

**WORKSHOP
ON
DRY LAND AND DESERTIFICATION (CLIMATIC
CHANGE): WASTE MANAGEMENT AND URBAN
ENVIRONMENT**

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**DRY LAND AND DESERTIFICATION (CLIMATIC CHANGE):
WASTE MANAGEMENT AND URBAN ENVIRONMENT**

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India is a large, diverse and poor country that faces severe environmental problems. The range of environmental problems confronting India is vast. The natural resource base of the economy provides support to three fourth of its population. Though, agriculture is the backbone of economy, the quality of agriculture land is poor and gradually declining due to several factors. India has also a very large and rapidly growing urban population. Basic amenities such as sanitation, water supply, electricity, housing and transport have not kept pace with rapid urbanization. As a consequence, the quality of urban environment has deteriorated significantly.

The range of environmental problems confronting India is vast and mitigation measures are expensive. The problems may be classified under two heads: (1) those arising from industrialization and urbanizations such as pollution, solid waste etc., and (ii) natural resource based problems such as deforestation, and degradation, biodiversity loss etc. Importantly, many of the industrial urban environmental problems have their genesis in the growth strategies adopted in post independence era. In India, air pollution is primarily an urban phenomenon, with main sources being motor vehicles, industries, thermal power plants, and use of coal and firewood in domestic sector.

It is to be noted that 6 of the 10 largest cities in India - Mumbai, Kolkata, Delhi, Ahmadabad, Kanpur, and Nagpur - have annual average levels of particulate matter (P.M.) at least three times as high as the World Health organization (WHO) standard. While only a few cities have high concentration of nitrous oxion (NOX) and sulphar dioxide (SO), this picture is likely to worsen with growing industrialization and motorization. Almost all surface water in India is unfit for human consumption. There are three major sources of pollution viz. domestic sewage, industrial effluents, and agricultural run off. Of these the first two are most important. Total sewage generated by urban centre increased from 5 billion liters/day in 1947 to 30 billion liters/day in 1997. Treatment capacity, however, is only about 3 billion liters/day. Even this capacity does not function properly and remains closed for long period due to various reasons. Industrial effluents are generated by a few sub sectors mainly in the forms of toxic wastes and organic pollutants.

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As mentioned earlier that green environmental problems are mainly deforestation, biodiversity loss, and soil degradation. Forests in India have been shrinking for several decades owing to pressure of population on land for competing uses, such as agriculture, irrigation and power projects, industry, roads etc. During 1995-97, alone, about 5,48,200 hectares of forest land was lost, mainly in the states of Andhra Pradesh and Maharashtra. During the period, 1.95 million hectare of dense forest degraded to open forest, 39,200 hectare become scrub and 312100 hectare were converted to non-forests areas. One of the main causes of deforestation has been the diversion of prime forest land for agricultural purposes. Large scale development projects have also contributed substantially to deforestation. Indiscriminate and unscientific mining is also another significant cause of deforestation. Again, habitat destruction, hunting and over exploitation, pollution and poisoning and displacement by exotics over the last few decades have led to the decline in India's wild bio-diversity.

Land degradation of various types (water erosion, wind erosion, salinity, water logging etc.) is extensive in India. It is estimated that about 163 million hectares of land, almost 60 per cent of the country's total area, have some degree of degradation (Table I).

The costs of land degradation are assumed to be primarily in terms of a reduction in agricultural productivity. While India has a long coastline, it faces environmental problems. The mangroves are being cut down for fuel wood and building materials. Coral reefs face assaults from coral mining and from sedimentation due to coastal construction, solid erosion and dredging. Over fishing, and promotion of shrimp farming have caused destruction of natural protection against cyclones in coastal areas. The coastal cities pump largely untreated wastes into sea through outfalls. Untreated sewage is a major source of pollution of coastal waters. It is said that the global warming is likely to increase sea level by expanding ocean water, melting glaciers and causing vulnerability to coastal areas.

Table - I
Present Status of Land Degradation in India
 (Area in lakh hectare)

States	Geographical Area	Earlier Assessment (1982)		Recent Assessment (1996)	
		Area	(%)	Area	(%)
Andhra Pradesh	275.07	122.31	44.5	96.65	35.1
Arunachal Pradesh	83.74	26.54	31.7	11.95	14.3
Assam	78.44	29.99	38.2	19.63	25
Bihar	173.88	65.52	37.9	47.51	27.4
Goa	3.70	2.00	54.1	2.14	57.8
Gujarat	196.02	125.86	64.2	85.53	43.6
Haryana	44.21	41.62	94.1	14.43	39.6
Himachal Pradesh	55.67	19.14	34.3	12.06	21.6
Jammu & Kashmir	222.24	8.93	21.2	12.25	29.1
Karnataka	191.79	114.03	59.5	82.77	43.2
Kerala	38.86	19.35	49.8	12.28	31.6
Madhya Pradesh	443.45	207.17	46.7	127.15	28.7
Maharashtra	307.69	198.46	64.5	74.53	24.0
Manipur	22.33	7.34	32.9	13.26	59.4
Meghalaya	22.43	11.02	49.1	11.02	49.2
Mizoram	21.08	10.38	62.6	8.27	49.3
Nagaland	16.58	10.38	62.6	8.21	49.3
Orissa	155.71	78.03	50.1	58.02	37.3
Panjab	50.38	32.30	64.1	10.7	21.2
Rajasthan	342.24	373.94	109.2	190.01	55.5
Sikkim	7.10	3.03	42.6	3.67	51.7
Tamil Nadu	130.06	38.22	29.4	41.11	31.6
Tripura	10.49	2.79	26.6	2.95	28.1
Uttar Pradesh	294.41	131.15	44.5	101.05	34.3
West Bengal	88.75	43.03	48.5	24.55	27.7
UTs	10.96	3.50	31.9	0.88	7.8
TOTAL	3287.26	1736.4	52.8	1074.3	32.7

Source: Bhattacharya et. al. (2004)

Soil Degradation

Soil is a vital natural resource and acts a life supporting system. Existing of all living things on earth is limited, directly or indirectly, to soil. It is also strong parameters to judge a country's sustainable wealth. However, the soil degradation in India is causing concerns to policy makers and environmentalists. Although, land degradation process is old but the situation has worsened in the recent times due to population pressure, industrialization and urbanization. Ecologists and environmentalists believe that accelerated soil degradation is a cancer on land that rapidly depletes the soil productivity. Again, soil degradation undermines the productive capacity of an eco system and worsens the socio-economic conditions of farmers. It also affects global climate through alterations in water and energy balance, disruption in the cycle of carbon, nitrogen, sulphur and other elements, pollution of natural water, and increased forests degradation. The decrease in the vegetative cover ultimately enhances the emissions of green house gases into the atmosphere that leads to global warming. It has been reported that about 57 per cent of the total geographical area of the country has been affected by the various soil degradation problems, induced largely by human interventions. Water erosion is a major problem causing loss of top soil while wind erosion is dominant in western regions, covering 13.5 million hectares of the total area. It causes loss of the top soil in 1.0 percent; terrain deformation is 1.2 per cent and over blowing and shifting of sand in 0.5 per cent of the affected areas. The influence of human induced chemical deterioration has been observed in 13.6 million hectares, causing salinity in 10.1 million hectares and loss of nutrients and organic matter in 3.7 million hectares of the area.

Natural vegetation is a source of soil conservation by checking the soil loss through surface run off. However, vegetation coverage is declining rapidly due to ever grazing and deforestation. The change in physical condition and chemical composition of soil due to the degradation processes is bound to reflect on agricultural productivity. Thus, soil erosion and land degradation have caused decline in productivity and unsustainable agriculture.

Desertification and Droughts

Desertification and drought pose an ever increasing global threat. Human induced activities such as over cultivation, overgrazing, deforestation and poor irrigation practices, along with climate change, are converting fertile land into unproductive and barren patches of land. The

arable land is gradually shrinking throughout the world, threatening food security, livelihoods and economic crisis. Large parts of the Indian subcontinent are prone to occurrence of droughts. Droughts cause misery to both human and livestock population, accelerate degradation of human resources and put a heavy pressure on resources and governments. The crop failures lead to acute shortage of food fuel and fodder that adversely affect health and nutrition of human and livestock population. The water tables fall with deteriorating quality of ground water. This bound to migration of local people in search of food, fuel, fodder and livelihoods. In order to mitigate the adverse effects of droughts and to combat desertification, the government of India has pursued strategies and implemented several development programmes over the past decades. These programmes include Drought Prone Area Programme initiated in 1973-74, Desert Development Programme started in 1977-78, National Watershed Development Programme in rainfed areas, started in 1990 etc. India is also signatory of the UN convention to Combat Desertification and is now developing an Action Plan based on experience gained through the past program, work and keeping in view the objectives and elements of UN conference in the framework of Agenda 21. The Agenda 21 is likely to influence the manner in which practices, techniques and policies are generated and spread amongst the stakeholders in areas prone to droughts and desertification. It is to be noted that droughts in India are mainly the result of failure of rains from southwest monsoon. The frequency of droughts and floods are likely to be influenced by climatic change as a result of increased green house gases emissions. It is expected that there will be decrease in cereals production and an increase in rainfall in south Asia region due to climate change in the coming years.

The dry lands of India have a delicate eco system, extremely vulnerable to external stress, whether induced by the weather or the market. The Green Revolution Package has made farmers vulnerable on both counts, critically dependent on high and extensive use of fertilizer, seeds, irrigation and pesticides. The poor are naturally the worst hit by a production plan i.e. unsustainable, both in economic and ecological terms. Again, in a country where 70 per cent of the land mass is undertaken by hard rocks, it becomes obviously impossible to sustain a strategy based centrally or deep drilling of tube wells. In most of India, the natural rates of ground water recharge are very low. The hard basalts allow water to pass through to the ground Water tables have fallen dramatically and the over exploitation of ground water has caused damage to aquifers. Droughts with stretches of neat cracked and

land, dried up wells, and ponds, helpless farmers and hungry families create an atmosphere of doom and despair. Water scarcity is the most visible attribute of droughts. It is also noted that in the Himalayan foothills, lime quarrying has destroyed the forests and desiccated the perennial mountain streams. Similarly, the mining of natural aquifers of Paleolithic lime stone for burgeoning cement industries in Swarashtra has resulted in the ingress of saline desertification into the fertile ecosystem. In the western ghats watershed of Tungabhadra, iron ore mining has created drought by reducing base flow and increasing silt load on rivers. In Chherrapoonji, the mixed natural forests in upper catchments have been destroyed. The critical changes in agricultural practices over exploitation of ground water, negligence of traditional water structures etc. have resulted in drought like situation. Today, the hydrological disequilibrium causes eradication and scarcity in one region and water logging and floods in another. About 19 per cent of India's total area with 12 per cent of its population is considered to be drought prone.

Droughts and desertification control are major global concerns and therefore UN convention to Combat Desertification emphasized on general principles, institutions, policies and procedures. The main theme of Agenda 21 includes: (1) planning for environmental and developmental goals; (2) participatory and decentralized approaches for planning and implementation of action plan; (3) institutional and human capacity building; (4) data base on environmental, social, economic, land use pattern, land capability, land and water resource management etc. for wider dissemination of information.

Urban Environment

Urbanization in India is characterized by unplanned and uncontrolled growth which leads to urban sprawl. Land use planning and pattern of development have considerable impact on the environment. Due to lack of resources, inadequate resource mobilization capability to adopt proper city planning and inadequate monitoring and regulation, most municipal governments fail to deliver services effectively; People in urban India face severe problems related to water, waste water and wastes disposal, and pollution. A survey (2000) of 241 Class 2 towns in 17 states of India undertaken by the Central Pollution Control Board, Delhi indicated that 90 per cent of water supplied is polluted. This is because of the fact that our rivers are highly polluted due to non-regulation of waste dumping and discharging waste water into them while ground water is polluted due to silting of solid

wastes, waste water and industrial effluents. About 30.5 million Disability Adjusted Life Years (ALY) are lost annually owing to poor quality of drinking water and the absence of sanitation facilities. The financial loss in terms of productivity has been quantified at Rs. 360 billion annually. Most of the urban local bodies do not have adequate infrastructure facilities such as required capacities for treatment of raw water, adequate testing facilities and technical man power for operations and management. Only 72 of 4400 towns in the country have partial sewerage facilities and 17 have some form of primary treatment facilities before disposal. Of the 229 class 1 cities, 160 have sewerage systems for more than 75 per cent of the population and 92 cities for more than 50 per cent of the population while waste generation in class I cities has more than doubled from 1978 to 1995, the treatment capacity has decreased during the same period. Of the total waste water generated in the metropolitan cities, barely 30 per cent is treated before disposal. Untreated water is thrown into water bodies such as rivers, lakes, Oceans and seas. In 118 cities, it is discharged indirectly into rivers, lakes, ponds, or creeks, while in 63 cities it is used for agriculture. Most of the urban local bodies do not have sewerage line for disposal of waste water, and sewerage. This leads to degradation of the environment and effect the quality of life of inhabitants. It is estimated that 75-80 per cent of water pollution is caused by domestic sewerage.

It is estimated that urban India generates about 48 million mt. of solid wastes annually. Of this only 72 per cent is collected daily and remaining wastes is allowed to create problems of urban environment. This also creates health problems. More than 70 per cent Indian cities have inadequate waste transportation facilities. They mainly choose land filling for disposal of wastes. However, the land fill sites are poorly managed and are prone to ground water contamination because of leachates. The land fill workers have also higher incidence of diseases such as diarrhea, as well as fungal and skin infections due to working in unhygienic conditions. Moreover, the compliance of Bio-Medical Waste Management Rules is still low. About 25 per cent of the waste generated is called hazardous. A survey (2001) of 120 health care centres in West Bengal, Gujarat, Punjab, Tamil Nadu, Haryana, Delhi and Uttar Pradesh found that 42 per cent of health care workers did not have knowledge about classification and segregation of biomedical waste. The survey revealed gross inadequacy of equipments and tools. Open dumping or burning of bio-medical waste was reported as common practice. This enhances the emissions of gases and air pollution.

The increasing levels of air pollution in urban areas have caused alarming situation since most of towns and cities have crossed danger limit. There are about 2.5 million premature deaths due to increased air pollution. The air quality was rated dangerous or bad in 34 cities out of 62 cities in 1994. However, this proportion has come down in 2000 due to introduction of CNG gas in public vehicles in the metropolitan cities.

Industrial effluents also cause serious air pollution and occupational health hazards. The rapid industrialization in India has resulted in the increased need for proper disposal of industrial wastes. The industries such as pesticides, drugs, pharmaceuticals, textiles, dyes, fertilizers, tanneries, paint, etc. generate hazardous wastes. About 50 per cent of total hazardous waste in the country is generated from Maharashtra, Gujarat, Tamil Nadu, U.P., Rajasthan, Andhra Pradesh and Karnataka. Improper storage, handling, transportation, treatment and disposal of industrial waste may adversely impact the environment. The improper industrial waste disposal has caused land contamination.

Solid Waste Management

Rapid population growth, urbanization and industrial growth have had to severe problems of waste management in cities. The problems of solid waste disposal and sanitation appear almost intractable as urban India today is a site of rotting garbage. Reliable estimates of solid waste generation are not readily available. Most estimates are based on per capita norms. It is estimated that each urban resident generates 350 to 1000 grams of solid waste everyday. If wastes from commercial and industrial establishments are added then these total waste generation will add up to an enormous quantity. It is estimated that Indian cities generate 48 million metric tonnes of solid waste annually. TERI has estimated that waste generation will exceed 260 million tonnes per day by 2047, more than five times the present level. (Table II).

Table - II
Estimated Waste Arising in Selected Countries

(Million Tonnes)

Country	Municipal	Industrial	Agricultural	Mining	Demolition	Sewerage	Hazardous
Belgium	3.5	27.0	53.0	7.1	0.7	0.7	0.9
Denmark	2.4	2.4	-	-	1.5	1.3	0.1
France	17.0	50.0	400.0	10.0	-	0.6	3.0
Germany	19.5	61.0	-	9.5	12.0	1.7	6.0
Greece	3.1	4.3	0.09	3.9	-	-	0.4
Ireland	1.1	1.6	22.0	1.9	0.2	0.6	0.02
Italy	17.3	40.0	30.0	57.0	34.0	3.5	3.8
Japan	48.0	312.0	63.0	26.0	58.0	2.0	6.6
Luxemburg	0.17	1.3	-	-	4.0	0.02	0.004
Netherlands	6.9	6.7	86.0	0.1	7.7	0.3	1.5
Portugal	2.4	0.07	0.2	3.9	-	-	0.16
Spain	12.5	5.1	45.0	15.0	-	10.0	1.7
USA	209.0	760.0	150.0	14.0	32.0	10.0	279.0
UK	-	70.0	80.0	110.	70.0	35.0	-
India	48	85.5	600.0	-	-	-	-

Source: Petts, J. and Eduljee C. Environmental Impacts Assessment for Waste Treatment and Disposal Facilities, Willey, Chickestar, 1994

A large quantity of waste requires proper systems of collection, transportation and disposal. It also requires knowledge of what the wastes are made up of, how they need to be collected and disposed off. Recycling of waste and energy generation from waste has great potential. Proper solid waste management requires commitment and resources to deal with. Municipal authorities do not have adequate resources and technical capacity to deal with the gigantic problem. Successful waste management requires involvement of the community and private entrepreneur to work with local government. Therefore, the collection efficiency of municipal solid waste has been reported low. On an average, roughly 30-40 per cent of the total waste generated remains uncollected, this is one of the biggest sources of environmental degradation.

There is no practice of sorting the waste at source in a scientifically segregated manner. Again, there is no public system of primary collection from the source of waste generation. Only in a few cities, organized methods of solid waste collection is being practiced through community and private sector participation. The street sweeping is reported to be irregular and inefficient. The tools used for sweeping and collection of wastes are

inefficient and out dated which cause littering of waste and occupational health hazards. In most of the cases the waste is not treated before disposal. The options for the treatment and disposal of household and commercial waste have largely been confined to landfill, which constitute a major share while incineration of household waste is much under utilized option. Recycling and reuse of household and commercial waste are similarly under utilized options, with only small proportion falling into these categories. Thus, landfill is chosen as the most suitable option in most of the cases because of its low cost, speedy availability and applicability for a wide range of wastes. Landfill can also be regarded as an environmentally acceptable method of waste disposal (Table III).

Table - III
Composition of Waste Disposal Routes (%)

Country	Incineration	Landfill	Composting	Recycling
Australia	11	65	18	6
Belgium	54	43	0	3
Canada	8	80	2	10
Denmark	48	29	4	19
Finland	2	83	0	15
France	42	45	10	3
Germany	36	46	2	16
Greece	0	100	0	0
Ireland	0	97	0	3
Italy	16	74	7	3
Japan	75	20	5	0
Luxemburg	75	22	1	2
Netherlands	35	45	5	15
Norway	22	67	5	6
Portugal	0	85	15	0
Spain	6	65	16	13
Switzerland	59	12	7	22
UK	6	88	0	6
USA	16	67	2	15

Source: Warne Bullitin Sheet, The World Resource Foundation, February 1995, Sited from P.T. Williams, Waste Treatment and Disposal, John Willy and Soni, New York, 1998

The municipal authorities deposit solid waste at a damp yard situated within or outside the city haphazardly and do not bother to spread and cover the waste with inert material. These sites emanate foul smell and become

breeding grounds for flies, rodents, and pests. Liquid sweeping through the rotting organic waste called lea chat pollutes underground water and poses a serious threat to health and environment. Landfill sites also release gases and enhance global warming. As per estimates of TERI, India released about 7 million tonnes of methane into atmosphere in 1997, this could increase to 39 million tonnes by 2047 if no efforts are made to reduce the emission through composting, incineration recycling etc.

Sanitary landfills are the means of disposal of all types of wastes. However, urban local bodies generally find it very difficult to locate a suitable landfill site, which meets the requirements of Municipal Solid Waste Rules. In India, disposal of organic waste on the landfill is prohibited and it is made mandatory to start the organic fraction of solid waste before disposal. Until recently, there were no sanitary landfills. The local bodies used to dispose off solid waste in the low lying areas in the cities. In such areas, no pollution prevention measures are taken. Municipal Solid Waste (Management and Handling) Rules, 2000 have made provision for local bodies to construct sanitary landfills. A study conducted to ascertain the status of compliance of SWM Rules, 2000 by Class I cities in India revealed that there is insignificant progress in the matter of processing of waste and construction of sanitary landfills. The sites of dumping and landfills are required to be well planned in terms of perspective planning.

Effect of Solid Waste on Climatic Change

The atmosphere that surrounds the Earth contains many types of gases, including those known as “greenhouse gases.” Greenhouse gases (GHG) absorb and retain heat from the sun. They regulate the Earth’s climate by holding warmth in an atmospheric blanket around the planet’s surface. Scientists call this phenomenon the “greenhouse effect.” Without greenhouse gases, the average temperature on Earth would be -2 degrees Fahrenheit instead of the current 57 degrees Fahrenheit. Excess greenhouse gases in the atmosphere, however, can raise global temperatures. In the past 100 years, scientists have detected an increase of 1 degree Fahrenheit in the Earth’s average surface temperature.

Solid waste disposal contributes to greenhouse gas (GHG) emissions in a variety of ways. The disposal of solid waste produces GHGs in a number of ways.

- Solid waste disposal and recycling increases emission of gases as it involves lot of energy consumption.

- The anaerobic decomposition of waste in landfills produces methane, a GHG 21 times more potent than carbon dioxide.
- The incineration of waste produces carbon dioxide as a by-product. In addition, the transportation of waste to disposal sites produces GHGs from the combustion of the fuel used in the equipment.
- Falling of green cover and increasing solid waste is contributing to increased amount of carbon dioxide in the atmosphere.

Rising levels of greenhouse gases in the Earth's atmosphere are causing changes in our climate, and some of these changes can be traced to solid waste. The manufacture, distribution, and use of products—as well as management of the resulting waste—all result in greenhouse gas emissions. Waste prevention and recycling are real ways to help mitigate climate change.

Objectives of the Seminar/Workshop

The main objectives are as under:

1. to discuss the emerging perspective, trends and issues in urban environment, climatic change and desertification;
2. to highlight the problems of soil degradation, land degradation, solid wastes management and urban sanitation;
3. to examine the causes, factors and constrains in management of urban sanitation and solid wastes;
4. to assess the scope of public private partnership in urban sanitation, waste management and city planning;
5. to discuss the scope of community participation in addressing the adverse impact of climatic charge and managing land, water and forestry resources;
6. to assess the role of NGOs in promoting urban environment, natural resources management and reversing the impact of climatic change;
7. to suggest policy measures for improving urban management, land and water resources management, and solid waste management in India.

Issues

- How we can reduce emission of gases and discharge of industrial effluents?
- How climatic change may be reversed?
- How community participation in management of urban sanitation, solid wastes and city planning may be enhanced?
- How soil degradation and land degradation are affecting climatic conditions?
- How ecological imbalance is causing drought, desertification and hydrological disequilibrium in India?
- How public private partnership mechanism may be evolved and strengthened?
- How Solid Waste Management (Management and Handling) Rules, 2000 may be affectively implemented?
- What are best practices of solid waste management, city planning and urban management in developed and developing countries?
- What are lessons from foreign experiences for management of India's environment?
- How desertification may be effectively checked and controlled?
- How soil degradation may be checked?
- What measures are required for promoting and strengthening programmes of Drought Prone Areas, Dissert Land Development, and Watershed Management Programme in rain fed areas?
- How we can check effectively the rain water run off?
- How we can strengthen traditional practices of rain water harvesting?
- How we can address the problems of deforestation and land degradation?
- How we can regulate the industries, health centres, and urban local bodies for clean urban environment?
- What are macro and sectoral policy reforms needed for managing urban environment?

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