of the body.

- A survey undertaken from 1994 to 1996 in Calcutta on the effects of noise pollution found that at least 60 per cent of the respondents suffered from some kind of hearing loss. [38]
- Occupational exposure to noise poses a serious health problem. A study of 500 textile workers revealed that hearing loss was incurred after a service of 6 years and it remained up to 10 years. After 20 years of service, the loss had become permanent. Another study found damaging effects of noise pollution on the hearing of workers in the BHEL industry in Hardwar.[39]
- In India, there is absolutely no enforcement of legislation on noise pollution to protect the civilian population against noise pollution.[40]
- There is a lack of scientific knowledge and public awareness on the subject in India.[41] The common man must know that loud noise – whatever be the source – harms the acuity of hearing over time. The deafness caused as a result is nerve deafness for which there is no cure.

2.7.2 Policy issues

Action for environmental management

A policy is needed to re-introduce silent/noise free zones especially around hospitals and residential areas. *Agency: Ministry of Home Affairs/ Ministry of Health and Family Welfare*

To reduce noise pollution, it is necessary to reduce the burden of vehicles. Therefore, a policy is needed to establish a mass rapid transit system as an alternative mode of transportation encompassing all the areas of the city. Urgent plans to remove major bottlenecks to traffic movements on arterial city roads, like construction of flyovers at crowded junctions, and removal of obstructions like hawkers, are needed to reduce noise pollution levels. *Agency: Ministry of Surface Transport/ Ministry of Environment and Forests*

Urgent plans are needed to remove major bottlenecks to traffic movements on arterial city roads by constructing flyovers at crowded junctions and removal of obstructions such as hawkers to reduce noise pollution. *Agency: Ministry of Surface Transport/ Ministry of Environment and Forests*

New airports should be sited far away from city limits. People living several kilometers around these airports are disturbed by noise pollution at odd times. *Agency: Ministry of Health and Family Welfare/Ministry of Civil Aviation*

Action for health management

Periodic medical and audiological examination of factory workers must be done. Also 5 per cent of traffic personnel are known to have hearing problems. A policy is needed to promote the medical examination of people exposed regularly to noise pollution. *Agency: Ministry of Labour*

Wearing of hearing protectors should be strictly enforced. Noise levels in factories should be strictly monitored. Workers should not be exposed to noise levels above 90 decibels (dBA) level for more than 8 hours. *Agency: Ministry of Labour*

Action for research

The research data available on noise pollution comes from developed countries where environmental conditions are different. Hardly any statistical data is available on health hazards of noise pollution in India. There is a need to conduct studies on the health effects of noise pollution. *Agency: Ministry of Health and Family Welfare*

Action relating to legal issues

There is no legislation to prevent factory workers and miners from being exposed to long duration of noise stress. In most industries, workers are not provided with ear protective devices to minimise health effects of noise pollution. Therefore, there is an urgent need for a legislation to introduce the use of protective ear devices in industrial and mine settings. *Agency: Ministry of Law, Justice and Company Affairs/ Ministry of Health and Family Welfare/ Ministry of Industries/Ministry of Steel/Ministry of Mines/Ministry of Labour*

No provision exists in the Factories Act for compensation on hearing loss and other side effects of noise pollution which include headaches, irritability, irregular menses in women and heart diseases. There is a need to introduce a provision in the Act for compensation for hearing loss and other effects. *Agency: Ministry of Law, Justice and Company Affairs/ Ministry of Health and Family Welfare/Ministry of Industries/Ministry of Labour*

Levels of noise from horns of various vehicles should be specified and regulated. There is a need to enact a legislation so that manufacturers design engines with these specified levels. Further, the use of horns should be restricted to emergencies. For this, sidewalks should be kept free of obstructions and jay-walkers should be severely punished as otherwise the resultant lack of order and absence of discipline can cause the whole system to fail. *Agency: Ministry of Law, Justice and*

Company Affairs/Ministry of Surface Transport/Ministry of Industry/Ministry of Environment and Forests

Action for public awareness raising

No attempt has been made to disseminate information on noise pollution. As a result, the public is ignorant about the health effects of noise stress. Information on noise pollution and its effects should be disseminated in regional languages through television and other media. *Agency: Ministry of Information and Broadcasting/ Ministry of Health and Family Welfare*

2.8 RADIOLOGICAL POLLUTION AND HEALTH

2.8.1 Summary of issues

- India's uranium mines at Jaduguda dump radioactive wastes into the wasteponds constructed on the rice fields of the adivasis. The wastes emit radioactive radiation which is lethal pollution and is causing severe forms of cancer among the people of Jaduguda.[42]
- A 1991 study near the Rajasthan Atomic Power Plant at Rawatbhata found high rates of congenital deformities, miscarriages, stll births, neonatal deaths, and tumours among residents near the plant. Nuclear radiation emitted from the plant is the most probable cause in these health problems.[43]
- In India, there is enough scope to for reducing the exposure of radiation. Unfortunately, regulatory mechanisms are almost non-existent.[44]

Radioactive pollution from the uranium mine in Jaduguda, Bihar is causing physical deformities in the people living around the mine.

2.8.2 Policy issues

Action relating to the institutional issues

Atomic Energy Regulatory Board, the regulatory agency which ensures nuclear safety in India, is not an independent body. It is under the Department of Atomic Energy. India has signed the International Convention on Nuclear Safety. According to this convention, the regulatory agency should be totally independent from all organisations involved in the promotion and utilisation of nuclear energy. Therefore, there is a need to set up a totally independent regulatory body with adequate technical and financial resources of its own and sufficient authority and infrastructure to implement directives to ensure the safety and regulation of civilian nuclear activities in India. *Agency: Ministry of Science and Technology/Department of Atomic Energy/Atomic Energy Regulatory Board*

There is a need for institutional arrangements through which the Atomic Energy Regulatory Board works in collaboration with the Ministry of Environment and Forests and the Ministry of Health and Family Welfare on issues relating to radiological pollution and public safety. *Agency: Ministry of Science and Technology/Department of Atomic Energy/Atomic Energy Regulatory Board/Ministry of Environment and Forests/Ministry of Health and Family Welfare*

Action relating to legal issues

The frequency of abortion in women, birth defects and health problems in children in villages close to nuclear power plants as well as health effects of workers employed in nuclear plants have been repeatedly by reported to be high. Presently, the Officials Secrets Act forbids public access to information on nuclear safety concerns. Therefore, there is a need for a policy to make information and data relating to the safety of our nuclear installations publicly available. *Agency: Ministry of Science and Technology/Department of Atomic Energy/Atomic Energy Regulatory Board/ Ministry of Health and Family Welfare*

Action for networking

The government does not involve NGOs or local communities in matters relating to nuclear safety. The government should inform non-governmental organisations and local communities about public health and safety aspects of nuclear power plants and other operations related to the nuclear cycle. *Agency: Ministry of Science and Technology/Department of Atomic Energy/Atomic Energy Regulatory Board/ Voluntary Action Network of NGOs*

2.9 INDUSTRIAL ACCIDENTS AND HEALTH

2.9.1 Summary of issues

- Industrialisation has made the country prone to major industrial disasters. The Bhopal gas tragedy in 1984 was responsible for 2,500 deaths in its immediate aftermath and left many tens of thousands affected.[45]
- Even after Bhopal many industrial disasters have taken place. There have been 119 disasters after Bhopal, says a 1997 report of the Ministry of Environment and Forests. These disasters include the oleum gas leak from the Shriram Fertilisers and Food Limited in Delhi in 1985, repeated leaks from the Kesoram Rayon factory in West Bengal, oleum gas leak in Pune in 1987, a fire in a plastic factory in

Delhi in 1995, a reported gas leak from the Hindustan Petrochemicals LPG Plant in Vishakapatnam in September 1997, and many others in Bombay and Pune.[46]

- There are many disasters which do not even come to public attention. The number of times drinking water treatment plants at Haiderpur and Wazirabad in Delhi have had to be closed on an emergency basis because of a sudden increase in pollution of the raw water caused by industries upstream, has been steadily increasing. In 1994, Wazirabad treatment plant had to be shut down 13 times — about once a month.[47] In 1990, an oil spill from the Bokaro Steel Plant into the Damodar went unnoticed for four days during which five million people in the area kept on drinking contaminated water.[48] The Ganga is reported to have got so polluted by an oil refinery near Monghyr in 1968 that it even caught fire.[49]

2.9.2 Policy issues

Action for environmental management

Documents prepared by industrial consultants on risk management (district management plans) should be approved by regulatory authorities in a manner similar to environmental clearances. These clearance committees should have experts who can interpret risk modeling results presented by industries and use them appropriately as decision support information for planning. Approval by the clearance committee may be subsequently audited by an independent authority. *Agency: Ministry of Industry/Ministry of Labour/Ministry of Environment and Forests/Ministry of Labour/Factories Inspectorates/Pollution Control Boards /State governments*

A number of factories are located in residential areas or close to residential areas. Moreover, slums mushroom close to the premises of the factories. A policy is needed to strictly ban factories in residential areas and to ban inhabitation around factories. We need to rationalise location of new factories on the basis of natural resources, communication, labour availability and markets for the products produced. The expansion, renovation of existing and old factories should be based on use of modern technology for purposes of undertaking pollution control and manufacturing. *Agency: Ministry of Industry/Ministry of Labour/Ministry of Environment and Forests/Ministry of Labour/Factories Inspectorates/Pollution Control Boards/ State governments*

Action for financial issues

In India, industrial emergencies have not been managed to a large extent because of the lack of industry initiatives to make investments in the area of industrial safety. There is a need for a policy to ensure that industries are motivated to enter risk minimisation programmes. A financial carrot-and-stick mechanism can be adopted by the government by involving various stakeholders. For instance, insurance premia can be linked to quantitative risk assessment which may automatically force industry to do better risk analysis studies. Further, tax breaks can be provided to facilities which can publicly demonstrate a reduction in the risk they pose. *Agency: Ministry of Finance/ Ministry of Industry/Ministry of Labour/Ministry of Environment and Forests/Ministry of Labour/Factories Inspectorates/Pollution Control Boards/State governments*

In India, industrial emergencies have not been managed proporly because of the lack of industry initiative to make investments in the area of industrial safety. A financial carrot-and-stick mechanism should be adopted by the government by involving various stakeholders.

Action relating to legal issues

In industrial accidents, compensation to workers and local communities has been inadequate leading to an increased burden of ill-health. A policy is needed to increase compensation by significant amounts. *Agency: Ministry of Law, Justice and Company Affairs/ Ministry of Industry/Ministry of Labour/Ministry of Environment and Forests/Ministry of Labour/Factories Inspectorates/ Pollution Control Boards/ State governments*

Action relating to education/training

Few industrial and regulatory agencies are willing to spend money training their personnel. Training industry personnel and regulators is a very important area of risk management. There is a need for a policy to ensure that industrial firms impart orientation and training on safety and emergency preparedness to workers. Industrial workers should be given a proper orientation course on how to handle equipment, types of disaster which can occur, and how to cope with and manage disasters. Similarly, regulators such as district magistrates who are in-charge of

approving district management plans submitted by major hazardous units should be trained to handle their responsibility effectively. *Agency: Ministry of Industry/Ministry of Labour/Ministry of Environment and Forests/Ministry of Labour/Factories Inspectorates/Pollution Control Boards/State governments*

Action for public awareness raising

Free access to all documents pertaining to major accident hazard risks should be allowed, including risk analysis studies and District Management Plans. Regulatory agencies handling industrial safety should provide information on web sites, through written booklets and handouts and on notice boards, in their office. *Agency: Ministry of Industry/Ministry of Labour/Ministry of Environment and Forests/Ministry of Labour/Factories Inspectorates/Pollution Control Boards/State governments*

Action relating to institutional issues

Implementation of existing regulations is tardy and done by many agencies — Pollution Control Boards, Factories Inspectorates, Explosive Inspectorate, Atomic Energy Regulatory Board, Dock Safety Board, etc. — which are not well equipped for the task. There is a need to strengthen a select number of agencies by providing them the state-of-the-art technology and communication facilities. There is also need for a network mechanism by which these agencies can collaborate on issues of industrial safety *Agency: Ministry of Industry/Ministry of Labour/Ministry of Environment and Forests/Ministry of Labour/Factories Inspectorates/Pollution Control Boards/State governments*

Regulatory measures and setting standards

One reason for poor risk management in India is the lack of adequate standards, regulations and guidance documents. Regulatory authorities must develop yardsticks, that is, standards and regulations, by which industry must be evaluated for its risk management efforts and which will provide guidance on how to meet them. For instance, standards and regulations are needed for site selection of new sites and plant layouts, the maximum allowable storage and handling of hazardous material in industrial units, zoning and banning of new activities around existing hazardous facilities, and risk communication.

Similarly, the government should lay down guidelines for evaluating risk analysis, emergency personal protective equipment, spill containment control and cleanup, medical emergency procedures, and resource planning for emergencies. *Agency: Ministry of Industry/Ministry of Labour/Ministry of Environment and Forests/Ministry of Labour/Factories Inspectorates/Pollution Control Boards/State governments*

2.10 CHANGES IN THE NATURAL RESOURCE BASE AND HEALTH

2.10.1 Summary of issues

- When water, firewood and fodder become scarce because of deforestation and land degradation, women have to spend enormous amounts of time collecting them. The social position of rural women makes it difficult to break out of the vicious cycle of overwork and ill-health.[50]
- Almost no study has been conducted in India to assess what excessive work burden does to the health of women. One study carried out by Sahayog, an environmental NGO in Uttarakhand, in 1996-97 involving over 1,000 women in ten locations across all the districts of Uttarakhand, estimated that the proportion of spontaneous abortions was 30 per cent, some 5 times higher than the average rate of abortion estimated for most Indian states in the National Family Health Survey of 1992-93. The study attributes the alarming health condition of women to their excessive work burden and poor nutritional status.[51]
- Trees play an important role in the precipitation of allergic symptoms and disorders. Some 10 per cent of the Indian population suffered from allergic disorders in 1965; the incidence of the disease will be much higher. However, the role of pollen grains and fungi from trees in aggravating these disorders has not been given due attention by the authorities in India.[52]

2.10.2 Policy issues

Action for environmental management

Deforestation in rural areas has resulted in an excessive work burden for women. Women have to walk miles to fetch water, fire wood and fodder. Most of these women die prematurly. Therefore, a policy is needed to increase afforestation. *Agency: Ministry of Environment and Forests*

Deforestation has led to the destruction of traditional herbs. A result of all this is the declining health status of tribals who do not have access to modern medicine. There is a need for a policy to improve health services to tribals. *Agency: Ministry of Health and Family Welfare/state governments*

Action for research

In most rural areas the job of meeting fuelwood, fodder and water requirements rests with women. The effect that this heavy burden has on the health of rural women is largely unknown. There is an urgent need for studies on the effect of work burden on the health of rural women. This should include physical as well as mental health. *Agency: Ministry of Health and Family Welfare/ Ministry of Rural Development*

There is an urgent need to take a look at the kind of technology women require in their households in terms of transportation and energy in order to reduce their excessive work burden.

Several new types of trees are being planted but there is no screening of their health effects such as allergic disorders. There is mounting evidence that respiratory problems due to allergies are on the rise, but very few studies have been conducted to correlate the effect of allergy-causing plants on such health disorders. Therefore, there is a need to more conduct studies to identify allergy-causing plants and their effects on allergic disorders. *Agency: Ministry of Environment and Forests*

Action for monitoring

Census of India does not include data on the health effects due to deforestation. One way out is to develop a detailed approach for the identification of the parameters of interest and collection and analysis of relevant data on this issue. These data can be collected in the next census. *Agency: Ministry of Environment and Forest/ Ministry of Home Affairs*

Action for public awareness raising

Rural women suffer from several health problems due to excessive work burden, but rarely seek medical assistance due to certain social stigma. There is a need to educate women on the health impacts of an excessive work burden and ways to seek medical assistance. *Agency: Ministry of Health and Family Welfare*

Action for technology changes

There is an urgent need to take a look at the kind of technologies women require in their households in terms of transportation and energy in order to reduce their work burden. Although there is a small programme in the Department of Science

and Technology on science and technology for women, it is not innovative and whatever ideas exist, the ability to disseminate them to the field is lacking. A serious programme in this field could play a significant serious role in reducing women's work burden. For instance, an efficient solar water heating system developed in villages could go a long way in reducing the quantum of wood required for heating water in the hilly and mountainous states. Similarly, women's needs should be taken into account when planning transport activities in rural areas. *Agency: Ministry of Science and Technology*

There is a need for providing alternatives to women to reduce the hazardous nature of the occupations they are engaged in. Cooking in badly ventilated small rooms with fuelwood exposed to smoke for long hours which affects their general health specially the eyes and lungs is one issue. The adverse impact of the health of women on account of lack of sanitation facilities in households which necessitates controlling themselves and the unhygienic surroundings which expose them to pollution and viruses, diseases, lack of community response in controlling these conditions due to waste disposal practices, deforestation, etc. need to be emphasized. *Agency: Ministry of Science and Technology/ Ministry of Health and Family Welfare/ Ministry of Environment and Forests*

2.11 HEALTH EFFECTS OF LACK OF SANITARY AND WASTE DISPOSAL FACILITIES

2.11.1 Summary of issues

- Everyday 630 million litres of untreated or partially treated sewage enters into the Yamuna river.[9] Only 200 cities and towns in India out of 4000 have sewerage systems and that too partial. Less than 50 per cent of the urban population have access to sanitary excreta disposal systems. Less than 10 per cent of the rural population have access to sanitation facilities.[53]
- In rural Kerala, for example, over 80 per cent of the households have no latrine facilities, and at least 50 per cent of households have to fetch their water from communal wells. Open defecation, poor hygiene and proximity of communal wells to private soakways or pit latrines results in most wells being highly contaminated with coliform bacteria. The development of compost toilets in certain districts of Kerala which utilise less water and result in no pollution of the groundwater has shown a significant way forward by serving as a cost effective solution to the human waste disposal problem.[54]
- Leptospirosis, a disease caused by water contaminated with urine of rodents and animals, is being increasingly reported in India now. It is assuming significance as an environmentally acquired infection and may cause serious complications like renal failure, pneumonia, meningitis, etc. with very high case

fatality rates. Unplanned urbanisation, improper disposal of waste, sewage and conventional and agricultural practices are important factors in the transmission of the disease. In 1997 several outbreaks were reported from Karnataka, Gujarat, Andamans and Maharastra. The actual disease burden in the country is not known due to lack of awareness and difficult diagnostic procedures [55]

- Improper disposal of medical waste poses a serious health risk. In Delhi alone, some 60 metric tonnes of medical waste is generated every day. A portion of this waste is disposed off in badly operated waste incinerators which are one of the largest sources of cancer-causing chemicals like dioxins and furans. In the last one year, Japan which went in for waste incineration more than any other country in the West, has suddenly found very high levels of dioxin in the soil because it found a better technique to measure dioxins in the environment. The lesson is: We may not even know for long what is lurking in our soils.[56]
- Extremely inadequate facilities of disposal of urban solid waste will create a critical situation in most urban centres in India during the next decade. At the rate of 500 grams of solid waste per capita per day, 150 million urban people will produce about 75,000 tons of solid waste daily. Urban planners and municipal managers must take note of this serious problem which could have disastrous impacts on the urban environment and community health.

2.11.2 Policy issues

Action for environmental management

Flush toilets and underground sewerage systems are not available in most villages and towns of India. Even today, several suburbs of Mumbai do not have an under-

Improper disposal of medical waste in badly operated incinerators is one of the leading source of cancer causing chemicals like dioxins.

ground sewerage system. Recent attempts of the government to introduce community latrines in different districts is making very slow progress where sanitation is viewed as a convenience and not as a measure that promotes good health. There is urgent need to promote compost toilets in rural and urban areas. For example, compost toilets have been successfully installed and sustained in some districts of Kerala with participation of women. There is a need to promote such cost-effective and environment-friendly technologies on a nationwide basis. *Agency: Ministry of Health and Family Welfare*

Hospital wastes, which contain toxic substances, are treated similar to other municipal wastes and disposed off in an inappropriate manner. For instance, solid and liquid waste is disposed off together, when actually they should be separated at source. Further, in certain hospitals where waste is disposed off in incinerators, their improper maintenance and functioning (for example, running the incinerator at temperatures lower than required temperatures) leads to the emission of lethal chemicals such as dioxins. Efforts are needed for the enforcement of Biomedical Waste (Management and Handling) Rules 1988. Handling friendly method of segregation of bio-medical waste at the source of generation is required to be developed so that toxic and hazardous waste is collected, treated, transported and disposed off properly. Feasibility of shared incinerator treatment facilities also needs to be explored. Methods of sterilisation for adopting at different units of the biomedical establishments also need to be standardised. *Agency: Ministry of Environment and Forests/Ministry of Health and Family Welfare*

A political commitment is needed to ensure that sanitation is followed by setting individual examples from the top. Political masters and bureaucrats do not keep their own toilets in government buildings and surroundings clean. Though the office chambers where high government officials sit are remarkably clean, the urinals and toilets in the same complex are dirty and stink. There is an urgent need to keep all government offices and public spaces clear before bureaucrats in charge of health and hygiene embark on a sanitation drive. *Agency: Ministry of Health and Family Welfare/All Central and State Government Offices*

The government should adopt the pay and use system for public toilets. We believe that people will pay for sanitary facilities if they are clean and hygienic. This would not only help to keep the urinals and toilets clean but even make municipalities self-sustainable to a certain extent. *Agency: Ministry of Health and Family Welfare/Municipalities*

Action for health management

In most development projects initiated by the government, which later lead to

many types of diseases in the surrounding areas, no significance is given to health issues. Therefore, there is a need to ensure that development projects are evaluated for their health impact before they are initiated. *Agency: Ministry of Health and Family Welfare*

At present, leptospirosis is not a notifiable disease. As a result there are no governmental regulations to ascertain the burden of disease or reduce disease incidence on a nationwide basis. Therefore, there is an urgent need to make leptospirosis a notifiable disease. *Agency: Ministry of Health and Family Welfare*

Action for financial issues

At present only 0.5 per cent of the overall health budget is allocated for waste disposal and sanitation. There is a need to allocate more funds to improve the waste disposal and sanitation system. *Agency: Ministry of Finance/Ministry of Environment and Forests/Ministry of Health and Family Welfare*

Action for public awareness raising

There is an absence of education regarding community-level waste management and proper personal hygiene among people. There is an urgent need to design and promote an extensive education programme on better waste management and sanitation habits. *Agency: Ministry of Information and Broadcasting/ Ministry of Health and Family Welfare*

There is urgent need to educate people especially agricultural, sewage and veterinary workers about the cause and transmission of leptospirosis. The medical and veterinary professionals also need to be made aware of the changing clinical spectrum of the disease. *Agency: Ministry of Health and Family Welfare*

LIST OF PARTICIPANTS

Chairperson of Conference

1. Dr. V Ramalingaswami, National Research Professor, X-29, Hauz Khas, New Delhi 110016.

Water Pollution and Health

2. Prof A K Susheela, Programme Director, Fluorosis Research and Rural Development Foundation, C-13 Qutub Institutional Area, New Delhi 110016.
3. Dr B K Sircar, Deputy Director, National Institute of Cholera and Enteric Diseases, CK-203, Sector II, Salt Lake, Calcutta 700099.
4. Dr Dipankar Chakraborti, Director, School of Environmental Studies, Jadavpur University, Calcutta 700032.
5. Prof K J Nath, Director, All India Institute of Hygeine and Public Health, 110 Chittaranjan Avenue, Calcutta 700032.
6. Dr P S Dutta, Principal Scientist, Nuclear Research Laboratory, Indian Agricultural Research Institute, Pusa Campus, New Delhi 110012.
7. Dr Sahab Dass, Lecturer (senior scale), Dayalbagh Educational Institute, Department of Chemistry, Faculty of Science, DEI, Dayalbagh, Agra.
8. Dr Subrat Panda, Professor, Department of Pathology, All India Institute of Medical Sciences, Ansari Nagar, New Delhi 110029.

Vectors and Environmental Management

9. Dr C P Thakur, Physician and Cardiologist, Kalazar Research Centre, Balaji Utthan Sansthan, Patna Uma Complex, Fraser Road, Patna 800001.
10. Prof Ishwar Prakash, Principal Investigator, Ecology of Small Mammals in theHilly Tracts of Aravalli and Vindhyam Rock Systems in Southeastern Rajasthan, Desert Regional Station, Zoological Survey of India, 107 Kamla Nehru Nagar, Chopsani Road, Jodhpur 342009, Rajasthan.
11. Dr N L Kalra, Consultant, Malaria Research Centre, 20 Madhuban, Delhi 110092.
12. Dr P K Das, Director, Vector Control Research Centre, Indira Nagar, Pondicherry 605006.
13. Dr Richard Montanari, Medical Officer (Epidemiology), Control of Tropical Diseases Unit SEARO, WHO, Indraprastha Estate, Mahatma Gandhi Marg, New Delhi 110002.
14. Ms Shailja Chandra, Secretary, Department of Indian Systems of Medicine and Homeopathy (ISM&H) Ministry of Health and Family Welfare, Red Cross Building, New Delhi 110001.
15. Prof T Jacob John, Department of Clinical Virology, Christian Medical College and Hospital, Ida Scudder Road, Post Box No 3, Vellore 632004, Tamil Nadu.
16. Dr V P Sharma, Former Director, Malaria Research Centre, D-I/55, Satya Marg, Chankayapuri, New Delhi 110021.

Ambient Air Pollution and Health

17. Prof C K Varshney, School of Environmental Studies, Jawaharlal Nehru University, New Delhi 110067.
18. Prof J N Pande, Professor and Head, Department of Medicine, All India Institute of Medical Sciences, Ansari Nagar, New Delhi 110029.
19. Karim Ahmed, Deputy Director, Health, Environment and Development, World Resources Institute, 1709 New York Avenue, N.W., Washington DC 20006, USA.
20. Dr Kseniya Lvovsky, Environmental Economist, Environment and Natural Resources Division, The World Bank, 1818 H Street NW, Washington DC 20433, USA.
21. Dr S K Chabbra, Reader and Head, Department of Cardiorespiratory Physiology, Vallabhai Patel Chest Institute, University of Delhi, Delhi 110007.

22. Prof S R Kamat, Lung Specialist, Shiv Pratap Clinic, 504/ A-101, Shiv Prasad 1st Floor, V S Agashe Path, Off. Bhavani Shankar Road, Near Kohinoor Tech. Institute, Off. Senapati Bapat Marg, Dadar, Mumbai 400028.
23. Dr Sameer Akbar, Environmental Specialist, World Bank, 70 Lodi Estate, New Delhi 110003.
24. Prof Veena Kalra, Department of Pediatrics, All India Institute of Medical Sciences Ansari Nagar, New Delhi 110029.

Environmental Toxins and Health

25. Dr Debi Mukherjee, Assistant Director General (PFA), Directorate General of Health Service, Ministry of Health and Family Welfare, 5th Floor, Nirman Bhavan, Maulana Azad Road, New Delhi 110001.
26. Prof Devika Nag, Former Head, Department of Neurology, King George Medical College, 24, New Bery Road, Lucknow.
27. Dr H N Saiyed, Director, National Institute of Occupational Health, Meghani Nagar, Ahmedabad 3800016, Gujarat.
28. Dr H S Wasir, Medical Director, Batra Cancer Care Centre, 1, Tuglakabad Institutional Area, New Delhi 110062.
29. Mr Hay Souree, Director, Yardi and Soree Private Ltd, E-110 Saket, New Delhi 1100????
30. Prof K C Sahu, Former Professor, Indian Institute of Technology, Mumbai, F-302, Pawai Park, L-1 Plot, Hiranandani Gardens, Pawai, Mumbai 400076.
31. Prof K N Mehrotra, Professor Emeritus, Indian Council of Agricultural Research, B-1/1604, Vasant Kunj, New Delhi 110070.
32. Dr Kamala Gopalkrishnan, Deputy Director, Institute for Research in Reproduction, Jehangir Merwanji Street, Parel, Mumbai 400 012.
33. Prof M S Krishnamoorthy, Director, Dr A L Mudlaidar Institute of Basic Medical Sciences, University of Madras, Taramani, Chennai 600113, Tamil Nadu.
34. Mr Manmohan Sharma, Voluntary Health Association of Punjab, SCF 18/1 Sector 10D, Chandigarh 160011.
35. Prof N K Ganguly, Director General, Indian Council of Medical Research, Ansari Nagar, New Delhi 110029.
36. Dr Nerges F Mistry, Sr Research Officer, The Foundation for Medical Research, 84 - A, RG Thadani Marg, Worli, Bombay 400018.
37. Dr P K Seth, Director, Industrial Toxicological Research Institute, Mahatma Gandhi Marg, Post Box 80, Lucknow 226001.
38. Dr T S Kathpal, Senior Pesticide Chemist, Department of Entomology, College of Agriculture, CCS Haryana Agricultural University, Hisar 125004.
39. Dr V K Dua, Officer-Incharge, Malaria Research Centre, Field Station, BHEL Complex, Sector III Dispensary, Ranipur, Haridwar 249403.
40. Dr V P Sharma, Former Director, Malaria Research Centre, D-I/55, Satya Marg, Chankayapuri, New Delhi 110021.

Environmental Changes and Nutrition

41. Dr Chandrakant Pandav, Additional Professor, Centre for Community Medicine, All India Institute of Medical Sciences, Ansari Nagar, New Delhi 110029.
42. Dr J S Kanwar, Additional Professor, Centre for Community Medicine, All India Institute of Medical Sciences, Ansari Nagar, New Delhi 110029.
43. Prof Maharaj Kumar Bhan, Department of Pediatrics, All India Institute of Medical Sciences, Ansari Nagar, New Delhi 110029.
44. Dr P N Tackar, Former Director, Indian Institute of Soil Sciences, Department of Soil Science, Indian Agricultural Research Institute, Pusa Campus, New Delhi 110012.
45. Dr R K Ratan, Senior Scientist, Department of Soil Science, Indian Agricultural Research Institute, Pusa Campus, New Delhi 110012.
46. Dr Vaidya Balendu Prakash, Founder and Principal Trustee, Vaidya Chandra Prakash Cancer Research Centre, Mandir Marg, Clementown, Dehradun 248002.

Indoor Air Pollution and Health

47. Dr D Kanungo, Head, Division of Medical Toxicology, Cenrbari Seth Block, Habitat Place, Lodhi Road, New Delhi 110003.
48. Dr Kirk Smith, Professor, Centre for Occupational and Environmental Health, 140 Warren Hall, 7360 University of California, Berkeley, Pin CA94720-7360 USA
49. Dr Jamuna Rama Krishna, Programme Officer, HIVOS-Humanistic Institute for Development Cooperation, Flat No. 402, Eden Park, 20 Vital Mallaya Road, Bangalore 560001.
50. Mr Sumeet Saxena, Fellow, Area Convenor, Centre for Environment Studies, Tata Energy Research Institute, Darbari Seth Block, India Habitat Centre, Lodi Road, New Delhi 110003.
51. Ms Madhu Sarin, Consultant, 48, Sector 4, Chandigarh 160001.
52. Dr V P Sharma, Former Director, Malaria Research Centre, D-I/55, Satya Marg, Chankayapuri, New Delhi 110021.
53. Dr Veena Joshi, Swiss Agency for Development and Corporation, Embassy of Switzerland, Chandragupta Marg, Chanakapuri, New Delhi 110021.

Noise Pollution and Health

54. Dr Abir Lal Mukherjee, Former Head, Department of ENT, Calcutta Medical College, 15/1 Nirmal Chandra Street, Calcutta 700012.
55. Mr M K George, Scientist, Delhi Pollution Control Committee, Department of Environment, 4th Floor, ISBT Building, Delhi 110006.
56. Prof S B Ogale, Head, Department of Otolaryngology, GS Medical College and KEM Hospital, Flat No. 3, Old C O Quarter, K E M Hospital, Parel, Mumbai, Maharashtra 400012.
57. Prof Santosh Kacker, Former Director, AIIMS, Head, Dept. of Ear Nose Throat, Batra Cancer Reseach Centre, Tuglakabad Institutional Area, New Delhi 110062.
58. Prof S Kameshwaran, Prof Emeritus, Madras Medical College, Honorary ENT Surgeon to President of India, Madras ENT Research Foundation (P) Ltd. 2, P S Sivasamy Salai, Mylapore, Madras 600004.
59. Dr T S Siddhu, Head, Department of Ear Nose Throat, Ram Manohar Lohia Hospital, New Delhi.

Radiological Pollution and Health

60. Dr A Gopalakrishnan, Former Chairman, Atomic Energy Regulatory Board, Engineering Staff College of India, Gachibowli, Old Mumbai Road, Hyderabad 500032.
61. Dr G K Iyer, Former Incharge, Occupational Health, Babha Atomic Research Centre, 26/73 Saptrishi, Bandra Reclamation, Bandra (W), Mumbai 400050.
62. Dr Sanghamitra Gadekar, Anumukti, C/o Sampurna Kranti Vidyalaya, Vedchhi, via Vellore, Valod, Surat 394641, Gujarat.
63. Dr U C Mishra, Director, Health Safety and Environment Group, Bhabha Atomic Research Centre, Trombay, Mumbai 400085.
64. Dr V T Padmanabhan, Director, Centre for Industrial Safety and Environmental Concerns, PO BMC, Kennedy Junction, Kochhi 21, Kerala.
65. Mr Xavier Dias, BIRSA, PO Box No. 3, PO Chaibasa, District Singhbhum, Jharkhand, Bihar 833201.

Industrial Accidents and Health

66. Dr L Mishra, Secretary, Ministry of Labour, Government of India, Shram Shakti Bhavan,

New Delhi 110001.

67. Dr Meenakshi Chaswal, Research Associate, Department of Biostatics and Medicine, University College of Medical Sciences, Guru Tegh Bahadur Hospital, Delhi 110095.
68. Dr M P Dwivedi, Former Director, Bhopal Gas Disaster Research Centre (ICMR), A-67 Shahpuri, Bhopal 462016.
69. Dr R K Tiwary, Scientist, Environment Management Group, Central Mining Research Institute, Barwa Road, Dhanbad 826001.
70. Dr S Sriramachari, Former ICMR Scientist, c/o Institute of Pathology, Safdarjung Hospital Complex, Post Box No 4909, New Delhi 110029.
71. Dr Sagar Dhara, Director, Cerana Foundation, E-303, Highrise Apts, Lower Tank Bund Road, Hyderabad 500080.
72. Dr U K Mishra, Department of Neurology, Sanjay Gandhi Post Graduate Institute, of Medical Sciences, Lucknow 226001, Uttar Pradesh.
73. Dr V K Vijayan, Senior Deputy Director and Head, Cardio-Pulmonary Medicine, Tuberculosis Research Centre, Mayor VR Ramanathan Road, Chetput, Chennai 600031.

Environmental Changes and Health

74. Dr A B Singh, Deputy Director, Aerobiology and Allergy Laboratory, Centre for Biochemical Technology (CBT), Mall Road, Near Jubilee Hall, Delhi 110007.
75. Mr Anil Agarwal, Director, Centre for Science and Environment, 41, Tuglakabad Institutional Area, New Delhi 110062.
76. Ms Asha Das, Former Secretary, Department of Women and Child Development, Ministry of Social Justice and Empowerment, Government of India, Room 604, A Wing, Shastri Bhawan, New Delhi.
77. Ms Jashodhara Dasgupta, Sahayog, Prem Kuti, Pokhar Khali, Almora, Uttar Pradesh 263601.
78. Dr Narendra Gupta, Director, Prayas, Village - Devgarh (Deolia), Via - Pratapgarh, Dist - Chittorgarh, Rajasthan 312621.
79. Dr Neeru Singh, Officer-in-Charge, Malaria Research Centre, Field Station, Jabalpur 482003.
80. Prof S Chanda, Division of Palynology and Environmental Biology, Bose Institute, 93/1 Acharya Prafulla Chandra Road, Calcutta 700009.
81. Dr Salil Basu, Health Anthropologist, I-1628 Chittranjan Park, New Delhi 110019.

Health Effects of Lack of Sanitary and Waste Disposal Facilities

82. Dr Singh, Sulabh International, Institute of Health and Hygiene, Sulabh Bhavan, Mahavir Enclave, Palam Dabri, New Delhi 110045.
83. Prof. K C Sivaramakrishnan, Centre for Policy Research, Dharma Marg, Chanakyapuri, New Delhi 110021.
84. Prof K J Nath, Director, All India Institute of Hygeine and Public Health, 110 Chittaranjan Avenue, Calcutta 700032.
85. Mr Paul Calvert, Team Leader, Training in Sea Safety Development Programme, Pulari, TC 42/937 (11), Asan Nagar, Vallakadavu, Trivandrum 695008.
86. Mr Ravi Agarwal, Centre Coordinator, Srishti, 1001, Antariksha Bhavan, 22 Kasturba Gandhi Marg, New Delhi 110001.
87. Dr Rita Mathur, Scientist, c/o Rajiv Gandhi Mission, Government of Madhya Pradesh, Mantralaya Vallabh Bhavan, Bhopal 462004.
88. Dr Subhash C Sehgal, Director, Regional Medical Research Centre, (Indian Council of Medical Research), Port Blair 744101, Andaman and Nicobar Islands, India.
89. Dr Uno Winblad, Pataholm 5503, S 38492 ALEM, Sweden.

REFERENCES

1. Anil Agarwal 1996, Payoffs to progress, in Down to Earth, Society for Environmental Communications, New Delhi, October 15, Vol. 5, No.10, p 31.
2. Carter Brandon and Kirsten Homman 1995, The cost of inaction: Valuing the economy-wide cost of environmental degradation in India, World Bank.
3. A K Susheela 1998, Environmental change and its impact on fluorosis in India, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment, July 1998.
4. Dipankar Chakraborti 1998, Arsenic in groundwater in eight districts of West Bengal: The biggest arsenic calamity in the world, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment, July 1998.
5. P S Dutta 1998, National overview on the chemical contamination of groundwater in India, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment, July 1998.
6. B Singh and G S Dhaliwal 1996, Pesticide residues in the environment, in Agriculture and Environment, p 67- 70.
7. Anil Agarwal 1996, Facing a silent spring, in Down To Earth, Society for Environmental Communications, New Delhi, November 30, Vol. 5, No. 13, p 34.
8. A Nair et al 1996, DDT and HCH load in mothers and their infants in Delhi, India, in Bulletin of Environmental Contamination and Toxicology, Vol. 56, p 58-64.
9. K. Kannan et al 1997, Organochlorine pesticides and polychlorinated biphenyls in food stuffs from Asian and oceanic countries, in Review of Environmental Contamination and Toxicology, Vol. 152, p 1-55.
10. State of India's Environment Series - 4, 1997, Homicide by Pesticide, Centre for Science and Environment, New Delhi,Yamuna the river of death.
11. Report of the Independent Commission on Health in India 1997, Voluntary Health Association of India, New Delhi, p 167
12. Anon 1984-85, The State of India's Environment, Citizens' Second Report, Centre for Science and Environment, New Delhi.
13. Anon 1994, Health Information of India, Central Bureau of Health Intelligence, Government of India, p 141.
14. N Raghuram 1996, Borne again, in Down to Earth, Society for Environmental Communications, New Delhi, June 30, Vol. 5, No. 3, p 28.
15. C P Thakur 1998, National overview of kalaazar, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
16. N L Kalra 1998, Impact of environmental changes on the epidemiology of visceral leishmaniasis in India, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
17. Anon 1984-85,The State of India's Environment, Citizens' Second Report, Centre for Science and Environment, New Delhi, p 254.
18. Anon 1998, A close hard look, in Down to Earth, Society for Environmental Communications, New Delhi, July 15, Vol. 7, No. 4, p 34.
19. Carter Brandon and Kirsten Homman 1995, Valuing environmental costs in India: The economy wide impact of environmental degradation, World Bank.

20. Priti Kumar et al 1997, Death is in the air, in Down To Earth, Society for Environmental Communications, New Delhi, November 15, Vol. 6, No. 12, p 29.
21. Priti Kumar and Sujata Bhattacharya 1999, When Wealth is not Health, in Down To Earth, Society for Environmental Communications, January 31, Vol. 7, No. 17, p 32-40.
22. 1997, Motor Transport Statistics of India, 1996, Transport Research Wing, Government of India.
23. M P Kueken 1998, Results of preliminary measurements and suggestions for the cost — effective air pollution assessment in Air Quality Management, Workshop on integrated approach to vehicular pollution control in Delhi, India Habitat Centre, New Delhi, p 184-190.
24. Anon 1997, Parivesh Newsletter, Central Pollution Control Board, December, Vol. 4 (iii).
25. Anon 1997, Devil in the diesel, in New Scientist, October 25, Vol. 156, No. 2105, p 4.
25a Ksenyia Lvovsky, 1998, Economic costs of air pollution with special reference to India, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment, July 1998.
26. A Nair et al 1996, DDT and HCH load in mothers and their infants in Delhi, India, in Bulletin of Environmental Contamination and Toxicology, Vol. 56, p 58-64.
27. Anon 1997, Decreasing sperm counts — Fact or Fiction, ICMR Bulletin, New Delhi, Vol. 27.
28. T C Anand Kumar and R H Mehta 1997, Declining semen quality in Bangaloreans: A preliminary report, in Current Science, Vol. 72, No. 9, p 621.
29. Anon 1996, Report on the water quality monitoring of the Yamuna river, Central Pollution Control Board (CPCB), New Delhi.
30. Anon 1982, The State of India's Environment, Citizens' First Report, Centre for Science and Environment, New Delhi, p 10.
31. J S Kanwar 1998, Policy measures needed to reduce soil micronutrient depletion, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
32. Anon 1984-85, The State of India's Environment, Citizens' Second Report, Centre for Science and Environment, New Delhi, p 20.
33. C S Pandav 1998, Ecological changes and its impact on iodine deficiency disorders, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
34. Anon 1991, Census of India, Provisional and Population Total — Rural and Urban Distribution, Registrar General Census Commissioner, India, Ministry of Home Affairs, New Delhi.
35. S Saxena and V Dayal 1997, Total exposure as a basis for the economic evaluation of air pollution in India, Energy Environment Monitor, Vol 13, No 2, p 93-101.
36. V Mishra, R D Retherford and K R Smith 1997, Effects of Cooking Smoke on Prevalence of Blindness in India, East-West Center Working Papers, in Population Series, Hawaii, No 91.
37. Anon 1997, Breathless, in Sunday, November, p 31.
38. A Mukherjee 1998, Health effects due to noise pollution, a case study in Calcutta, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
39. S Kacker 1998, Overview of the health effects of noise pollution with special reference to India, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
40. S Kameshwaran 1998, Effect of traffic characteristics on noise parameters, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
41. T S Siddhu 1998, Need for research on health hazards due to noise pollution in metropolitan India, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
42. Xavier Dias 1998, Radiological pollution from Jadugoda mines, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
43. S Gadekar 1998, A study of disease and congenital deformity pattern near the Rajasthan atomic power plant, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
44. V T Padmanabhan 1998, Overview of health effects of ionising radiation, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
45. Anon 1984-85, The State of India's Environment, Citizens' Second Report, Centre for Science and Environment, New Delhi, p 193.
46. Anon 1998, Observer, Economic Bureau, 1998, 119 industrial disasters after Bhopal Tragedy, in The Business and Political Observer, New Delhi, March 9.
47. Anon 1996, A report on the risk assessment on the river Yamuna, Indo- Dutch Project.
48. R K Tiwary 1998, Health and environmental effect of the oil spillage into Damodar river and policy measures needed to manage such disasters, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
49. Anon 1982, in The State of India's Environment, Citizens' First Report, Centre for Science and Environment, New Delhi, p 24.
50. Anil Agarwal 1992, Who will help her learn?, in Down to Earth, Society for Environmental Comnmunications, New Delhi, November 15, Vol. 1, No. 12, p 22.
51. Jashodhara Dasgupta and Abhijeet Das 1998, Health effects of women's excessive work burden in deforested rural areas of Uttarakhand, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
52. A B Singh and Arnima Rawat 1998, Aerobiology and allergic disease, an integrated approach, Centre for Biochemical Technology Conf. Pl. Biotech, p 72-79.
53. K J Nath 1998, National overview of the health effects of the lack of sanitation and waste disposal, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
54. P Calvert 1998, A Positive experience with composting toilets in India — Kerala case study, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
55. S C Sehgal and A P Sugunan 1998, Leptospirosis in India and control measures, Paper presented at the National Conference on Health and Environment organised by the Centre for Science and Environment in July 1998.
56. Anon 1998, Stricter dioxin rules means business, in Financial Times, March 22.