

## **Challenges of Sustainable Environmental Health in Developing Countries**

**K.J. NATH**

**President, Institution of Public Health Engineer, India  
Chairman, Arsenic Task Force, Govt. of West Bengal, India  
Regional Coordinator, South East Asia & Member,  
Scientific Advisory Board, International Scientific Forum on Home  
Hygiene (IFH), UK  
Vice Chancellor, Sulabh International Academy of Environmental  
Sanitation; Former Director, AIH&PH, Govt. of India**

### ***Abstract:***

One of the greatest failures of the last fifty years has been the failure to lay the foundation stones of public health in the developing world – hygiene, sanitation and water supply. It is a failure that today deprives hundreds of millions not only of health but of productivity. It is a failure that undermines the normal mental and physical growth of rising generations. It is a failure that pollutes fresh water resources with faecal matter on a massive scale. It is a failure that condemns more than a billion people to live with a daily environmental crisis of squalor, smells, and diseases. And it is a failure that holds back the development of people and of nations. Despite significant progress made in the economic & industrial development, the demographic and environmental health scenario continues to be a cause of serious concern in the developing countries particularly in those of Sub-Saharan Africa and South East Asia. The traditional problems of water and air-borne infections combine with malnutrition and poor environmental sanitation to form a vicious cycle which is increasing the burden of diseases beyond the capacity of the existing health infrastructure and jeopardizing the productivity of society. Today, while the urban population of these countries faces the development and environmental degradation, concurrently the rural population continues to suffer lack of sanitation and safe drinking water, malnutrition and ecological insecurity.

### ***Introduction:***

World Health Assembly 1998 Alma Ata adapted four key strategies for attaining health for all. One of these key strategies was “Promoting healthy lifestyles and reducing risk factors to human health that arise from environmental, economic, social and behavioral causes. If the agenda has remained unfinished by a wide margin, the primary reason could be found in our failure to develop an enabling policy for promoting a hygienic environment conducive to healthful living. Environmental services such as community water supply, sanitation, control of air and water pollution, waste disposal, personal and domestic hygiene along with nutrition and health education are central to the concept of preventive and social medicine and they are the key pillars of primary health care. An estimated

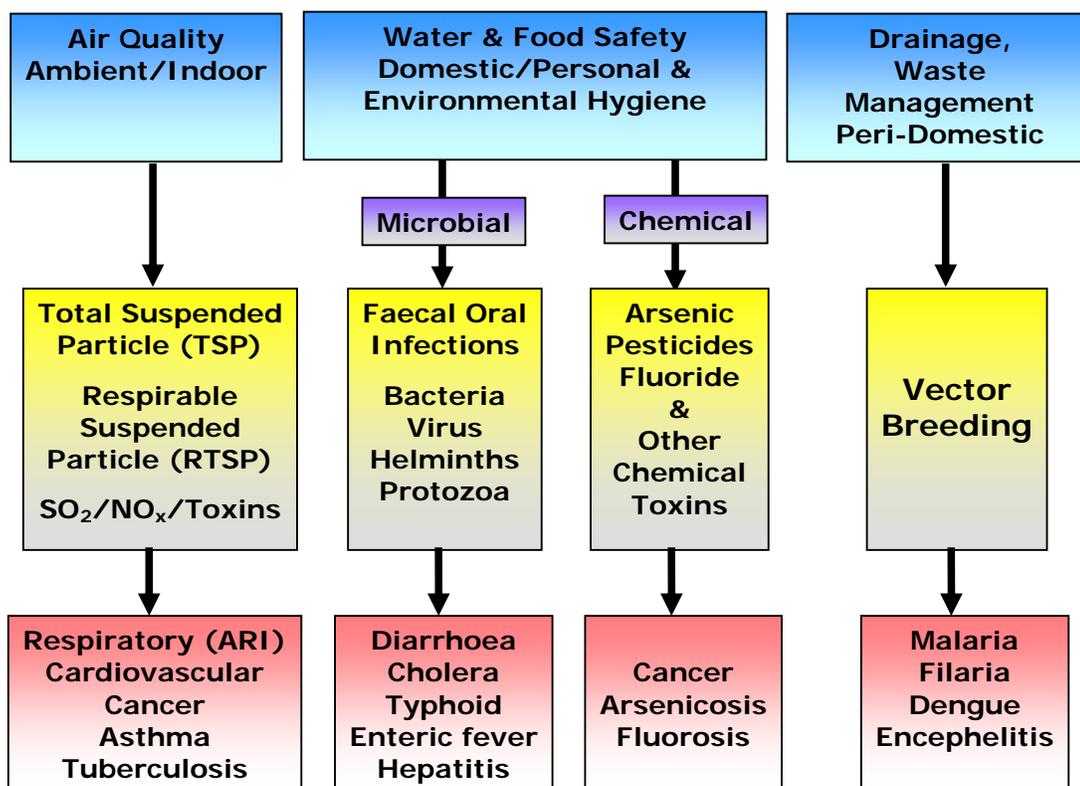
60-80% of all diseases and over 1/3<sup>rd</sup> of deaths in the developing countries are caused by environment related factors, and on an average as much as 1/10<sup>th</sup> of each person's productive time is sacrificed to environment related diseases.

In most of the developing countries of Asia and Africa the Health authorities are struggling to maintain balance between the competing priorities of curing diseases, containing epidemic along with promoting environmental and preventive health. The heavy and critical burden of diseases caused by environmental factors, is putting tremendous pressure on the health infrastructure, which can hardly cope up with the same.

**Environmental Threats to Public Health:**

The Figure below summarizes the major environmental threats to community health in the developing countries like pollution of ambient and indoor air, chemical and microbial contamination of water, soil and food and lack of sanitation, hygiene, drainage and waste management

**Figure-1**



**Environmental Threats to Public Health**

The faecal-oral infections caused by bacteria, virus, helminthes and protozoa attributable to unsafe water and lack of sanitation are causing huge burden of infectious diseases like diarrhoea, cholera, typhoid, enteric fever, hepatitis and critically high infant mortality. Pollution of ambient air in the urban environment

and indoor air pollution are causing acute respiratory infections (ARI) along with cardio-vascular diseases, asthma and lung cancer. This is also abating tuberculosis which has already assumed critical proportions because of poverty and malnutrition. Another emerging environmental health to community health is posed by contamination of soil and water sources by pesticides and heavy metals like Arsenic, Fluoride etc. Inadequate drainage and improper solid waste management are creating conditions conducive to vector breeding giving rise to vector borne diseases like malaria, filarial, dengue, encephelitis etc.

### ***Environmental Pollution in Urban Areas: A critical health concern***

Data in respect of non-communicable diseases related to environmental pollution and lifestyle are scanty. Cardiovascular diseases and cancer are on the increase in urban and industrial areas and psychological and neurological sickness due to high noise pollution is also causing concern. Both ambient air pollution and indoor and workplace environment are responsible for increasing respiratory episodes, asthma and acute respiratory infection. Though it would be difficult to project the exact burden of environmental and lifestyle-related non-communicable diseases, they may become one of the major public health problems in the developing countries, unless adequate measures are taken to arrest the environmental degradation of urban and industrial areas. The Table-1 depicts Annual health incidence and health costs due to ambient air pollution levels exceeding WHO guidelines in 36 Indian cities (using data from 1991-1992)

**Table-1**

	<b>Physical impacts</b>	<b>Cost valuation (US\$ millions)</b>
Premature deaths	40,351	170-1615
Hospital admissions and sickness requiring medical treatment	19,800,000	25-50
Minor sickness (including restricted activity days and respiratory symptom days)	1,201,300,000	322-437
Total		517-2102

Urban air today is a deadly cocktail of pollutants, thanks to the geometric growth of automobile vehicles on road and extremely inadequate emission control. Tiny respirable particulates (PM 10), exacerbate cardiac and respiratory problems; even at very low levels of exposure in the short run. These trigger cancer in the long term. Carbon monoxide impairs the oxygen carrying capacity of the blood. Sulphur-dioxide is associated with increased mortality and hospital admissions associated with respiratory and cardiac symptoms. Nitrogen oxides increase the susceptibility of respiratory systems and impair immune responses. To these we should add a range of air toxins including volatile organic compounds and polycyclic aromatic hydrocarbons. Figure 2 depicts the annual average levels of SPM in the ambient air of 36 Indian cities. Both in terms of total suspended

particulate matter (TSPM) and fine respirable particulate matter (RSPM) major Indian cities are critically contaminated. According to a WHO estimate of the 500000 deaths caused per year globally due to exposure to particulate pollution, 20% occur in India. Figure-3 depicts WHO estimates on excess deaths due to particulate matter in ambient air across various regions in the world. It could be seen that China, India and Central Eastern Europe are the most affected regions.

Figure-2

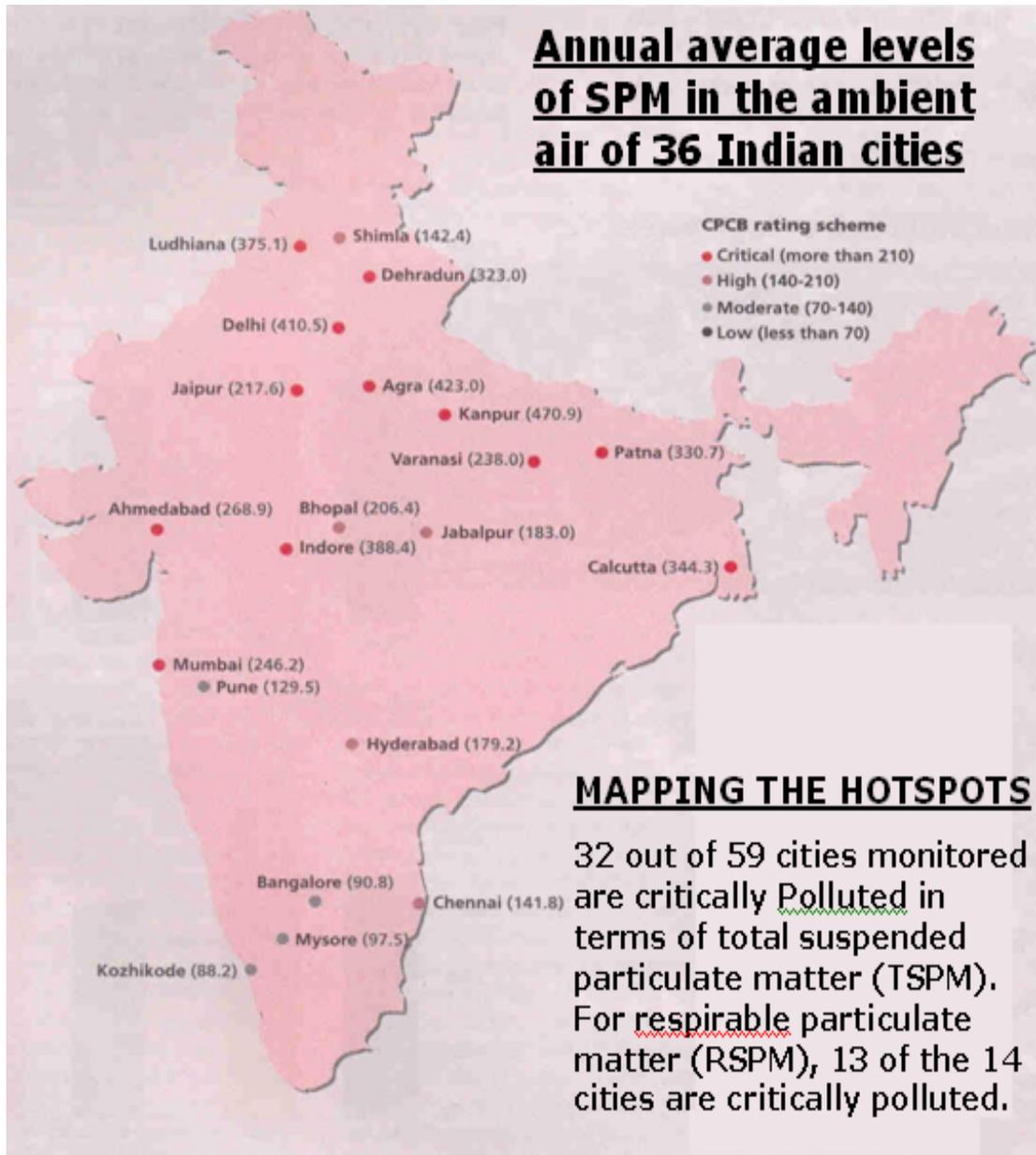


Figure-3

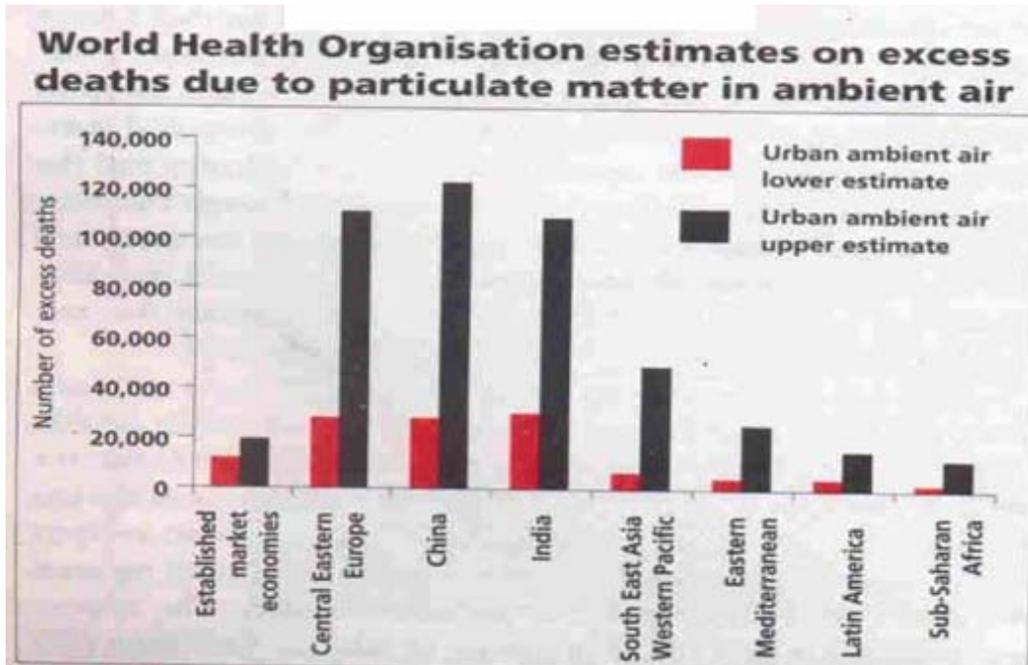


Figure-5 depicts average SPM levels in the ambient air at the major traffic intersections in Calcutta. Impact on the pedestrians and those working roadside including the traffic policeman could be extremely serious. It could be stated that the present rate of growth of automobile transport is not environmentally sustainable unless stricter emission control and traffic management regulations are enforced. Figure 4 depicts the rising trends of Bronchial asthma and Bronchiolitis cases at a New Delhi Hospital.

Figure- 4

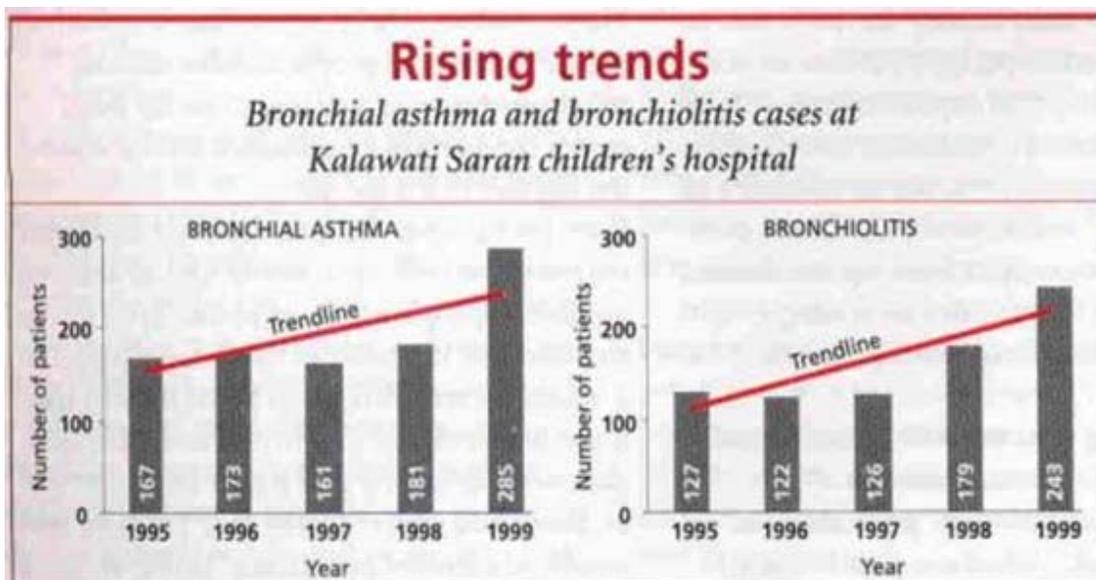
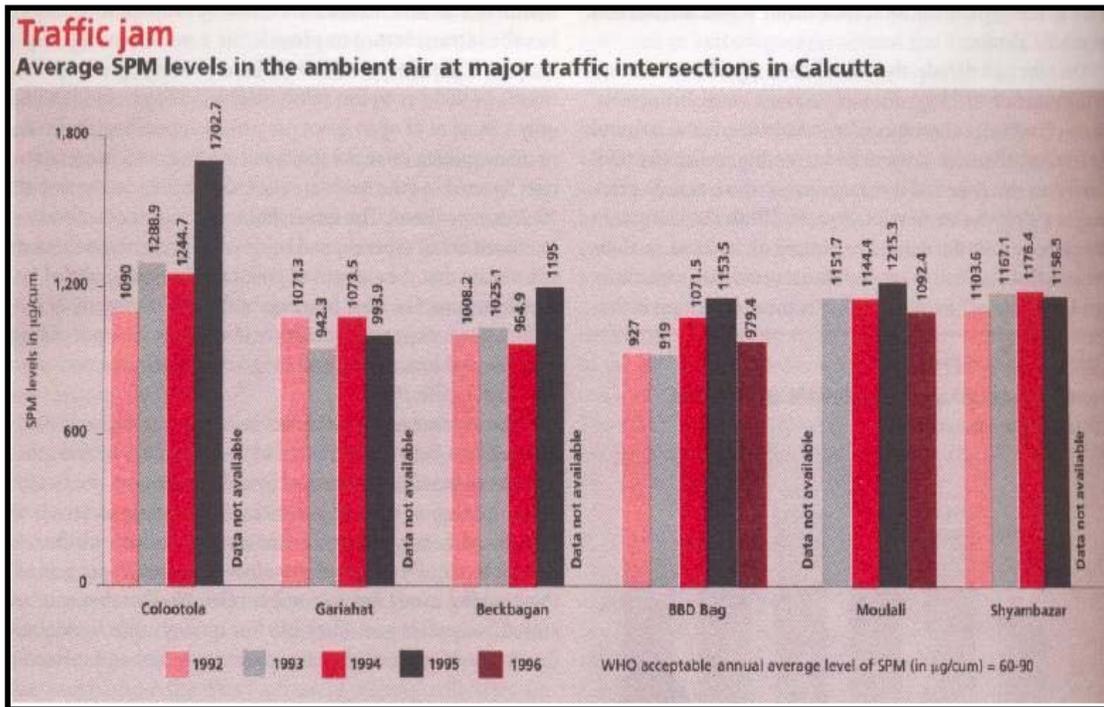


Figure- 5



### Indoor Air Pollution: A critical environmental problem in the developing countries

Concentration of particles found indoors often exceeds the levels found outdoors, particularly in the ill-ventilated homes of the rural poor and urban slums. Experts have identified six major categories of ill-health which can be attributed to exposures indoors.

- Acute respiratory infections in young children
- Adverse pregnancy outcomes (low birth-weight, stillbirth or neonatal death) for women exposed during pregnancy
- Lung Cancer
- Chronic lung ailments (bronchitis or asthma) and associated heart maladies
- Diseases of the eyes
- Increase in the severity of coronary artery disease

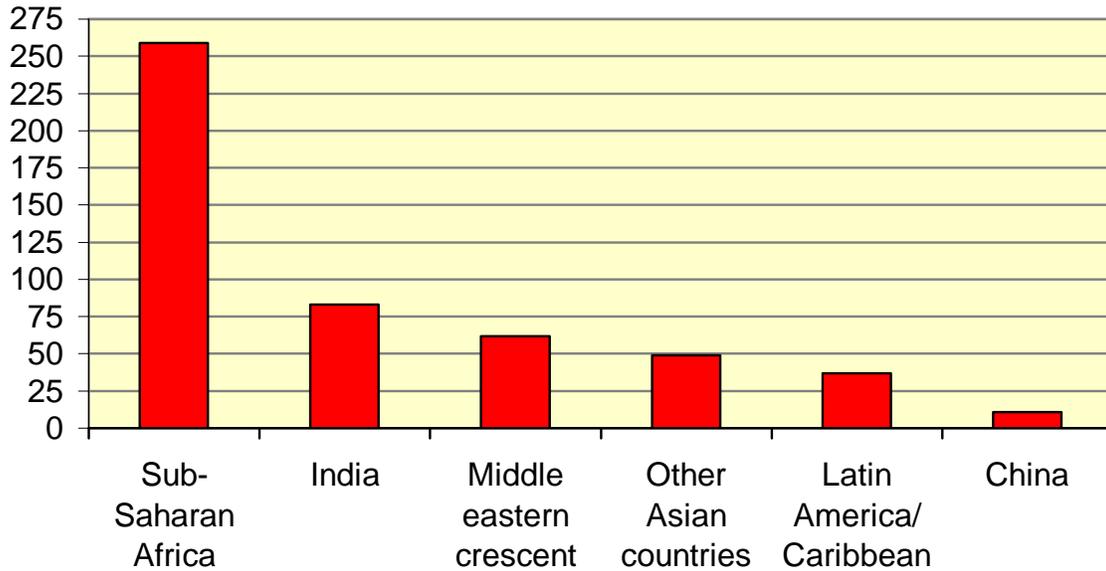
**4.3 Million Children fall prey to ARI every year**

### ***Water and Sanitation Related Disease Burden in the Developing Countries:***

Despite substantial improvement in water and sanitation coverage, both mortality and morbidity figures, indicate a significant burden of communicable diseases derived from water, sanitation and other environment factors. The

Figure-6 depicts the infectious disease burden in the year 2000 in different regions in terms of disability adjusted life years (DALY) per 1000 persons. Burden of select infectious diseases in the developing countries are shown in Table-2. Estimates of morbidity and mortality of water and sanitation related diseases in the South East Asian region countries are shown in Table-3.

**Figure – 6**



**Table-2**

<b>Diarrhoea</b>	<b>4 billion cases per year. 2.2 million deaths</b>
Intestinal nematode infections	Infect about about 500 million people.
Schistosomiasis	About 200 million are infected. 20 million suffer severe consequences.
Trachoma	About 6 million are blind from trachoma

**Table-3**  
**Estimates of morbidity and mortality of water-related diseases in SEAR countries (late 1990s)**

<b>Diseases</b>	<b>Morbidity (episodes/year or people infected)</b>	<b>Mortality (deaths/year)</b>
Diarrhoeal episodes	0.7 to 3.7 episodes per child less than 5 years of age	
Malaria	3,100,000	NA
Dengue Fever	400,000	8,000
Hepatitis	NA	28,000
Lymphatic Filariasis	60,000,000 (people infected)	-

**Table-4**  
**Regional Child Mortality & Select Determinants**

	<b>India</b>	<b>China</b>	<b>Other Asian countries</b>	<b>Latin America/ Caribbean</b>	<b>Middle Eastern Crescent</b>	<b>Sub-Saharan Africa</b>
Child mortality – under 5 (per 1000 live births) in 1999	90	37	65	38	92	166
Access to improved water source in 2000 (% of total population)	88%	75%	78%	85%	83%	54%
Access to sanitation in 2000 (% of total population)	31%	38%	66%	78%	76%	54%
Female illiteracy in 2000 (% of 15-24 year olds)	35%	4%	20%	6%	31%	27%
Immunization 1996-97 (% of infants <12 months)	81	96	90	87	79	55

Regional child mortality and select determinants are depicted in Table-4. It could be seen that India and Sub-Saharan Africa are among the worst affected regions. Lack of access to sanitation, female illiteracy and unsafe water are the three critical factors behind high child mortality in these countries. The Table-5 indicates the estimated preventable child deaths that could be achieved through various environmental interventions. It is pertinent to note that more than 4 million child deaths in the developing countries could be prevented by implementing 100% access to safe water & sanitation along with immunization and female literacy.

**Table-5**  
**Estimated preventable child deaths (thousands per year)**

		India	China	Other Asian countries	Middle Eastern Crescent	Sub-Saharan Africa	Latin America/ Caribbean	Total
1.	Increase child immunization to 100%	110	5	30	85	525	15	770
2.	Increase female literacy to 100% (age 15-24 year)	460	15	135	280	615	15	1520
3.	Provide safe water to 100% of the population	90	60	90	90	700	20	1050
4.	Provide safe sanitation to 100% of the population	570	150	115	105	565	25	1530
5.	Provide safe water and sanitation to 100% of the population	635	200	195	185	1165	45	2425
6.	Increase immunization and female literacy and water and sanitation to 100%	1030	215	330	495	1910	70	4050

**The Killer Vectors in Urban and Rural Environment:**

Vector-borne diseases like Malaria, Filariasis, Dengue, Kala-azar, encephalitis etc are adding significant disease burden in the developing countries. Unhealthy living conditions, lack of drainage and solid waste management are the primary factors for vector breeding. In India, it has been a century of research and implementation of Malaria control strategies. It was a major killer during the 40s and 50s. Concerted efforts by the Government after independence and intensive use of insecticides brought down the incidence to a few thousand cases per year by 1960. But since then, there has been a steady resurgence particularly of urban malaria. Today, it is more than 2 million cases per year. Excessive reliance on insecticides has damaged the environment and yet could not protect public health in the long run. Faulty urban planning and lack of peri-domestic and home hygiene are to be blamed for the resurgence of urban malaria. A long term and sustainable approach is required for the control of vector-borne diseases in the developing countries. Bio-environmental control

strategy which is based on vector biology and ecology could be the most cost effective and sustainable measure for vector control.

### ***Chemical Toxicants in Water, Soil and Food Chain: Emerging health concern in the developing countries***

The WHO Guideline for drinking water quality set guideline values for some 100 distinct chemicals. Not all of them occur in significant concentrations in all the countries or with significant frequency. The public health significance also varies from country to country. As such, in developing a national risk management strategy for chemicals in water and environment, care should be taken to consider all social, health, economic, cultural and ecological issues. While, we must ensure that resources are not unnecessary diverted towards monitoring substance of relatively minor health importance, there is absolutely no way that we can compromise on the issue of health risk while setting national standards and standards for monitoring and surveillance of water sources, food and soil. Among the chemicals & heavy metals, which are posing serious threats to the health of the community, Arsenic, Fluoride and pesticides are emerging as the most critical health concerns in some countries of Asia and Africa.

### **Pesticides and heavy metals in the environment.**

Data in respect of pesticide residues and toxic heavy metals in the environment is rather inadequate for a rational and scientific assessment of environmental health impact. However, despite limitation of available data, the points of grave public health concern for the developing countries are:

- (i) Residues of pesticides contribute significantly to contamination of food, water, soil, animal products and human milk and tissues.
- (ii) The ubiquitous presence of DDT and HCH in the environment.
- (iii) High body burden of DDT and HCH in the general population, and the possible risk of breast cancer among women, and
- (iv) Widespread contamination of bovine milk and baby feeds with hard-to-degrade organochlorine pesticides.
- (v) Consuming vegetable contaminated with heavy metals and pesticides could lower a child's intelligence.

### **WHO estimated in 1991 that around 25 million farm workers in the developing countries are likely to suffer pesticide poisoning in each year.**

The increasing use of chemicals and pesticides in agriculture, industries and commerce as well as in public health and medical care services poses serious risk for human and the environment. The WHO publication on health situation in South East Asian countries has reported a number of cases of pesticides poisoning in Bangladesh, India, Indonesia, Myanmar, Nepal and Thailand, affecting large number of people. The present level of management of hazardous chemical industries including bio-medical wastes from hospitals is a serious health concern in the region. Though a number of regulations and legislation have been enacted in recent years in India and other countries,

enforcement of the same is poor. There is an urgent need to strengthen national capabilities for ensuring sound management of chemicals and hazardous wastes.

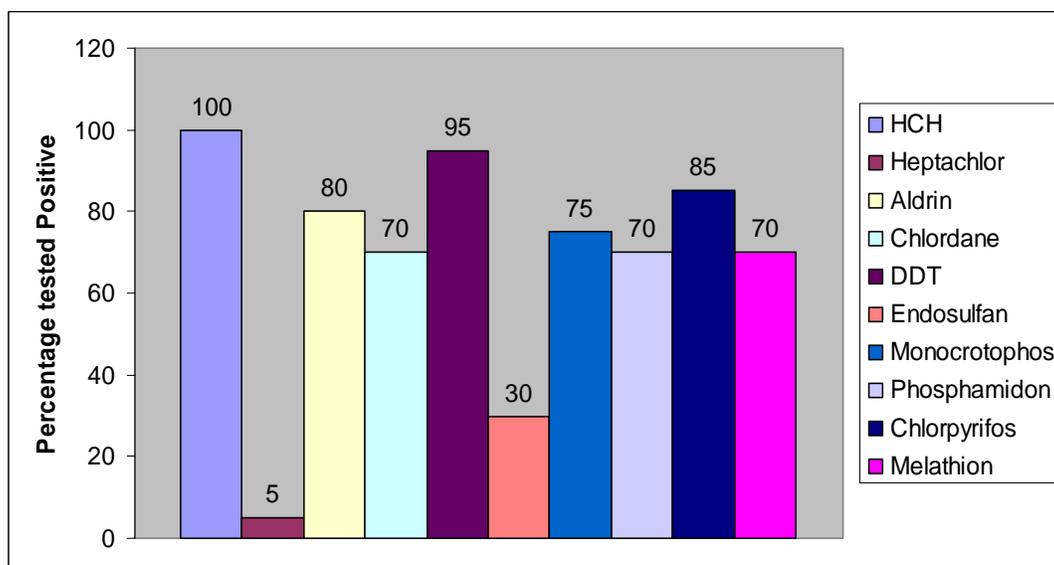
In surveys conducted by Indian Council of Medical Research, out of total 13,000 samples of wheat, rice, spices, pulses, vegetables, fruits etc tested between 1968-1998, 54% were found to be contaminated and it is apprehended that the daily intake of pesticides like HCH, Aldrin, DDT might be exceeding ADI (Acceptable Daily Intake) significantly.

Table-6 depicts the levels of pesticides in some common vegetables in the rural areas of Punjab in India. A random sample survey in a few villages of Punjab State in India indicated high level of pesticides among the agricultural farmers. (Figure – 7)

**Table-6**  
**The Toxins in Food Pesticide levels in two blocks in Punjab**

Type of sample	Talwandi Sabo	Chamkaur Sahib
Vegetable	Cauliflower	Cabbage
Heptachlor	0.015 ppm	0.009 ppm
Chlorpyrifos	0.00333 ppm	0.001 ppm
Alpha endosulphan	0.0027 ppm	Absent
	Carrot	Ghia (Bottle gourd)
Aldrin	0.0013 ppm	Absent
Ethion	1.68 ppm	Absent

**Figure-7**  
**Pesticides in Human Blood**



## ***Arsenic & Fluoride in Groundwater, the New Menace in South-East Asia***

The excess of naturally-occurring harmful inorganics like arsenic and fluoride in groundwater is a major health concern in the South-East Asia Region (SEAR). Drinking arsenic rich water over a long period is unsafe, as it is a documented carcinogen. Almost 50 million people in Bangladesh are at risk of drinking water with arsenic contamination above 50 micrograms per litre. The same figure for West Bengal in India would be between 5-12 million. The most commonly reported, symptoms of chronic arsenic poisoning include hyperpigmentation and keratosis. Skin cancer and internal cancer can also occur. The estimated risk of excess lifetime skin cancer in Bangladesh at the present arsenic contamination level is put at 3754000 (0.29% of the population) Situation in India and other South Asian countries are likely to be similar. A scientific epidemiological assessment of the extent and magnitude of the problem in Bangladesh and India has not yet been made.



The problem of arsenic in groundwater has also been reported from other SEAR countries, such as Myanmar, Nepal, Thailand, China, Vietnam, and Cambodia. The critical concerns for governments and other sector partners in the affected countries are:

- (i) Restricting the people from drinking arsenic-contaminated water;
- (ii) Providing alternative sources of arsenic free source drinking water;
- (iii) Informing the people about the health risk associated with drinking arsenic-contaminated water, and
- (iv) Providing medical relief, by way of training medical practitioners serving either in government systems or outside.

In India, 20 out of 35 states are affected by high level of fluoride in groundwater and 66 million people are at risk of fluorosis. Six million children below the age of 14 are suffering from skeletal fluorosis. Fluoride problems have also been reported from China, Bangladesh, Thailand and many other countries. Like arsenic, in the case of fluoride too, the most important control measure is to provide alternative safe source of water or fluoride contaminated water must be treated.

### ***New Millennium: Old Maladies***

In India, according to a World bank report, the total costs in terms of health and productivity impact of lack of safe water and sanitation and environmental degradation, add up to a total of US\$ 9.7 billion per year i.e 4.5% of the GDP of the country at 1992 values. The health impact of water and air pollution and lack of sanitation account for 73% of the total damage. Unfortunately, the health sector, which bears the burden of the activities of sectors like urban & rural development, industry etc, does not have adequate institutional capacity or infrastructure for monitoring the environmental health impact of the same. As such, it can do little advocacy for protecting and promoting environmental health.

We are at the threshold of a new millennium, yet the maladies of the old system and institutions inherited from the colonial past still continue. Among these maladies following could be identified in many of the developing countries.

- Market economy based medical education with curative and hospital care bias.
- Neglect of preventive, promotive, environmental health.
- Lack of a holistic and community based approach to disease control.
- Health Policy stands in isolation from the Non-Medical and socio-ecological Determinants of Health
- Lack of epidemiological, environmental and ecological surveillance.
- Inadequate and ineffective advocacy on the part of health on key policy matters related to environment, industry, nutrition, education, gender etc.

### ***Approach for 21st Century***

#### ***Environment & Health: The Critical Coalition***

As a first step towards formulation of a radically different Public Health Approach in the 21st century we need an in-depth socio-ecological and epidemiological analysis of national health programmes. Only on the basis of a rational and scientific epidemiological, ecological and demographic understanding of the existing situation, we would be able to add the much needed and much talked about, ecological and social dimension to our health system. Provision of an environment conducive to healthful & hygienic living condition would remain the most essential & critical factor for health promotion. Policies and programmes of the environment-related sectors need to be smoothly interfaced with the policies and programmes of the health sector, in order to reduce the health risk to the citizens and the consequential disease burden.

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