Corporate Environmental Management in India – An Overview

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In the last decade, the industrial scene in India has been viewed with a mix of optimism and serious concern. The optimism is based on the continuing, healthy growth rates, high savings and investments in the corporate sector. The concern is that the industrial development has been done at a price of the environment. Not only is industrial pollution increasing public health risk, but abatement efforts also are consuming significant portions of business growth. Against the background of increasing demands for inclusive growth and sustainable economy, new initiatives have been practiced and debated by business, industry associations, and the government. However, progress is still to be made to complete the unfinished public and private sector environmental agenda. This overview attempts to provide a resource base on critical issues and set the basis for further discussion on promising pathways for corporate environmental management in India.

1. Country Profile

1.1 Population, Economy and Industrial Growth

Although India occupies only 2.4% of the world's land area or 3.29 million sq. km, it supports over 15% of the world's population or 1.12 billion, which is growing at the rate of 1.3% a year. India's median age is 25, one of the youngest among large economies. About 70% live in more than 550,000 villages, and the remainder in more than 200 towns and cities. It has the world's 12th largest economy - and the third largest in Asia behind Japan and China-with total GDP of around $1 trillion. Services, manufacturing, and agriculture account for 55%, 27%, and 18% of GDP respectively (Fig 1). Nearly two-thirds of the population still depends on agriculture for its livelihood. Real GDP growth for the fiscal year ending March 31, 2007 was 9.4% up from 9.0% growth in the previous year. India is continuing to move forward with market-oriented economic reforms that began in 1991. Recent reforms include liberalized foreign investment and exchange regimes, industrial decontrol, significant reductions in tariffs and other trade barriers, reform and modernization of the financial sector, significant adjustments in government monetary and fiscal policies, and safeguarding intellectual property rights. Foreign direct investment inflows have risen significantly in recent years, contributing to $255 billion in foreign exchange reserves in 2005 (RBI, 2005).

The country has abundant resources to support industrial growth. Major natural resources available include, coal, iron ore, manganese, mica, bauxite, chromites, thorium, limestone, barite, titanium ore, diamonds and crude oil. Major industrial products are textiles, jute, processed food, steel, machinery, transport equipment, cement, aluminum, fertilizers, mining, petroleum, chemicals, and computer software, which accounted for 27% of GDP in 2006. Exports of engineering goods,

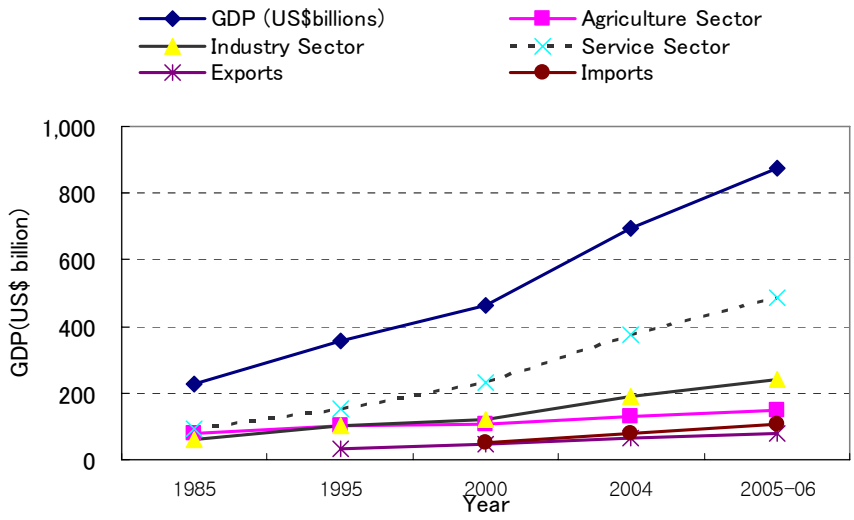


Fig. 1. Economic performance of India in recent years

petroleum products, precious stones, cotton apparel and fabrics, gems and jewelry, handicrafts, tea accounted for $127 billion in FY2006-2007. Wheat, rice, coarse grains, oilseeds, sugar, cotton, jute, tea are main agricultural products. Software exports accounted for $22 billion in FY 2006-2007. India's major trade partners are Japan, USA, European Union and Russia and with imports of petroleum, machinery and transport equipment, electronic goods, edible oils, fertilizers, chemicals, gold, textiles, iron and steel accounted for $192 billion in 2006.

1.2 Industrial Portfolio and the Size of Business Operations

Major Industries

Growth of India's economy is led by robust performance of industrial sector. Impressive growth in manufacturing, 7% average over the one decade is reflection of growth trends covering electronics and information technology, textiles, automobiles, pharmaceutical and basic chemicals (Table 1). This economic boom has also lead into an increase in investments and activities in the

Table 1. Growth trends in selected manufacturing sector

	Growth rate (%)		Relative contribution (%)	
	2003-04	2002-03	2003-04	2002-03
Manufacturing Sector	7.4	6.0	15.8	15.6
Food Products	0.5	11.0	0.7	18.4
Metal products and parts	3.7	6.4	1.5	3.1
Transport equipment and parts	17.0	14.6	14.8	14.3
Rubber, plastic, petroleum and coal products	4.4	5.5	4.3	6.5
Non-metallic mineral products	3.7	5.1	3.5	6.0
Basic chemicals and products	8.6	3.7	21.7	11.6
Machinery and equipment	15.8	1.6	28.5	3.6
Basic metal and alloy industries	9.1	9.3	10.8	13.1
Cotton textiles	3.1	2.7	1.9	2.2
Other manufacturing industries	7.7	0.0	3.2	0.0

(Source: TATA-Statistical Outline of India)

construction, mining, and iron and steel sectors. A complete list and further details of progressive growth of industries is available at Kansai Research Centre.

By size, the companies of India are classified as micro, small, medium and large. The key characteristics of different sizes of those enterprises are illustrated in Table 2. They differ by investment, employment, production capacity and environmental impacts. Further, the companies in India are classified as public sector companies, private sector companies, as well as small and medium scale enterprises.

Public Sector Enterprises

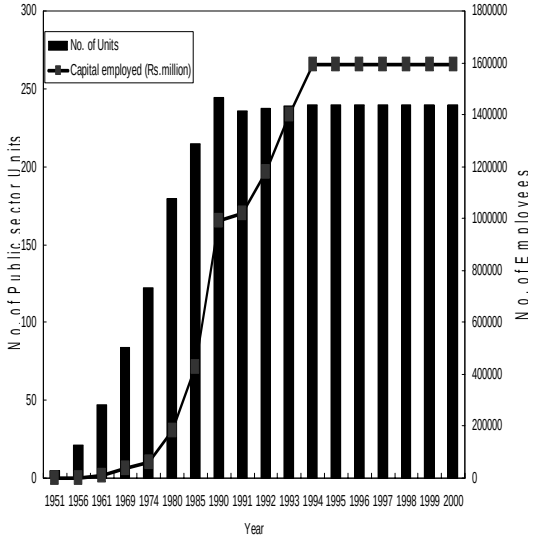
Until 1999, the industrial scene in India is dominated by public enterprises, which are owned and controlled by the Central and State governments. As of 31 March 2003, there are nearly 240 Central Public Sector Enterprises which are making significant contribution to the growth and competitiveness of Indian economy in the contemporary context (Fig 2). They are engaged in manufacturing and producing goods like steel, fertilizers, heavy engineering products, transportation equipment, drugs and pharmaceutical, petro-chemicals, cement, textiles, mining of coal and minerals, extraction and refining of crude oil, and in rendering services like trading and marketing, transportation services, contract and construction services, financial services, telecommunication services, tourist services and consulting services. Investment in central public enterprises has grown appreciably over the years. From a figure of Rs. 290 million in 1951 in five enterprises, investment rose to Rs. 1354.45 billion in 246 enterprises by March 1992 and to Rs. 3,334.75 billion in 240 enterprises by March 2005.

Table 2. Key parameters of Indian enterprises

Parameters	Micro	Small	Medium	Large
Investments in Plant and machinery	up to Rs.2.5 million	up to Rs.10 million to Rs.50 million	Up to Rs.100 million	Above Rs.100 million
Employment	less than 5	less than 100	less than 200	above 500
Production	tiny	small	medium	large
Technology	primitive	obsolete	intermediate	high
Brands	Nil	Rarely	few	good
Organization	proprietary	proprietary/ partnership	partnership/ pvt.ltd .cos	public limited
Management	direct	Semi-professional	Organized	professional
Gestation	Nil	short	medium	long
Profits	low	good	Very Good	Huge

(After: Desai,2006)

Public sector companies have been nurseries of technology and expertise, both managerial and technical. In the areas of agriculture, defence, space research, nuclear programme, heavy engineering, infrastructure building, they have built the strength of the nation. Besides driving the key segments of the economy, public sector companies have begun to excite stock markets after liberalization.



Sector	Units	Public sector production	
		2002-03	2001-02
Coal	(million tonnes)	325.4	312.5
Lignite	"	26.0	23.5
Petroleum	"	129.7	125.7
Finished Steel	"	11.0	10.0
Aluminium	(thousand tonnes)	244.7	231.7
Primary Lead	"	-	37.8
Zinc	"	-	176.3
Nitrogenous Fertilizer	"	2854.0	2880.0
Phosphatic Fertilizer	"	307	479

(Source: TATA-Statistical outline of India,)

Fig 2. Growth and contribution of public sector companies in India

Private sector enterprises

The private sector companies, now accounting for over 85% of industrial production continued to play a pioneering role in the development of the Indian economy (Table 3) and has a number of achievements to its credit. The private corporate in India has largely triggered the recent boom in the economy and the private investment in industry has beaten government investment. In an indication of investment confidence, private investment in industry surpassed outstanding government investment by 28%. Private sector investment in infrastructure related industries like roads, railways, air transport, shipping and automobiles grew at triple digit rates, while public sector investment in these core industries stagnated. But the public sector investment continues to surpass outstanding private

Table 3. Company type by ownership

Main Characteristics	Factories No.	Employment (000s)	Fixed capital	Gross output	Value added
			Rs. Million		
Public/Private sector					
Public sector	14,947	3,430	3386.48	6199.79	1000.96
Co-operative Society	2,048	309	907.9	309.26	426.3
Wholly Private	110,634	3,965	823.69	3086.83	391.71
Others	920	46	186.4	286.8	72.2
Total	128,549	7,750	4319.6	9604.56	1443.02
% Distribution					
Public sector	11.6	44.3	78.4	64.4	69.4
Joint sector	1.6	4.0	2.1	3.2	3.0
Wholly private	86.1	51.2	19.1	32.1	27.1
Others	0.7	0.6	0.4	0.3	0.5
Total	100.0	100.0	100.0	100.0	100.0

sector investments in mining, electricity services and irrigation. But recent developments show that within a reasonable time private investment will surpass government investment in services and mining, electricity generation and irrigation. The private sector has now come of age and has developed considerable entrepreneurial, managerial, technological, financial and marketing strength.

Small and Medium Enterprises

The private sector covers not only organized industries but also small scale industries, agriculture, trade and a great deal of activities in housing, construction and other fields. The micro and small enterprises constitute an important segment of the Indian economy, contributing around 39% of the country's manufacturing output and 34% its exports in 2004-05. It provides employment to around 29.5 million people in the rural and urban areas of the country. Keeping in view its growing importance and the imperative of SME for upgrading technology, the Government had revised the definition of SSI sector wide the Micro, Small and Medium Enterprises Development Act, 2006. As per the Act, in the manufacturing sector, an enterprise with the investment in plant and machinery up to Rs.50 million is termed as a small enterprise, and an enterprise with the investment up to Rs.100 million is defined as medium enterprise. In service sector, enterprise with investment in equipment up to Rs.20 million are classified as small enterprise and those with investment up to Rs.50 million are classified as medium enterprise.

Table 4. Number of small and medium enterprises in India

Regions	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01
North India	914,428	956,616	960,683	988,145	1,026,278	1,109,630
N.East India	34,803	37,273	38,948	40,688	42,528	44,984
East India	263,557	272,783	281,375	288,166	294,786	311,631
West India	233,819	259,732	284,594	307,887	326,762	345,649
South India	567,849	623,153	692,217	749,519	809,396	856,179
Total	2,014,456	2,149,557	2,257,817	2,374,405	2,499,750	2,668,073

(Source: Ministry of Micro, Small & Medium Enterprise)

As shown in Table 4, nowadays, the growth of small and medium sized enterprises has been propelled by fresh investments in heavy industries, which depends on SMEs as their suppliers. The contribution to exports by SMES has also been significant in the wake of increase in manufacturing activity and the increasing prominence of service sector companies (Table 5). SMEs in India are generally divided into two categories, export oriented non-traded, which are usually locally owned and serve the domestic market. They are often managed by a single or few persons, often as family business. Investments are small but often within family and friends. Machinery is limited and often outdated. Management techniques are often old fashioned. But Small Industry Development Organization (SIDO) is the nodal agency, In recent years, give thrust to the enterprises like garments, engineering, spices and metals, which employ more than 30% of total population and bring in foreign revenues to the country, which is rich in its mineral reserve.

Table 5. Performance of small and medium enterprises

Year	No of Units (Rs.millon)			Production (Rs.billion)		Employment (Rs.millon)	Exports (Rs. billion)
	Regd	Unregd	Total	(at current Prices)	(at constant prices)		
2002-03	1.591	9.358	10.949 (4.1)	3119.93 (10.5)	2106.36 (7.7)	26.021 (4.4)	860.13 (20.7)
2003-04	1.697	9.698	11.395 (4.1)	3577.33 (14.7)	2287.30 (8.6)	27.142 (4.3)	976.44 (13.5)
2004-05	1.753	10.106	11.859 (4.1)	4182.63 (16.9)	2515.11 (10.0)	28.257 (4.1)	1244.17 (27.4)
2005-06	1.871	10.471	12.342 (4.1)	4762.01 (13.9)	2776.68 (10.4)	29.491 (4.4)	N.A

Note: Figures in the parenthesis indicate percentage growth over previous year

(Source: Development Commissioner (SSI))

2. Environmental Implications of Industrialization

In the context of rapid industrialization, India, like any other developing Asian country, has experienced considerable environmental degradation in recent decades. According to the Centre for Science and Environment (CSE, 1999), while the Indian economy grew by 2.2 times between 1975 and 1995, industrial pollution and vehicular pollution grew by 3.47 and 7.5 times respectively. The situation continues to worsen in the last decade with near two digit economic growth. They are briefly discussed under the headings of water and air pollution, waster management and energy efficiency.

2.1 Water and Air Pollution

India has more than 20 industrial cities with the populations of at least 1 million, and some of them including New Delhi, Mumbai, Chennai, and Kolkata- are among the worlds most polluted. Sources of air pollution, India's most severe environmental problem, come in several forms including untreated industrial smoke. One of the most affected cities in New Delhi, where airborne particulate matter (PM) has been registered at levels more than 10 times India's legal limit (Fig 3).

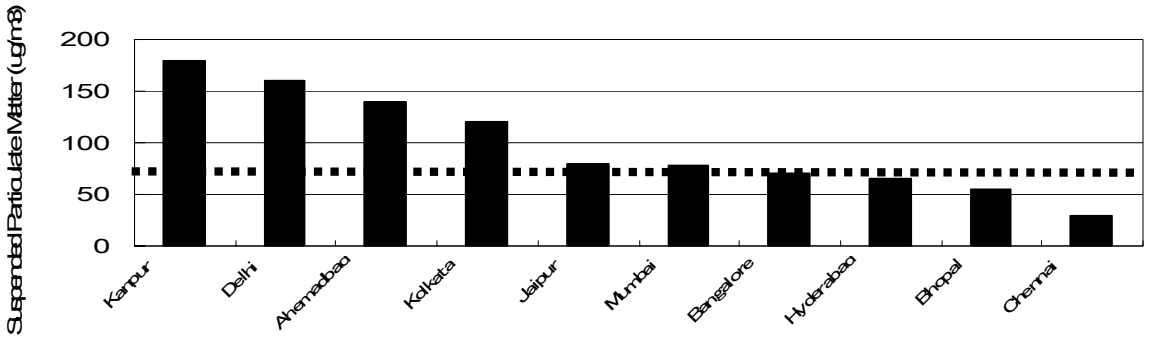


Fig 3. Extent of air pollution in major cities in India.

The air pollution by various industrial sectors has been listed in Table 6. In addition, India's reliance on coal-fired power plants for its electricity generation has undermined some of the vehicular-oriented air quality improvement initiatives. Despite the fact that India is a large coal consumer, it has been slow to set sulfur dioxide (SO_2) emissions limits for coal-fired power plants, mainly because most of the coal mines in India is low in sulfur content. Coal-fired power plants do not face any nitrogen oxide (NO_2) emissions limits either, although thermal plants fueled by other fossil fuels are subject to particulate matter emission standards. Again, however, the government's support for air quality standards has been undermined by the lack of enforcement of these standards.

Table 6. Air pollution by various sectors

Sector	1970-71	1980-81	1990-91	2000-01
Industrial	56%	41%	29%	20%
Transport	23%	42%	63%	72%
Domestic	21%	18%	7%	8%

(Source: Ministry of Environment and Forest (MoEF))

Similarly, the high levels of water pollution in excess of national ambient standards prevails in all major rivers. Fig 4 illustrates the magnitude of such degradation and table 7 shows the relative contribution of industrial sectors. In 2003, of the nearly 3000 ambient water quality observations, the levels of prevalent organic pollution, measured by BOD, exceeded water quality criteria for Class A water bodies over 1,000 cases. Located along the banks are many small scale industries, sourcing the river water for industries, while letting into untreated.

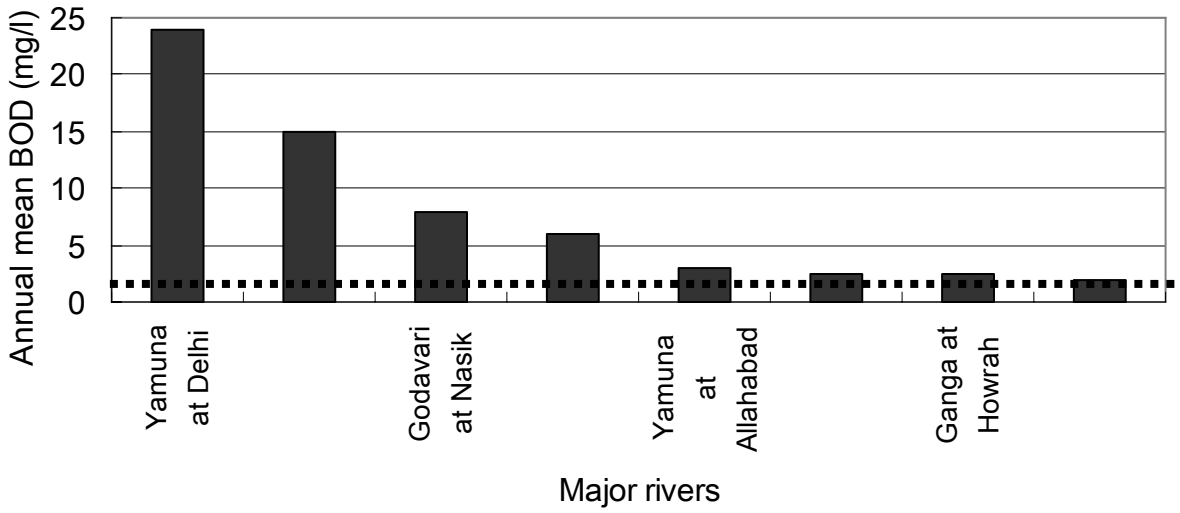


Fig 4. Water Pollution in major rivers

Table 7. Major water polluting industries (% of total BOD emissions)

Industries	1995	2000
Food	49.2	52.2
Metal	15.2	13.9
Textiles	13.6	13.1
Chemical	8.3	9.6
Paper	8.3	6.6
wood	0.3	0.3
Clay	0.2	0.2

Empirical evidences from different research studies on the impact of growth on environmental quality outcomes show that the country is still recording an upward trend in the levels of major air and water pollutants. Central pollution control Board (CPCB) has categorized seventeen high impact sectors industries (Table 8) which have significant environmental categories in terms of water effluents, air emissions, hazardous wastes and energy use. A demand for change and more effective action is building up and being recognized, albeit to a varying degree, at all levels and by all players. Country's five year plans continue to emphasis that national development agenda should prioritize environmental protection at the central, state and local levels by suitably modifying unsuatinable industry activities and understanding cumulative cross sectoral efforts.

2.2 Industrial Wastes

During the last 30 years, the industrial sector in India has quadrupled in size. Waste generation from industries is critical due to their large geographical spread in the country, leading to region wide impacts. The main source of hazardous waste and cause of an adverse impact on the environment has been the Indian chemical industry. The annual growth in hazardous waste generation can be directly linked to industrial growth in the states. States such as Gujarat, Maharashtra, Tamil Nadu, and Andhra Pradesh, which are relatively more industrialized, face problems of toxic and hazardous waste disposal far more acutely than less developed states. The major hazardous waste-generating industries include petrochemicals, pharmaceuticals, pesticides, paint and dye, petroleum, fertilizers, asbestos, caustic soda, inorganic chemicals and general engineering industries. Hazardous wastes from the industrial sectors mentioned above contain heavy metals, cyanides, pesticides, complex aromatic compounds, such as PCBs, and other chemicals which are toxic, flammable, reactive, corrosive or have explosive properties.

Table 8. High impacts sectors, as designated by the Government of India

Sector	Key Environmental Aspects
Aluminium	Disposal of red mud, bauxite tailings and other hazardous waste, dust emissions and high energy consumption
Caustic	Water pollution due to disposal of brine mud, mercury and chlorine; chlorine emissions
Cement	Fugitive dust emissions fro material handling and air emissions from stack, energy consumption
Copper	SO2 and dust emissions; water pollution from electrolytic bath and other process; disposal of slag from smelter
Distillery	Water pollution from highly organic effluents from spent wash; soil contamination; high energy consumption.
Dyes	Water pollution due to toxic azo-dyes, highly organic colored and phenolic substances
Fertilizer	Water pollution due to heavy metal, ammonia and fluoride bearing effluent, ammonia emission, fluoride bearing dust and hazardous material.
Iron and steel	Water pollution from cyanide, fluoride and heavy metal bearing effluent, ammonia emission, fluoride bearing dust and hazardous material; high energy consumption
Leather	Water pollution, particularly from hexavalent chromium and salt in discharge
Pesticide	Air pollution due to particulate and volatile organic compounds; effluent containing pesticide residues.
Petrochemicals	Water pollution due to phenol and benzene containing effluent; fugitive emissions of toxic and carcinogenic and volatile organic compounds (VOC); hazardous material disposal.
Pharmaceuticals	Water pollution due to organic residues bearing effluent; VOC and particulate emissions; hazardous waste containing process sludge and spent catalyst.
Pulp and paper	Water pollution from high organic and inorganic substance and chlorinated compounds in black liquor; highly molodorous emissions of reduced sulphur compounds and VOC.
Refinery	Water pollution from effluent containing organic and inorganic materials, oil and solvent; air emissions of particulate matters, SO2, benzene, toluene and xylene, VOC
Sugar	Water pollution due to high BOD and COD effluent and spillage of molasses; air pollution due to combustion of bagasse, coal etc; high energy consumption
Thermal power	Air emission from combustion, coal handling, water pollution due to discharge of boiler blow down, outflow from ash pond; land contamination due to fly ash disposal practices
Zinc	Air pollution due ti fugitive zinc dust, water pollution containing residues, disposal of solid and hazardous waste.

(Source: Cental Pollution Control Board)

Table 9 gives India's status of number of units generating hazardous waste as well as the quantity of waste generated, for recyclable, incinerable and disposable waste types. In total, at present, around 7.2 million tonnes of hazardous waste is generated in the country of which 1.4 million tonnes is

recyclable, 0.1 million tonnes is incinerable and 5.2 million tonnes is destined for disposal on land (MoEF 2006). As per the information provided by the MoEF, there are 323 hazardous waste recycling units in India, and of these 303 recycling units use indigenous raw material while 20 depend on imported recyclable wastes. The major generators of non-hazardous industrial solid wastes in India are thermal power stations producing coal ash, steel mills producing blast furnace slag and steel melting slag, non-ferrous industries such as aluminium, zinc and copper producing red mud and tailings, sugar

Table 9 Status of hazardous waste generation

State	No.of units generating hazardous waste	Quantity of Waste Generated (tonnes per annum)		
		Recyclable	Incinerable	Disposable
Andhra Pradesh	501	61,820	5,425	43,853
Assam	18	0	0	166,008
Bihar	42	2,151	75	243,51
Chandigarh	47	0	0	305
Delhi	0	0	0	0
Goa	25	873	2,000	3,725
Gujarat	2,984	26,000	19,953	150,062
Haryana	309	0	0	31,046
Himachal Pradesh	116	0	63	2,096
Karnataka	454	47,330	3,328	52,585
Kerala	151	84,932	5,069	690,014
Maharashtra	3,953	8,47,436	5,012	1,155,398
Madhya Pradesh	183	89,593	1,309	107,767
Orrisa	163	2,841	0	338,303
Jammu&Kashmir	57	0	0	0
Pondicherry	15	8,730	120	43
Punjab	700	9,348	1,128	12,233
Rajasthan	306	9,487	19,866	2,242,683
Tamil Nadu	1,100	193,507	4,699	196,002
Uttar Pradesh	1,020	0	0	0
West Bengal	440	45,233	50,894	33,699
Total	12,584	1,429,281	118,941	5,250,173

(Source: -MoEF, 2006)

Table 10. Source and quantum of non-hazardous waste generated from major industrial sectors

Waste	Quantities MTPA		Source/Origin
	1990	1999	
Steel and blast furnace slag	35.0	7.5	Conversion of pig iron to steel manufacturing of iron
Brine mud	0.02	-	Caustic soda Industry
Copper slag	00.2	-	By-product from smelting of copper
Fly ash	30.0	58.0	Coal based thermal power plant
Kiln dust	1.6	-	Cement plants
Lime sludge	3.0	4.8	Sugar, paper, fertilizer, tanneries, soda phosphate
Phosphogypsum	4.5	11.0	Phosphoric acid plant, ammonium phosphate
Redmud/bauxite	3.0	4.0-4.5	Mining and extraction of aluminium from bauxite
Lime stone	-	50.0	-
Iron tailings	-	11.25	-
Total	77.14	147.05	

(Source: National Institute of Environmental Engineering, 2006.)

Industries generating press mud, pulp and paper industries producing lime sludge and fertilizer and allied industries producing gypsum. The quantities of industrial waste produced per annum from these industrial sources are presented in Table 10. The seriousness of the problems due to wastes generated from the industries is not something to be taken for granted. Since these wastes are generated in huge quantities, the recycle/reuse potential of these wastes should be explored. Solid wastes constitute a complex problem in heavy industries like paper mills in the industry due to the varying nature and enormity of the wastes generated. The pressure on the natural resources is already high, and unless long term plans are made, these industries will face serious problems for solid waste disposal in the coming years.

2.3 Energy Scenario

Commercial primary energy consumption in India has grown by about 700% in the last four decades. Today, India accounts for only 3.5% of the world's energy consumption; with the capita energy consumption is 1/3rd of the world's average, which is 329 kgoe. Driven by the expanding economy and a quest for improved quality of life, energy usage in India is expected to rise to around 450 kgoe/ year in 2010. With a targeted GDP growth rate of 10%, and an estimated energy elasticity of 0.80, the energy requirements of India are expected to grow at 5.6- 6.4 % over the next few years. This

implies a four-fold increase in India's energy requirement over the next 25 years and India faces significant challenges to meet this.

India's energy supply status is illustrated in Fig 5. Coal accounts for just over 50% of total energy consumption. The power generation sector uses the majority of this coal, with heavy industry at distant second. Petroleum makes up 34.4% of India's energy consumption, while natural gas (6.5%) and hydroelectricity (6.3%) account for much of the remainder. Natural gas is growing in importance, as its

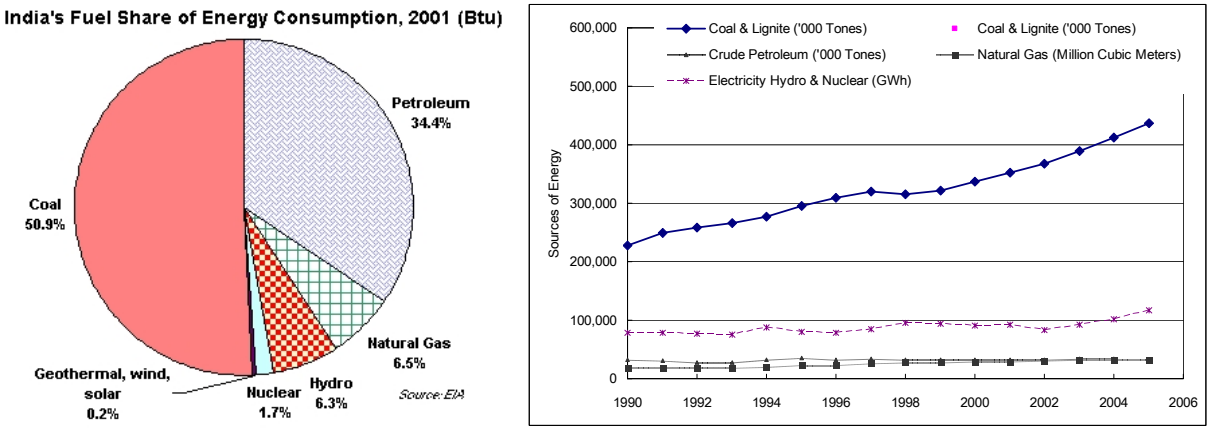


Fig 5. Share of energy consumption in India

share of India's energy consumption has risen from just 1.4% in 1980, while hydroelectricity - which made up 11.5% of the country's energy usage in 1980 - has declined in relative importance. Nuclear (1.7%) and geothermal, wind, solar, and biomass (0.2%) made up a very small share of the country's energy consumption. However, coal is the most important and abundant fossil fuel in India and accounts for majority of India's industrial energy needs. India's industrial heritage was built upon

Table 11. Sector-wise coal consumption in India

	Power	Steel	Railways	Cement	Total
	Mn.tonnes				
1995-96	184.5	26.4	4.3	11	271.1
1996-97	199	25.6	4.4	11.3	286.5
1997-98	212.9	23.6	4.6	10.1	297
1998-99	204.7	25	4.1	8.6	288.6
1999-00	222.6	21.4	3.4	9.5	304.3
2000-01	234.6	20	3.2	10.3	315.8
2001-02	242.8	20.3	3.2	11.9	325.8
2002-03	250.8	18.9	2.5	12.6	335.7
2003-04	264.4	18.1	2.3	13.4	353.6

(Source: TATA-Statistical Outline of India)

indigenous coal, largely mined in the eastern and the central regions of the country. The sector wise use of coal as source of energy is lustrated in Table 11. With power, steel, cement dominating the industrial portfolio, the green house gas emission reduction depends on how much clean coal production shall be attained in the future.

With 251 million metric tons of carbon equivalent emitted, India ranked fifth in the world in carbon emissions, behind the United States, China, Russia and Japan. Although India's carbon emissions stood at only 80% of Japan's (316 million metric tons of carbon equivalent) total, the rapid growth of India's carbon emissions are of concern. Between 1990 and 2001, India's carbon emissions increased by an astonishing 61% (Fig 6).

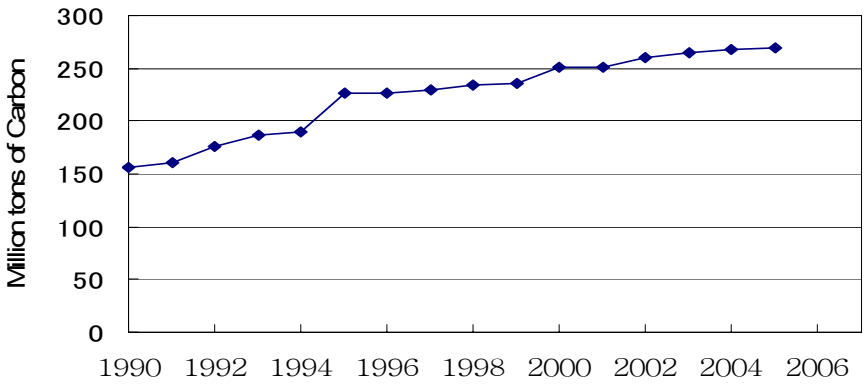


Fig 6. India’s carbon emissions

The rise in India's carbon emissions has been exacerbated by the low energy efficiency of coal-fired power plants in the country. With the high capital costs associated with replacing existing coal-fired plants, a scarcity of capital, and the long lead time required to introduce advanced coal technologies, it stands to reason that many of India's highly-polluting coal-fired power plants will have to remain in operation for the next couple of decades. As such, India's contribution to world carbon emissions is expected to increase in coming years, with an estimated average annual growth rate between 2001 and 2025 of 3.0% (The Hindu, 2007). The absolute increase in emissions will partially be a function of the degree to which coal is relied upon as a major energy source. Indian economic policies such as high import tariffs on high-quality coal and subsidies on low-quality domestic coal also have contributed to increased use of low-quality coal, although initiatives to encourage the use of higher-quality coal, such as reducing the tariff on imported coal, may help in reducing the country's carbon intensity. The introduction and adoption of technologies to reduce coal consumption and/or improve the efficiency of the coal that is combusted is an important policy priority, given that the majority of India's power generation is coal-fired.

On the other hand, India's carbon intensity has remained relatively flat over the past 20 years, even falling from a high in 1995 (30,459 Btu per $) back below 1980 level (25,861 Btu per $). India's still elevated energy intensity level is due in large part to the growth of energy-intensive industries that

has taken place in the country during the course of its economic expansion, coupled with the virtual absence of energy efficiency and conservation measures in most industrial sectors, in spite of strict standards. The differences in carbon emissions per dollar of GDP between India and other developed countries like Japan suggest large emission reductions are possible from transferring technology from the advanced economies. But, to its part, as explained in Box 1, several incentive mechanisms has been developed to promote renewable energy in India.

Box 1. An illustrative list of economic incentives for energy conservation in India

The Government of India have come out with many incentive schemes to promote energy conservation in the country. The incentives available to encourage energy saving and the use of renewable sources of energy shall be categorized as follows:

Fiscal incentives from Central Government: in respect of income-tax, excise duty and custom duty. However, the custom duty has recently been withdrawn due to the restructuring of custom duties on various items. The income-tax benefit includes 100% depreciation on written down value for renewable energy devices and there are designated items eligible for union excise duty exemption.

Subsidies from Central Government: Ministry of Non-conventional Energy Sources provides subsidies for many devices operating on new and renewable sources of energy. The central government has extends soft loan for purchase of renewable energy devices through the Indian Renewable Energy Development Agency.

Industrial licensing exemption: Delienecnsing is dones for *e*quipment up to 5000 kW for mini and micro hydel systems, electric vehicles, devices for harnessing wind, biomass, geothermal, tidal and ocean- energies.

Assistance from financial institutions: to encourage the existing industries to introduce energy conservation equipment or change over to process/production methods which are less energy intensive, financial institutions are offering assistance at concessional terms under their soft loan scheme for modernization. Though under the scheme, concessional assistance will be offered for replacement of equipment which are at least 10 years old, this restriction on age criteria is relaxed if the equipment proposed to be installed involves energy savings.

Concessions/subsidies available at State Government level: State governments have announced sales tax exemption for all renewable energy equipment, while some of the State governments have also exempted conventional energy savings devices for sales tax purposes. Subsidies announced by the State Governments are for energy audit studies and for purchase of renewable energy devices. The State Electricity Boards (SEBs) contribute towards energy conservation by way of offering incentives in their tariff structure for improvement in power factor. SEBs is also contributing funds for promotion of renewable energy devices and advertisement campaigns.

Incentives given by oil companies under Petroleum Conservation Research Association (PCRA) scheme: PCRA is registered as a society under the Ministry of Petroleum & Natural Gas to promote petroleum conservation in India. PCRA has two schemes in the area of energy conservation, energy audit subsidy scheme and boiler modernization scheme.

Energy audit subsidy scheme: It is started in 1989 with the primary objective to identify the energy saving opportunities in various industrial units. PCRA offers subsidies up to 50% of the cost towards the conducting of energy audit at the interested party's industrial premises limited to a maximum amount of Rs. 25,000 per industrial unit. The subsidy is payable after satisfactory conduct of energy audit and acceptance of energy audit reports both by the interested party and PCRA.

Boiler modernization scheme: It is started in 1981, by PCRA in association with the oil companies, covers replacement of old and inefficient boilers with efficient ones. This scheme covers the replacement of inefficient oil fired boilers by modern efficient oil or coal fired boilers. These boilers have to be in operation with the oil consumer for a period of at least two years. The interest rate for this scheme at the inception was around 18%. It has, however, been reduced in stages to 9% plus a service charge of 0.5 to 1% levied by oil companies. This loan is repayable in installments in three to five years.

3 Environmental Governance

3.1 Environmental Policy

By any bench mark, India has an extensive environmental governance system with a comprehensive set of laws, specific statutory mandates, regulatory instruments, and institutional frameworks to implement and enforce policy objectives. As illustrated in Box 2, environmental issues

Box 2. An illustrative list of key Environmental legislations in India

Policies

1992 Policy Statement on Abatement of Pollution
1992 National Conservation Strategy and Policy Statement on Environment and Development
1998 National Forest Policy
2002 Wildlife Conservation Strategy
2006 National Environment Policy

Environment Acts

1927 The Indian Forest Act
1972 The Indian Wildlife (Protection) Act (amended 1993)
1973 The Water (Prevention and Control of Pollution) Act (amended 1988)
1977 The Water (Prevention and Control of Pollution) Cess Act (amended 1992)
1980 The Forest (Conservation) Act (amended 1988)
1981 The Air (Prevention and Control of Pollution) Act (amended 1987)
1986 The Environment (Protection) Act (amended 1992)
1988 The Motor Vehicles Act
1991 The Public Liability Insurance Act (amended 1992)
1995 National Environment Tribunal Act
1996 National Environment Appellate Authority Act
2002 The Wild Life (Protection) Amendment Act
2002 The Biological Diversity Act
2003 The Water (Prevention and Control of Pollution) Cess (Amendment) Act

Environment Rules

1986 The Environment (Protection) Rules
1989 Hazardous Wastes (Management and Handling) Rules
1990 Forest (Conservation) Rules (amended 1992)
1991 Chemical Accidents (Emergency Planning, Preparedness and Response) Rules
1998 The Bio-Medical Waste (Management and Handling) Rules
1999 The Recycled Plastics Manufacture and Usage (Amendment) Rules
2000 The Municipal Solid Wastes (Management and Handling) Rules
2000 The Hazardous Wastes (Management and Handling) Amendment Rules
2000 The Ozone Depleting Substances (Regulation and Control) Rules
2001 The Batteries (Management and Handling) Rules
2002 The Noise Pollution (Regulation and Control) (Amendment) Rules
2003 The Recycled Plastics Manufacture and Usage (Amendment) Rules
2003 Bio-Medical Waste (Management and Handling) (Amendment) Rules
2003 Forest (Conservation) Rules
2003 Draft Biological Diversity Rules

Environnent Notifications

1994 Environnemental Impact Assessment Notification 1994 (amended 2002)
1998 Constituting the Taj Trapezium Zone Pollution (Prevention and Control) Authority
1999 Fly Ash Notification
2003 Charter on Corporate Responsibility for Environmental Protection (CREP)

International Agreements to which India is a Signatory

1972 The Rio Declaration on Environment and Development and the Agenda 21
1975 The Convention on International Trade in Endangered Species of flora and fauna (CITES)
1985 The Vienna Convention/Montreal Protocol on substances that deplete the ozone layer
1991 The Convention on Wetlands of International Importance (Ram Sar Convention)
1992 The Framework Convention on Climate Change
1992 The Convention for Conservation of Biological Resources

have become a national concern in India only from 1980s. The guiding policy during the previous decades was one of accelerating economic growth through rapid industrialization with little concern for environmental impacts. Through the 1970s to 1990s the Indian approach to environment generally has been one of command and control. Though regulations were enacted frequently, the implementation continued to be weak. This scenario changed with the leak of iso-cynate gas from the Union Carbide factory at Bhopal in December 1984, leading to one of the world's worst industrial disasters. The Bhopal gas leak became a watershed in the history of environmental legislation in India. The death toll of nearly 3000 people, in the periphery generated fears about the safety status of other companies that were situated near thickly populated areas. These increased with the occurrence of an oleum gas leak in a major chemical industry in Delhi. While both the government and industry had paid little attention to the environmental hazards posed by manufacturing facilities, these events highlighted the need for improving safety and environmental protection systems.

After that, the government and the private sector have redefined the desired goals, formulated specific rules and set in place an enforcement programme and regulatory agencies to ensure compliance. Formal environmental planning in India started in 1972, when the preparatory committee for the Stockholm conference became the forerunner of the National Environmental Planning and Coordination Committee. The regulations to control and manage air and water related pollution were in place since 1974 and 1981 when the Water Act and Air Acts, were respectively, enacted. It also led to the establishment of central and state pollution control boards with wide powers for scrutinizing the effluent management efforts of firms. The major concern and need to manage the fragile resources in the country in a scientific manner was felt only in the mid-eighties, while that can be said for green house gas emissions in 2000s.

In 1986, the Ministry of Environment and Forests (MoEF) enacted The Environmental Protection Act. Subsequent to this Act, in order to prevent indiscriminate disposal of hazardous waste, the MoEF promulgated the Hazardous Wastes Management and Handling Rules in 1989, and efforts to establish inventories for hazardous waste management were accelerated. Though the hazardous waste rules were introduced in 1989, the response towards their implementation has remained very poor. The Bureau of Energy Efficiency (BEE) was established in 2002. The Public Liability Insurance Act of 1991 introduced the concept of a no-fault liability standard. Under which compulsory and immediate compensation had to be paid to those affected in the case of accidental events. In addition to obtaining adequate insurance policies firms were also required to contribute a prescribed amount for a relief fund to be set up in the state. The National Environmental Tribunal Bill of 1992, provided for strict liability for damages, arising out of any accident when handling hazardous substances. It also provided for establishment of a National Environmental Tribunal for effective and expeditious disposal of relief and compensation classes related to such accidents under the bill the government also reserved the right to implead in the cases where persons did not have adequate/ appropriate legal representation.

The Charter on "Corporate Responsibility for Environmental Protection (CREP)" is launched in March 2003 with the purpose of making the companies to moved beyond the compliance of

regulatory norms for prevention and control of pollution through various measures including waste minimization, in-plant process control and adoption of clean technologies. The Charter has set targets concerning conservation of water, energy, recovery of chemicals, reduction in pollution, elimination of toxic pollutants, process and management of residues that are required to be disposed off in an environmentally sound manner. The Charter enlists the action points for environmental problems for various categories of seventeen highly polluting industries. A task force was constituted for monitoring the progress of implementation.

3.2 Institutional Framework

As can be seen from the previous section, India's high rate of environmental degradation is not due to the absence of a sound environmental legal regime, but to a lack of environmental enforcement at the local level. In India, environmental legislation involves a shared responsibility between the Centre and the States, with Central government having responsibility for policy and regulatory formulations and the State governments for ensuring implementation and enforcement of national policies. As, shown in the Fig 7, at the central level, the MoEF and the Central Pollution

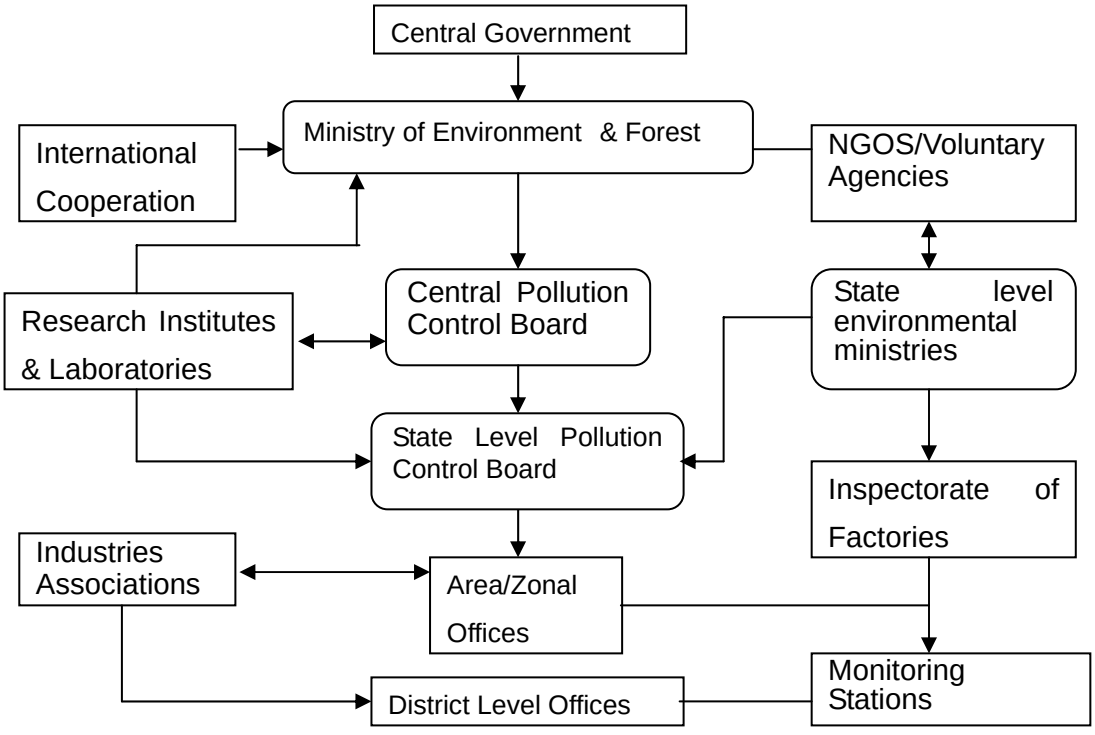


Fig 7 Institutional framework for environmental protection in India

Control Board (CPCB) are the nodal agencies responsible for environmental compliance and enforcement. Similarly at the state level, the State government departments of Environment and Forest (DoE/DoF) and the State Pollution Control Boards (SPCB) are the designated agencies to perform these

functions. Despite strong policy and institutional framework, environmental degradation continues in many areas, non compliance is widespread (Fig 8) and public dissatisfaction is dominant. In principle, SPCBs are the primary designated agencies to implement and enforce most of the environmental laws at the state level. But their responsibilities are vast- establishing pollution control programs, issuing site specific regulations, addressing citizens complaints as well as implementing different management systems as outlined in Table 11. As a result, less time and emphasis is spent on monitoring and tracking compliance of existing facilities and pursuing enforcement actions against polluting facilities, resulting in poor compliance records.

Many SPCBs have relatively good records regarding the performance of the highly polluting units in the large scale sectors, the monitoring and inventory of small-scale units in the category of highly polluting processes is very poor and often incomplete. In part, the lack of interdepartmental coordination between the SPCBs and the field units of small scale industries department result in the existence of some highly polluting units in the various States. (Planning Commission, 2005). Moreover, most of the SPCB are already under-staffed and under-funded in meeting its existing obligations to implement regulatory mandates of various national and State laws and directives from the courts. A recent report by the Planning Commission (2005) concluded that the SPCBs are currently characterized by a dominant presence of non-technical staff, differential availability of staff for monitoring polluting industrial units, large staff vacancy positions, vast variations in financial positions, and prohibitive spending restrictions imposed by State governments. One of the main institutional challenges for SPCBs is about recruiting and maintaining quality technical staff to perform mandated duties. Many PCBs are chronically understaffed as indicated in Table 12 resulting in varied compliance rates across the country (Fig 8).

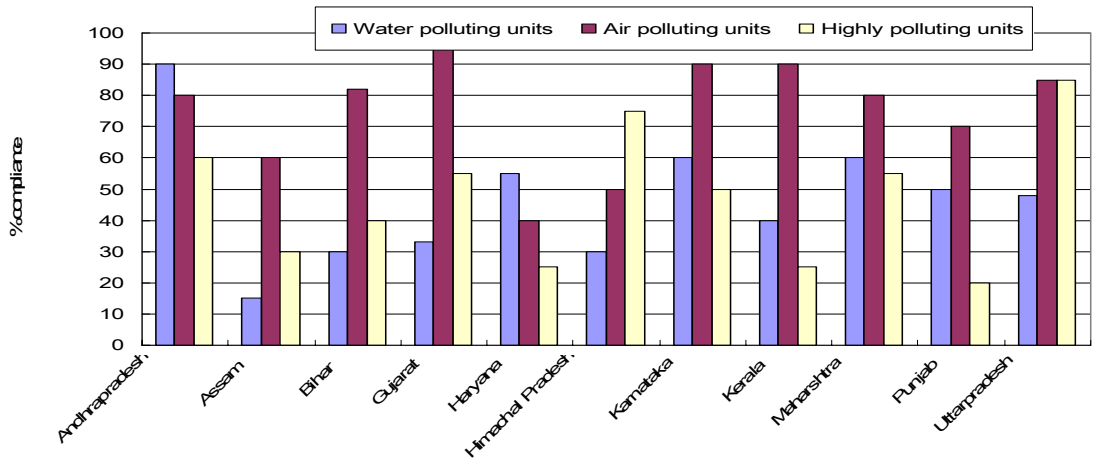


Fig 8. Status of environmental compliance across various states

(Source: Planning Commission of India, 2005)

Table 11 Summary of environmental management planning approaches by PCBs in India

Action plans for critically polluted/problem areas.	This is the major area-based program in India. To date, 24 critically polluted/problem areas have been identified by the Central Pollution Control Board (CPCB) in consultation with the concerned State Pollution Control Boards (SPCBs), for which action plans are in various stages of implementation.
Programs for environmentally sensitive areas	The Ministry of Environment and Forests (MoEF) have issued notifications prohibiting or restricting location of industries, mining operations and other development activities with environments impacts in five environmentally sensitive areas.
Eco-city program	The Eco-City Program has been initiated by the CPCB for environmental improvement in selected small and medium towns. In the first phase, it has been launched in four towns.
City level urban air action plans	The CPCB has identified 53 non-attainment cities where the air quality exceeds the prescribed ambient standards. The concerned State governments and SPCBs are required to prepare action plans for air pollution reduction in these cities. Several measures have been undertaken in recent years in Delhi; and action plans have been submitted for 16 other cities.
Areas with industrial clusters	Under this program, eight areas of concern due to the clusters of polluting industries - mostly tanneries and foundries but also drugs and pharmaceutical manufacturing units, and clusters of coal mining and coal based power stations- have been subjected to rigorous monitoring and pollution control initiatives.
Area wise zoning atlas for the siting of industries	To delineate the areas that suitable for industrial siting and for classification of areas in different categories based on their existing environmental profiles, the program for preparation of District–wise Zoning Atlas has been taken up by the CPCB in collaboration with the SPCBs. In the first phase, 19 districts were taken up for preparation of the zoning atlas.
Area wise assimilative capacity assessment	A pilot program for assessing area wise assimilative capacity and exploring the feasibility of setting location specific standards was undertaken by the CPCB in the river stretch in Rajamundri and in the Vizag air shed area, Andhra Pradesh.
Area wise carrying capacity studies	Studies were undertaken in five selected areas of the country to assess the area wise carrying capacity over time, to assist with spatial planning and decision making with respect to industrial growth and other development activities based on environmental considerations.

Table 12. Comparison of staff resources and skills for every 100 polluting units in the states

State	Sanctioned staff	Staff in position	Number of technical staff	%of technical staff to total	% of vacant posts to sanctioned posts
Andhrapradesh	4.72	3.11	1.17	37.61	34.08
Assam				47.21	3.43
Bihar	16.66	15.69	10.28	65.52	5.48
Goa	9.68	5.24	1.61	30.77	45.83
Gujart	7.8	6.69	3.50	52.34	14.16
Haryana	12.37	8.59	2.16	25.14	30.62
Himachal Pradesh	52.65	44.25	11.50	26.00	15.97
Karnatka	22.19	7.77	4.47	57.48	64.97
Kerala	29.83	28.77	14.27	49.59	3.56
Madhya Pradesh	20.13	21.92	9.29	43.29	8.87
Mahrashtra	8.47	7.00	3.23	46.20	17.39
Orissa	21.05	15.31	5.84	38.13	27.27
Punjab	6.26	2.86	2.32	81.13	54.31
Rajasthan	9.93	9.09	3.89	42.72	8.44
Tamilnadu	11.42	8.54	3.62	42.39	25.24
Uttarpardesh	11.68	8.52	3.09	36.25	29.99
West Bengal	5.30	4.19	2.49	59.44	20.99
All boards	10.73	8.10	3.70	45.69	24.46

（Source: Planning Commission of India, 2005）

3.3 Judiciary

In most countries, the judicial systems have been viewed as a last resort in resolving environmental conflicts. In India, however, it has often been the first resort because of perceived inabilities or lack of political will of the agencies to enforce environmental laws and regulations. In 1996, India's Supreme Court served closure notices to 225 polluting industrial units and ordered their relocation or closure (Table 13). Immediate closure of as many as 60 industries is also done, not for not installing the required effluent treatment plants. In a number of judgements Indian courts have ruled that under the constitution of India, citizens have a fundamental right to live in a pollution free environment and that the court was duty bound to compel the statutory authorities to ensure the same.

As exemplified in Table 14, the rise of judicial activism led to the strengthening of existing provisions of the law, institutions and the corporate attitude to environmental protection. This period also saw the emergence of Public Interest Litigation in which the traditional rules regarding locus standi, where petitioners were expected to prove that they were personally affected, were relaxed. This also increased the pressure on companies to respond to the grievances of local community through judicial systems.

Table 13. Number of factories closed down due to judicial intervention

Category	Total number of units	Total number of units closed	Total no. of units complying	Defaulters
Aluminium	7	1	6	-
Caustic	33	-	33	-
Cement	205	17	182	6
Copper	4	-	4	-
Distillery	209	39	167	3
Dyes	102	10	90	2
Fertilizer	124	13	109	2
Iron&Steel	19	1	14	4
Leather	94	15	75	4
Pesticide	111	8	102	1
Petrochem	75	-	74	1
Pharma	401	41	350	10
Pulp&Paper	136	26	108	2
Refinery	16	-	16	-
Sugar	462	50	409	3
Zinc	6	1	5	-
TPP	151	3	133	15
Total	2,155	225	1,877	53

(Source: TATA-Statistical Outline of India)

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Table 14. Summary of selected public interest litigations and court directives

Case	Court Directive
Ratlam Municipality v/s Vardhichand – AIR 1980 SC 1622	The municipality was directed to construct toilets and remove filth from an open drain irrespective of financial constraints.
M.C. Mehta v/s Union of India & Others – AIR 1988 SC 1037	The authorities were directed to stop the operation of tanneries causing pollution in river Ganga.
M.C. Mehta v/s Union of India & Others – AIR 1987 SC 1086	The Court held that the enterprise engaged in hazardous or dangerous activity owes an absolute duty to the community to ensure that harm is avoided to anyone on account of hazardous nature of activity undertaken by such enterprise.
M.C. Mehta v/s Union of India & Others – 1997 (11) SCC 312	Directed the Government to constitute an authority for regulating and control of ground water management.

M.C. Mehta v/s Kamal Nath – 1997(1) SCC 388	Relying on Public Trust Doctrine, the Court ordered that it extends to natural resources such as rivers, forests, etc.; directed for recovery of damages who caused damage to the environment.
Vellore Citizens Welfare Forum v/s Union of India – 1996(5) SCC 647	Directed the polluter to pay the cost for remediation of the damaged environment as part of the process of sustainable development, polluter pays principle and precautionary principle.
S. Jagannath V/s Union of India – AIR 1997 SC 811	Directed shrimp culture industry to close its activities in view of the ecologically fragile coastal area and adverse effect on the environment because of its activities.
Rural Litigation & Entitlement Kendra v/s State of Uttar Pradesh – AIR 1987 SC 359	Directed the mining industry to stop the mining activities in the forest area of Doon Valley.
B.L. Wadhera v/s Union of India – AIR 1996 SC 2969	Directed the municipality of Delhi to remove garbage from various parts in the city of Delhi.
M. C. Mehta v/s Union of India & Others 1997(11) SCC 327	Directed the authorities for closure/shifting/relocation of hazardous and noxious industries outside the territory of Delhi which were operating in violation of the Master Plan.
M.C. Mehta v/s Union of India & Others 1997(3) SCC 715	Directed the industries to stop construction activity within 1 km from the lakes for the preservation of tourism and upheld the concept of sustainable development and precautionary principle.
M.C. Mehta v/s Union of India & Others 1986(2) SCC 176	Observed to set up separate environment courts to deal with environmental disputes.

(Source: the Supreme Court of India website http://supremecourtofindia.nic.in/)

3.4 Market Based Instruments

It is difficult to find solutions to variety of environmental problems through regulatory approaches alone. Moreover, the challenges that elude conventional approaches may find solutions through market based approaches. For a truly sustainable transformation of the industry the environmental policy must attack a new generation of diffuse problems for which regulatory solutions would be difficult, while recognizing that some environmental problems have always eluded conventional controls (UNRISD, 2006). Market-based instruments like proportional emission or discharges are good options to internalize the environmental externalities. But no measures or plans, including carbon tax and polluter-pay principle, have so far been contemplated for implementation in India. However, the industries which use water in their processes are required to pay “water cess” to the State Pollution Control Board for the quantity of water drawn.

The major barriers to the implementation of market based instruments are:

- India has traditionally focussed on command control for environment management there little understanding and appreciation of the use of market based instruments among the various stakeholders. Further, any move to a greener and a more transparent system is likely to face opposition from vested interests for maintaining the status quo and the regime of controls where lobbying and manipulation of the decision making processes are possible.
- The orientation of the existing legal system towards a command and control system. As of now there is no legal, institutional or organizational framework to mediate, administer, implement and monitor market based instruments. Existing regulatory agencies have little capability for monitoring and enforcement at the local enforcement and self government levels
- The existing industrial structure is also likely to be a barrier. For example, in India the strategic sectors such as power, transport, fertilizers etc are dominated by large public sector or government owned organizations. Such firms would be less responsive to market based instruments as they have the capacity to ignore market forces through absorbing losses or mark up pricing. (Gupta, 1997)

But there is growing attention and calls for introduction of economic or market-based instruments (Box 3).

Box 3. Market based instruments for environmental protection in India

An international workshop on economic instruments for industrial pollution prevention and control was held in Delhi in June 2001(Shrivastava, 2001). It brought together Indian and international experience with the application of economic instruments. The three-day workshop put forward a variety of tools used around the world, including pollution charges, tradable permits, performance bonds, and taxes on output and inputs, as well as the instruments of persuasion, such as public disclosures. The stories from countries as different as China, Columbia, Indonesia, Philippines, Thailand, United States and Vietnam were bridged with the current experience in India to generate the way forward to expanding the appropriate mix of instruments for India. Several important messages emerged from the workshop. First, there was a consensus that the existing regulatory system in India needed to be strengthened by a greater use of incentives. Second, it was noted that for these instruments to work well in practice, sufficient attention should be given to the details of implementation, including the capacity of regulatory institutions, during the design stage. Third, the workshop concluded that a greater reliance on economic incentives should start with testing a simple instrument, consistent with India's legal and institutional framework for pollution management. Finally, the workshop recommended initiating the use of such an instrument on a pilot basis. A recent introduction of the pilot bank guarantee program, a kind of performance bond instrument, for non-compliant industries is consistent with these recommendations.

4. Voluntary Corporate Environmental Management Activities

Among the Asian countries, India and Malaysia appear to be most active in the field of corporate social responsibility (OECD, 2005). The National Conservation Strategy and Policy Statement of Environment evolved in 1992 turned to be the catalyst for changing the attitude of corporate houses. The statement highlighted the need for integration and internalization of environmental considerations in the activities of various industrial sectors. Even though the voluntary approaches are fragmented and constrained by many factors, they show the business commitment to explore its environmental performance through a number of approaches as described below:

4.1 Voluntary Agreements and Codes of Conduct

The Confederation of Indian Industries (CII) and The Federation of Indian Chambers of Commerce and Industry (FCCI) work closely with government on environmental policy issues and provide a platform for sectoral consensus building and development of codes. CII has been organising environmental and social summit every year and established the Environmental Management Department (EMD) with a team of well trained professionals to undertake range of activities, such as training and conducting audits for setting voluntary standards. EMD's thrust is on building in-house

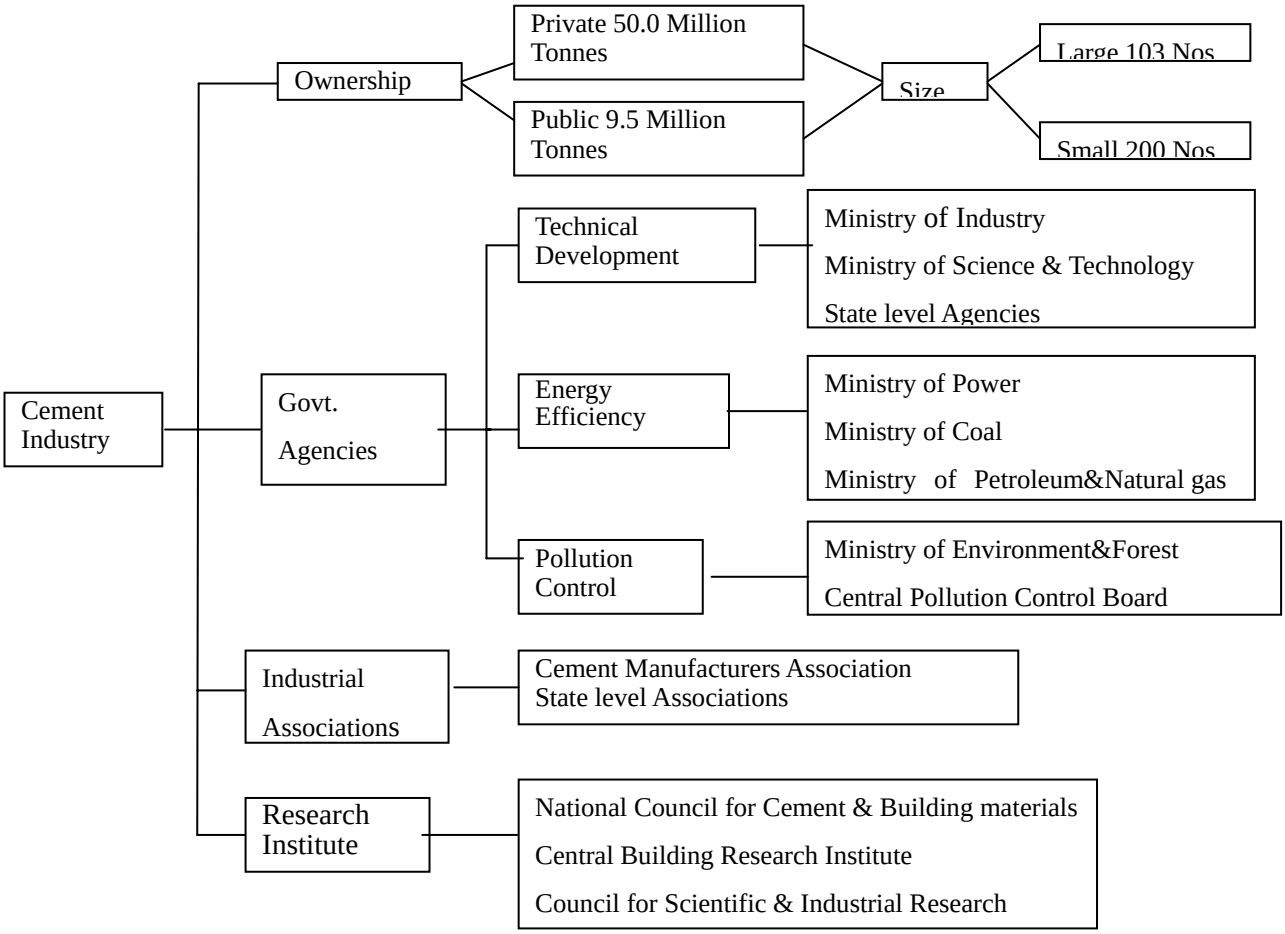

Fig 9. Institutional set up for environmental protection in the cement industry

capabilities in Indian industry to address environmental issues effectively and proactively. FICCI also has an exclusive Environmental Information Centre that compiles and disseminates information on environment regulation, success stories, best practices, energy efficiencies and clean technologies.

Both the business associations are instrumental to the growth of number of voluntary agreements by the industry to demonstrate environmental stewardship to company shareholders, communities, consumers and the regulators. There are instances where successful voluntary agreements made between the industry and government to gradually improve environmental performance beyond compliance requirements. One example is the agreement with the cement industries to improve their emission levels to 50µg/Nm^3 from 100µg/Nm^3 which was set to became legal requirement in 2006 (World Bank, 2007). In that process, Cement Manufactures' Association (Fig 9) showed the leadership and instrumental in bringing in the standards in cooperation with research institutes and pollution control boards. Similar codes of conducts are developed for chemical industry, through its responsible care initiative and garment sector.

4.2 Environmental Reporting Initiatives

Indian companies actively participate in such initiatives as Global Reporting Initiative (GRI).With CII as an organizational stakeholder in the coalition for Environmentally Sustainable Economies (CERES), it helped UNEP in preparing the GRI reporting guidelines. Apart from this, a number of leading companies are also actively managing their environmental impacts and this is evidenced by some major companies producing detailed sustainability reports. India was also one of the first countries in which Global Compact was launched. As of 2004, over 90 companies had committed to its Global Compact principles. Realizing the need for nationwide network, India Partnership Forum, a joint UNDP/CII initiative was started in 2001, thus exercising leadership within the broader regional business community. The confederation of Indian Industry (CII) has adopted Social and Environmental Principles and continues to play an important role in promoting its principles to their members and refining their environmental reporting initiatives.

4.3 Environmental Management Standards

The Bureau of Indian Standards (BIS), the national standards body of India and a founder member of International standards Organization (ISO), continues to take part international standardization activities. India was among the few countries to develop a national quality standard, the IS10201, in 1982. Similarly in 1988 BIS formulated a standard on environmental management even before ISO developed ISO14001. ISO 9000 standards were adopted by BIS in their entirety, and latter developed as IS9000. In addition to the adoption of ISO standards, BIS has formulated standards in the fields of quality cost analysis (IS10708), the development of supplier rating systems (IS12040), complaints handling (IS15400), quality circles (IS12301), the management of hospital services (IS13808), in addition to a handbook on statistical quality control (SP28).

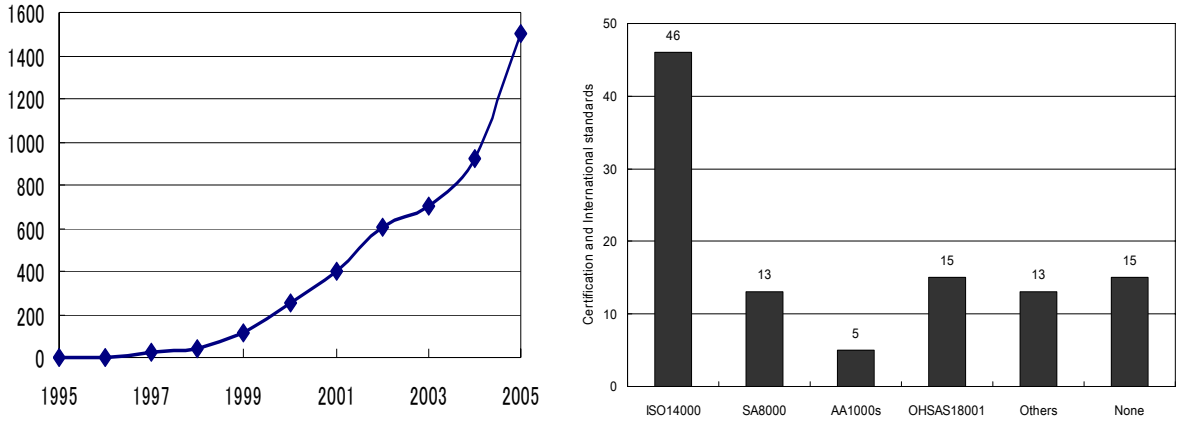

Fig. 10 Growth of internationally certified companies in India

Among the international standard system ISO9000 has seen an impressive growth in India (Fig 10). The number of certified companies increased from 5,554 in 2001 and approximately 12,000 in 2006. ISO 14001 is an environmental management standard that defines the environmental policy of an organization. This standard helps organizations to protect the environment, check pollution, and improve their overall environmental performance. In India, ISO 14001 is found to be useful tool for business to step up from just maintaining regulatory compliance to an organization with improved productivity and enhanced competitive advantage. With just one ISO14000 certified company in 1995, the number grew to 257 companies over the next five years and reached 879 in 2003. By the end of 2005, approximately 1,500 companies were certified with ISO14000. Some SPCBs have stayed requesting an ISO 14001 certificates from the high impact sectoral categories before the renewable of their consents and authorization. However, it has been noted that most of the certified firms were large industries, or units or facilities of large firms, while SMEs have been relatively slow in their uptake of their standards.

4.4 Eco Labelling and Certification Programs

Eco labelling assists firms to produce more environmentally benign products, and ensure that the inputs to their production processes have not been environmentally damaging in their own production. There are now several certification and standard schemes, most of them are voluntary, for product quality, environmental friendliness and organic production. Over 1,100 products have been certified for product quality standards by BIS and 16,000 licenses have been issued to companies meeting these standards. Realizing the popularity of labels in many industrialized countries, the Indian eco-lable scheme – Eco-mark was launched in 1991 for certifying and awarding a special product label to goods meeting specific environmental and quality standards. Basically, Eco-mark is a market based non-regulatory instrument to reduce pollution and improve environmental protection. In India, the scheme consists of a three stage cradle to grave screening process, meaning that the life cycle analysis of the product is based on the environmental consequences of the manufacturer, use and disposal of the product. Eco-mark scheme was initially designed to cover 16 product categories although this was latter

reduced to 14. However, new categories such as ozone depleting substances, leather products etc have been added, and presently there are 17 product groups for which Eco-mark was available. The BIS awards and oversees the progress of eco-labelling. There are now Eco-mark criteria for more than 140 products in several categories such as soaps, detergents, paints and paper.

But the overall business response to the Eco-mark scheme within India has not been very encouraging, and manufacturers have been hesitant to apply the label. Only few companies have been granted Eco-mark label since its inception in 1991, which include a detergent company and three paper mills. Moreover, none of these companies is using the label on their products. Discounting the failure of Eco-mark, Jain (2004) states that some independent certification schemes are spreading fast in India, especially in the context of fair trade and for certain export items like tea. Fair trade organization international has certified that 23 companies in India operate in accordance with its Fair trade standards, while International Fair trade association has several companies in India. Similarly, the International Federation of Organic Agriculture Movements has 29 members and eight associates in India certifying production according to organic standards. However, it should be noted that independent third part certification programs in India are formed primarily at ensuring quality of products in trade, and concerns for the environment are generally given lower priority and are most often linked to reducing negative environmental impacts of industry.

4.5 Registration Schemes

The voluntary registration scheme with an aim to establish environmentally sound facilities for recycling of wastes was introduced in late 1990s. The scheme is designed to voluntarily register factories with environmentally sound technology for recycling of waste oil, non ferrous metallic wastes, lead batteries etc. and the scheme ensure that industries generating these wastes auction them only to registered units in the country. These schemes are augmented to support financially the business initiatives on the waste to energy projects, and establishment of bio-gas projects from organic wastes. In the field of energy conservation, these programs mainly focused on products rather than process. For different types of equipment there are different types of energy conservation parameters to be registered. One or more of the aspects of maximum limit on energy consumption, minimum limit on efficiency and maximum limit on losses is stipulated. Besides product specifications, guidelines are given for achieving energy efficiency, concerning selection, system design and codes for installation and maintenance (TERI, 2003).

4.6 Eco Design

At the heart of voluntary corporate environmental management is better design of products, processes and services. When the design of a product is improved, the production processes and services follow. Better design can win more customers as well as reduce pollution. It can also create significant innovation, and organizations that want to promote innovation should consider using “green” design as a starting point. Consumer product designers, usually large corporations make decisions that influence the environment during the product's life cycle. To develop truly sustainable products, the

designers must be able to assess which design solution is environmentally preferable. They need to measure the environmental consequences of their design decisions. That is to say, for designing an eco-friendly product, one should design environmentally sound product life cycles, for which one needs to consider all the aspects from the material inputs to the energy use of a product during its whole life cycle. Unfortunately, the consumer movement has been not taking significant strides in India. While product liability litigation is still low and consumers are less demanding for improved environmental performance from their manufacturers and service providers.

4.7 Cleaner Production

Cleaner production approach is a preventive, integrated strategy that is applied increase productivity by ensuring a more efficient use of raw materials. International organizations like UNIDO are instrumental in promoting such concepts in sectoral activities, as well as the implementation of multilateral environmental protocols through development and transfer of clenaer prodyction technology and investment promotion. The results from demonstartion projects indicates tangible benefits. But cleaner production requires changing attitudes, exercising responsible environmental management and promoting technology change, which is often lacking. There are a number of barriers to the adoption of clean technologies in India. A study by the National Environmental Engineering Research Institute indicated a number of barriers including:

- Polluting technologies often have a price advantage over the non-polluting processes. The current resources of firms may be insufficient to meet incremental costs for clean technology adoption.
- Lack of information regarding local markets such as availability of trained manpower. This may lead to over/underestimation of capital and operating costs.
- Low risk bearing capacity of firms in the small and medium scale sector.
- Practical and operational difficulties such as access to good quality raw material etc those are required for the implementation of certain technologies.
- The adaptability of imported technologies to local conditions.
- There is a lack of coordination and direction in research and development efforts and inadequate thrust for technology transfer from lab-to-commercial scale.

5. Potentials and Limits of Responsible Entrepreneurship in India

In India, the corporate environmental management agenda is facing of immense proposition. A survey by the Centre for Social Markets (CSM, 2001) asked mainly large companies to list the main driving factors to environmental responsibility. Fig 11 represents the results, with a combination of awareness, regulatory changes and a changing global competitiveness as the driving forces for voluntary corporate and social responsibility. In another study done by German Development Institute (2007), brand enhancement was mentioned as the main driving force for business case. In that survey, many of the business believed that those pro-active actions help to improve their company's reputation, which increases long term market potential and so makes a business case. However, the

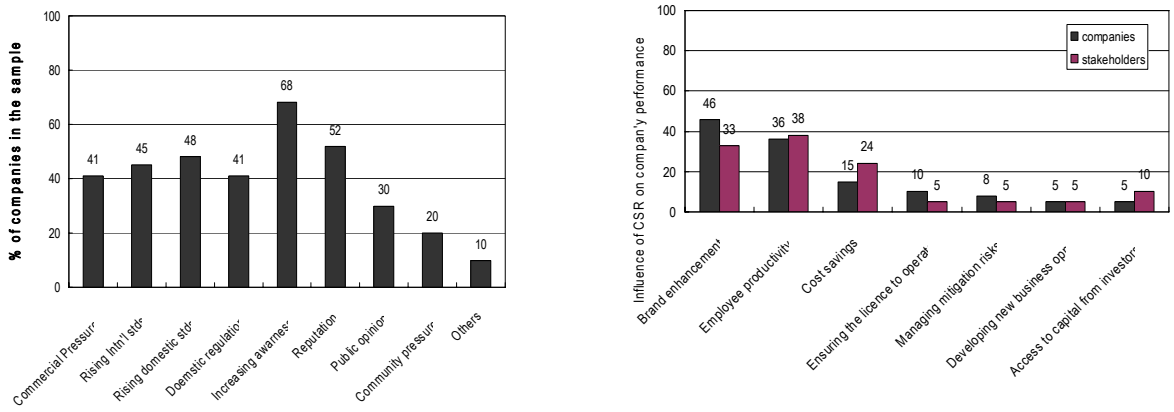

Fig 11 Driving forces of corporate and social reasonability as observed in India

degree to which the brand value is relevant to a company largely depends on its consumers and other business in which it operates. Current approaches of environmentally responsible entrepreneurship, like that of most other developing countries, is facing different barriers. Jose (2005) studied various factors, which shall be summarised as follows:

5.1 Policy distortions and subsidies

- The problem of market failure arising from policy distortions and subsidies. This is because environmental costs of goods and services are rarely fully internalized due to the prevailing regime of policy distortions, taxes and subsidies (World Bank, 2002). With a system of administered pricing and in many cases assured raw material for subsidies such as coal, timber etc, and many sectors of the industry had no incentive to internalize the environmental costs of their operations.
- There has been a systematic build up of biases into the system often leading to irrational use of both resources as well as products. For example continuous subsidies in the agricultural sector has led to the overuse of fertilizers and the subsequently land degradation. Other examples include the supply of the primary raw material at highly subsidized rates in the pulp and paper industry and the supply of ground water at reduced rates to most industrial units. These distortions have caused the industry to adopt inefficient and waste generating technologies in the past.
- Until the late 1980s the system of licensing and controlled production limited consumer choice as a consequence of which firms operated in a predominantly sellers market. In the absence of adequate internal competition, incentives for innovation were low, leading to the adoption and promotion of energy inefficient or polluting technologies. This is particularly evident in the case of the Indian automobile industry, which initiated modernization, and energy-environment conservation measures primarily after the after the threat of competition became greater.

5.2 Legislative Barriers

- Effective environmental management in industries has been hampered due to non-integrated regulatory regimes, lack of adequate monitoring mechanisms and ineffective implementation of

existing legislation by the pollution control boards (Monga, 2004). The regulations are difficult to implement and the implementing strategy has been rather weak. This partly comes from the fact that the regulations envisage centralized control rather than on line monitoring and self-regulation. Reliance on criminal procedures has made pollution control boards rely on litigation which is time consuming for the businesses.

- Even well meaning legislation such as one that requires monitoring and reporting of environmental performance have failed to hit their mark. The weak implementation of the existing legislation until recently also meant that there was a natural incentive for firms to generate extra profits by evading legislative requirements.

5.3 Technological Barriers

- Technological incompetence arises from a number of factors such as non availability of technology itself to the funds to cleaner production technologies; inability of the workforce to imbibe new skills and value systems due to attitudes, culture, education or experience related factors. Technological incompetence may also develop due to limited access to know-how and technology in pollution prevention, control and remediation (AIT, 2004).
- While technology is being rapidly upgraded some sectors such as electronics, telecommunications and pharmaceuticals; in many of the high impact sectors such as chemicals, dyes, intermediates and tanneries polluting processes continue to use obsolete technologies. This problem is compounded by the fact that there is little research and development of innovative, cost-effective and developing country specific solutions to environmental problems.
- There is no effective system for bench marking of technological products and processes on energy efficiency and environmental friendliness.
- Cost plus pricing of outputs, protection regimes, and subsidized costs of raw material and natural resources discouraged conservation and recycling.
- Many of the severely polluting sectors such as dyeing, tanning and chemical manufacture use obsolete and inefficient production processes. The problem is compounded by the fact that small scales of production have also make environmental protection uneconomical on an individual basis.

5.4 Financial Barriers

- A significant portion of the environmental problems may be traced to the operations of the small and medium scale and unorganized sectors. While these contribute about 40 percent of the GDP they are also the most affected by credit squeezes, high interest rates and reduced access to venture capital. Further, venture capital for financing environmental projects is still a new concept with very few institutions providing such financing. Difficulties in obtaining financing for modernization coupled with the high cost of capital hamper attempts to develop and install cleaner processes and technologies. High capital costs also inhibit investments in research and development for environmental improvement (World Bank, 2006)

- Much of the small enterprises often do not have internal expertise to deal with waste and pollution problems. Further they also do not have the financial resources to bring in consultants from the outside. They need to find innovative mechanisms to deal with this problem.

5.5 Organizational Barriers

- Shortage of capital and underdeveloped infrastructure required for implementing environmental change, including the installation of clean technologies
- There is a severe lack of infrastructural facility dedicated to product testing and reporting. This is compounded by the absence of strong consumer protection movements (APO, 1999).
- The regulatory agencies in India are understaffed and are not generally equipped to evaluate and promote alternate technologies.

5.6 Social Barriers

- While India has a rapidly growing and technically competent workforce, literacy levels continue to be low in many sectors. In a survey among its employees, a large chemical manufacturer in Delhi, discovered that illiteracy was a major hurdle in the company's efforts to improve environmental management systems. In the small-scale sector this problem is aggravated as the labour force is often poorly educated and health and safety concerns are likely to be ignored in an environment where unemployment levels are high (India Partnership Forum, 2002).
- The existing organizational structure of companies and lack of incentive for environmental competitiveness also act as barriers to a transformation.
- As a result of the attitudinal barriers that exist among the managers and employees there is as yet little consideration of environmental attributes into corporate decision making.

6 The Way Forward

6.1 Waking up to Risks

There is a need to recognize that the environmental problem in India is complex and barriers are many given the large number of heavy industries, overlapping domains of state and central government agencies/pollution control boards and hyper active stakeholders like civil society organizations and active judiciary. Post liberalization has seen rapid and often dramatic changes in the institutional, legal, market forces being faced by the corporate sector. Global environmental concerns, such as green house warming, ozone hole depletion, and biodiversity destruction have become important inputs for decision making at corporate levels. Accompanying these changes is an intense debate on the issue of inclusive economic growth and industrial greening. The present day corporate environmentalism in India as outlined in Table 15 is an outcome of several emerging trends at local, national and global level.

Table 15. Chronology of corporate environmentalism in India

Characteristics of CEM approaches	1960s	1970s	1980s	1990s	2000s ⇨	
CEM in industrialized countries (Hoffman, 1997)	Problem solving	Technical compliance	Managerial compliance	Reactive & Receptive	Constructive	Proactive
CEM in India	Ignorance	Minimum compliance	Compliance; Rigorous internal control	Process optimization; Strategic opportunity		New strategic vision for competitive advantage
Stakeholders	Governments	Governments, communities	Governments, communities, NGOs	Governments; communities, NGOs, investors, customers		
Critical events	Silver springs (1962)	Earth day (1972)	Bhopal Accident (1984); Brudtland Report (1987)	Rio summit (1992); ISO 14001 (1995) Kyoto Protocol (1997); BCSD; ESCAP (eco-effectiveness)		

The most important among these is a new appreciation of the need to protect the environment by the key stakeholders. Stakeholders such as, investors, consumers financial agencies, international buyers, local communities and employees have become increasingly vocal about the need for environmental protection (Fig 12).

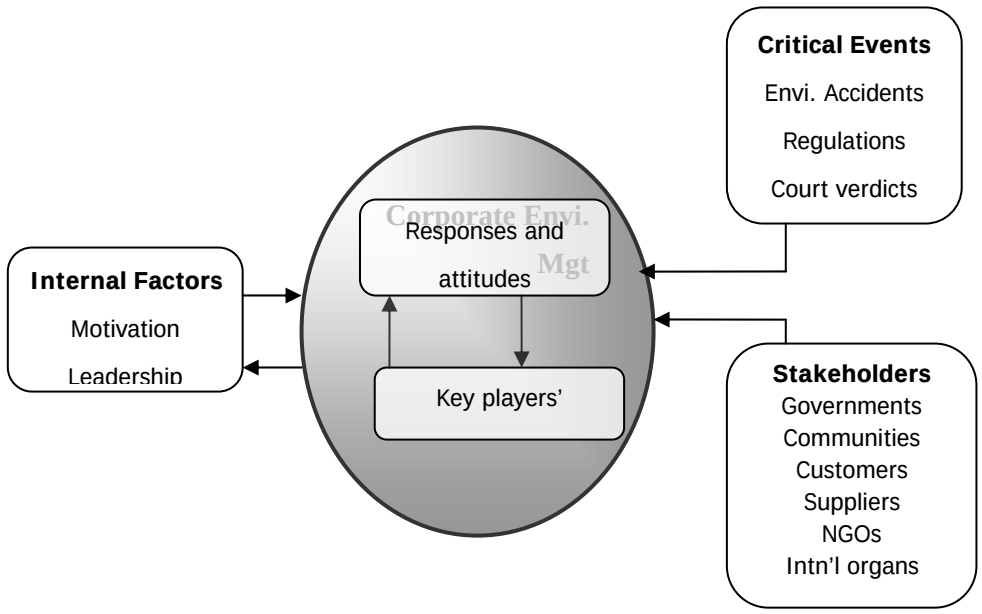

Fig 12. Actors and evolution of corporate environmentalism in India

Most corporate are subject to extensive regulation on waste disposal, emission control and resource usage, thus increasing the costs of doing business considerably. Even financial and insurance firms are also beginning to insist on comprehensive environmental audits to limit their environmental exposure

(CSM, 2001). For example in India many financial institutions and nationalized banks have created special departments for examining the environmental implications of their lending policies. This is accompanied by threats of potential criminal and financial liabilities in the event of non-compliance. Local community concerns have also played a major role in changing the business attitude. On the other hand, the increasing resource scarcity of critical raw materials such as water and timber, have put many firms on the verge of closure (Pricewatercoopers, 2007). In others, concerns about spiralling energy and raw material costs have put energy and environmental conservation on the corporate agendas (Pricewatercoopers, 2002). Finally the realization that environmental management can be undertaken in an economically viable manner and can lead to significant competitive advantages have also pushed many firms on to the sustainability path (Yang, 2006).

However, in spite of high economic growth, resources available for monitoring and enforcement are declining as seen from increase in litigation suits. So, approaches that involve low institutional costs and promote flexible responses from companies need to be promoted. New strategies that combine conventional monitoring, self regulation and promote better environmental management through pressure/incentives is in immediate need. Alternate approaches need to be explored to bring in a reasonable trade off between high environmental costs and increased business competitiveness in the global markets.

6.2 Strengthening Corporate Environmental Management through Alternate Governance Systems

It is more likely that large corporate sectors will take proactive or corrective actions, when they take audit of their operations and bring to the notice of the caring public and regulators. Environmental information disclosure programs, when combined with the third party rating systems as practiced in other countries of the region has the potential to motivate industries to improve their corporate environmental activity (Kathuria, 2006; Blackman et al, 2004). In India, several green rating programs that rate the performance of various sectors have been undertaken by the Confederation of Indian Industries (CII), Centre for Science and Environment (CSE), and other organizations in India.

The Green rating projects of CSE works by employing several environmental criteria under different categories. These categories shall be corporate environmental policy and management systems; input and process management; and public perception of the company's environmental responsibility, including the local community, NGO and the media. The benefits coming out of such voluntary approaches are many as illustrated in Fig 13. The rating methodology for the companies has

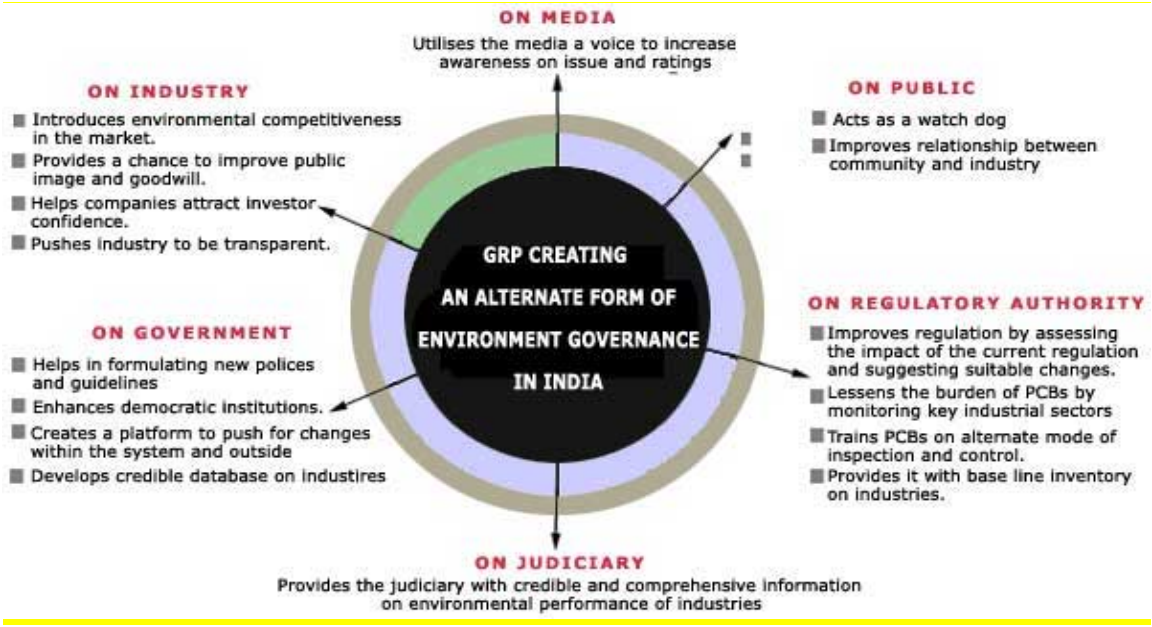

Fig 13. Features of environmental information disclosure schemes

been developed keeping in mind lifecycle impact of the industry. Thus, the weights were allotted accordingly with 80% of the score devoted to lifecycle analysis and the remaining 20% for corporate governance. The life cycle analysis assessed the environmental impact of the company at various stages of the production process: sourcing of raw materials, manufacturing and assembly, effects of consumption and product disposal.

Box 4. Public incentives to green rated companies

The Gujarat PCB has adopted a series of incentives to promote industries choosing to design environmental audits and environmental management systems and disclose their voluntary activities to the public. These incentives include giving priority environmental approvals within a period of 45 days; extending the water consents from 5 years to 6 years; allowing enterprises to be eligible for 25 percent fee rebated provided they do not exceed the water limits under their consent and meet the standards under the Water Act. In addition, the Gujarat PCB has promoted a series of industry specific guidelines, based on the rating program experiences, for certain sectors such as aluminium, cement, chlor-alkali, pulp and paper under the Charter of Corporate Responsibility

(Source: GPCB website, http://gpcb.gov.in)

For companies, it shall be a bench marking tool to measure performance and public relations tool promote itself as an environment friendly company. For government, it is a tool to encourage companies to move beyond compliance and to identify performance weakness in key sectors. As illustrated in Box, public policies should create an enabling environment and incentive mechanisms for effective promotion of such programs.

6.3 Strengthening Corporate Environmental Management through Business to Business Cooperation

Environmental problems, particularly in the "brown" sector, such as heavy manufacturing, chemicals, energy and infrastructure, have received increased public attention with the rapid growth in the country's economy. However, SMEs totalling to more than 4.5 million units, account for about 40 percent of industrial output in terms of value and estimated to contribute approximately 70 percent of the total industrial pollution load (Fig 14), poses great threat to the environmental governance. On the other hand, with the emergency of global supply chains, companies are increasingly challenged by environmental issues. Better corporate environmental practices will therefore spread only if suppliers and consumers are included in what companies consider to be their sphere of influence.

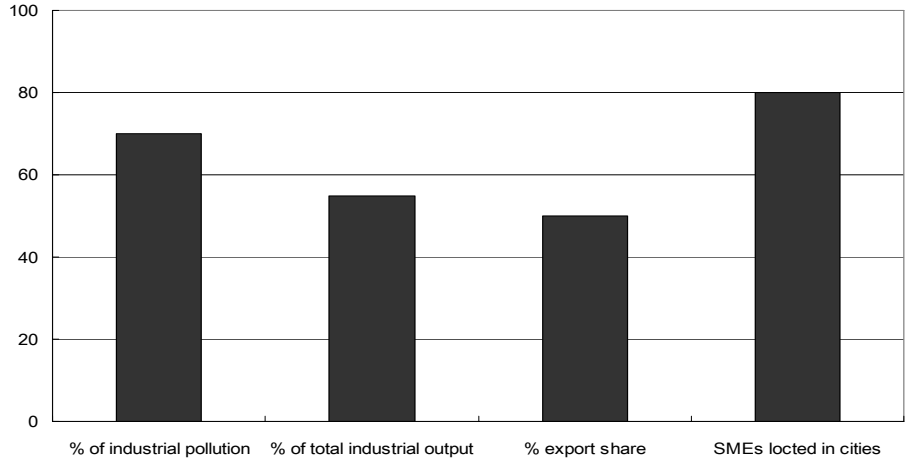

Fig 14. Significance of small and medium enterprises in India

While social and environmental standards are increasingly becoming precondition for doing business with multinational companies, it is imposing new demands on small and medium enterprises, which often form part of larger companies' supply chain (Sharma and Vrendburg, 1998). Then it is crucial that large corporation supports sound corporate environmental management activities across small and medium enterprises through supplier technical assistance programs (Box 5). By doing so, as many of the small companies can effectively arrest environmental degradation at local and global level. Benefits arising from responsible supply chain management include improved customer relationships, competitive advantage and long-term business sustainability, especially in the export-oriented companies. From the small suppliers view point, additional benefits may include opportunities for partnership with multi-national companies, productivity gains and added learning and innovation capacities (UNIDO, 2002)

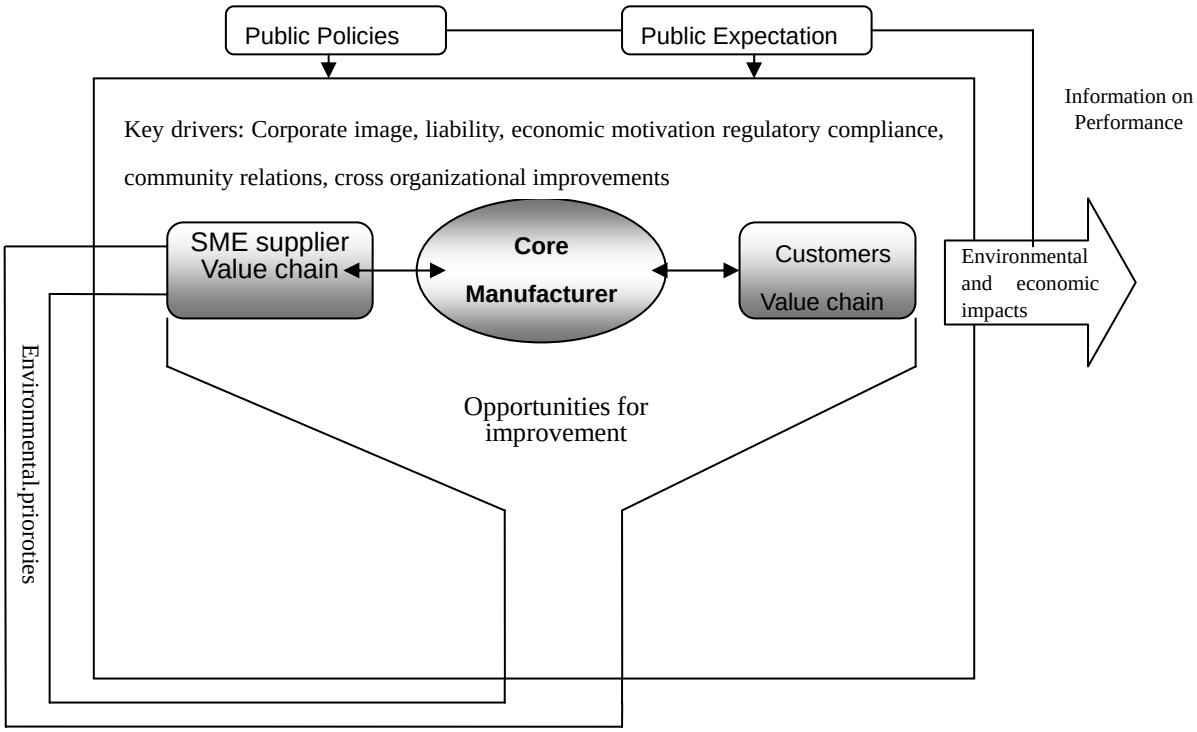

Fig 15. Features of supply chain environmental management

Box 5. Greening supply chain initiatives in India

Supply chain management is an important factor which links three important concepts — business competitiveness, economic productivity, and environmental management. Greening of the supply chain is a growing industry concept that advocates the purchaser to use its purchasing power to demand improved environmental performance from the suppliers, which in many cases are small and medium industries, upstream in the supply chain. It is also implied that the purchaser, usually a large corporation, will play a facilitator's role towards its suppliers and help them in their efforts in adopting more environmental-friendly practices. The intended result is to create a trickle down effect throughout the supply chain in which the entire supply chain is motivated to become "green" or more environmentally friendly. In India, the National Productivity Council as well as industrial associations and institutes in India have promoted this concept. For example, the Indian Institute of Materials Management has established a knowledge bank that promotes best practices on chain supply management. A Pilot was established to assist 20 small and medium enterprises to implement ISO 14001 environmental management systems by linking them with larger companies, to which they supplied their products, as a mentor support system. The core of the project was a series of trainings and review sessions where the basis of environmental management system elements were introduced and SMEs were shown how to feasibly implement them with the assistance of their mentors.

(UNIDO, 2002)

There are many examples that progressive firms in India have adopted state of art management practices for environmental protection but have not received public recognition for their good work. Likewise, industrial segments and enterprises that are lagging behind in environmental performance do not feel significant pressure to improve. Projecting a transparent picture of environmental performance, good companies get the deserved pat on the back while poor performers will be hauled up. A market oriented performance monitoring and assistance will help both the business and regulators as well as investors and consumers. Many of the indicated measures would involve further examination, design, not least, consultation with private and public agencies.

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Environmental Information Centre of FICCI www.cleantechindia.com

Ministry of Environment and Forest http://envfor.nic.in

Central Pollution Control Board http://www.cpcb.nic.in

Reserve Bank of India http://rbi.or.i

Annex. A Summary of efforts for integrating environmental consideration into corporate activities in India

Framework	Energy Efficiency	Resource/Waste Efficiency/ Pollution Control	Conservation of forest, land and soil
Institutions	1. Energy Management Centre (EMC, Ministry of Power) 2. Ministry of Non-Conventional Energy Sources (MNES) 3. State Electricity Boards 4. State level nodal agencies 5. State level technical Organizations 6. Indian Renewable Energy Development Agency (IREDA) 7. Petroleum Conservation Research Association (PCRA) 8. Industrial Associations like CII, PHD Chamber of Commerce 9. National Productivity Council	1. Central Pollution Control Board(CPCB) 2. State Pollution Control Boards (SPCBs) 3. Ministry of Environment and Forests(MoEF)	1. Ministry of Environment and Forest 2. Forest Survey of India (FSI) and the 3. Wildlife Institute of India (WII) 4. National Wastelands Development Board. 5. Indian Board of Wildlife. 6. Indian Council of Agricultural Research (ICAR) Central Forestry Board.
Regulation	1. The National Energy Efficiency Program (NEEP) 2. The Oilfields (Regulation and Development)Act,1948 3. The Atomic Energy Act, 1962 4. Petroleum Rules 1974 5. Atomic Energy Act 1962 amended 1987 6. The Energy Conservation Act, 2001 7. Electricity Act 2003 8. The Electricity Act Amendment Act 2003 9. The Petroleum and Natural Gas Regulatory Board Act 2006	1. National environmental Policy 2006 2. The Water (Prevention and Control of Pollution) Act, 1974, amended in 1988. 3. The Water (Prevention and Control of Pollution) Cess Act, 1977, amended in 1991. 4. The Air (Prevention and Control of Pollution) Act, 1981, amended in 1988. 5. The Environment (Protection) Act, 1986. 6. Basel Convention since 1992 7. 7. The Motor Vehicle Act, 1938, amended in 1988.	1. The Wildlife (Protection) Act, 1972, amended in 1983, 1986 and 1991. 2. The Forest (Conservation) Act, 1980, amended in 1988. 3. The Environment (Protection) Act, 1986. 4. 4. A Notification on Coastal Regulation Zone, 1991.
Economic	Incentives for energy conservation 1. Fiscal incentives from Central government 2. Subsidies from Central government 3. Industrial licensing exemption 4. Assistance from financial institutions 5. Concessions/subsidies available at the State government level 6. National awards for energy conservation in industrial sector 7. Incentives given by State	Incentives for pollution control 1. Effluent Charges 2. Credit andloan at reduced rate of interest 3. Customs or Excise Duties and Sales Tax Rebate 4. Depreciation allowance 5. Investment allowance 6. Tax Benefits through contributions towards natural resource conservation 7. Exemption from tax on capital 8. Strengthening of emission standards	

	Electricity Boards 8. Incentives given by Oil Companies under PCRA Scheme	9. Scheme for adoption of Cleaner technologies in small scale industries	
Voluntary	1. Promotion of cleaner technology & waste management 2. Public environmental Reporting 3. Performance based Contracting 4. Eco Designing 5. Environmental management system 6. Environmental Indicators 7. Eco Labelling 8. Registration Scheme of recycled waste	Charter on Corporate Responsibility for Environmental Protection (CREP) CPCB Standards 1. Effluent and emission standards for petroleum oil refineries 2. Emission standards for Sulphuric acid plant 3. Proposed emission standards for common hazardous waste incinerator	1. Joint Forest Management (JFM) 2. Western Ghat Wild Life Protection Movement
Procedural	1. ISO 14001 Environmental management system 2. Bureau of Indian Standards (BIS)		
Information	1. Government of India has proposed to prepare a detailed national plan to tackle the effects of global warming, set of guidelines to protect natural resources and waste handling 2. FCCI and CII established environmental information centres		
Technical Assistance	Domestic: 1. Energy management & Audit program for executives. 2. Training program on Renewable Energy source. 3. Energy conservation in Fertilizer Industries. 4. Energy conservation seminar for Production (Winding) department. 5. Energy Conservation lectures, sharing of experience of energy managers and auditors. International Projects: 1. Global Environment Facility -10 projects on GHG emission. 2. Energy Recovery from waste, gas and liquid 3. Information sharing, Training, Public Awareness-Green Aid Plan, Japan and National Cleaner production, UNIDO/UNEP	Domestic: Inception Workshop on National Capacity Needs Self-Assessment for Global Environmental Management in India"-MoEF, UNDP and GEF. International Projects: 1. UNDP/UNIDO-Tannery waste water treatment projects in Chennai and Kolkata. 2. UNIDO-EMS in Small Scale Industries: Waste minimization 3. NORAD-Industrial Pollution Control, Cooperation of Environmental Industries between India and Nordics, All India 4. CIDA-Environmental Management in Industry: Eco-efficiency. 5. DANIDA-MSW projects. 6. ADB-Management of hazardous waste with a grant of US$400,000 with technical assistance	International Projects: 1. Dutch Aid and World Bank-Ganga Action Plan 2. World Bank-National River Conservation. 3. ICEF-20 National Resource management Projects concerning land, water, energy, forest and environment in 16 states of the country.