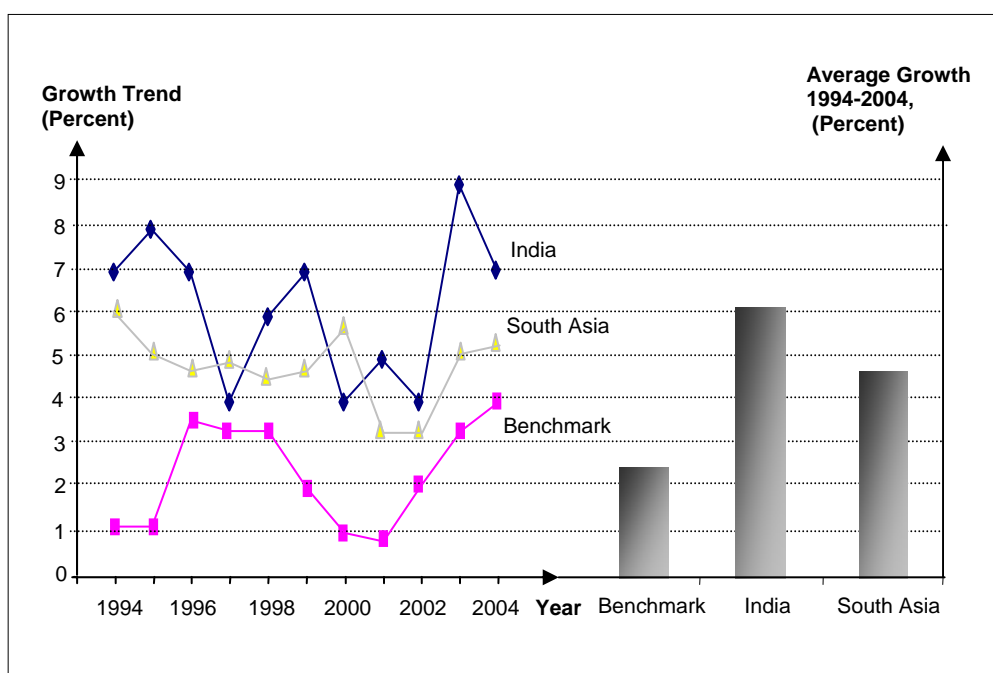


I. Keeping Up With Environmental Challenges of Rapid Growth

India's Growth Story

1.1 Indian economy is one of the fastest growing in the world with a consistent average growth of about 6 percent over the past decade (Figure 1.1). Since 2003, growth reached 7–8 percent per year, and the country aspires to achieve and sustain an average annual growth rate of 8 percent or higher, much needed for eliminating poverty among 354 million of its population, representing 27 percent of the world poor¹.

Figure 1.1: A Decade of India's Economic Growth in Perspective



Source: World Bank (2006c)

Note: Benchmark countries: Average annual growth rates are computed for those countries that had similar level of per capita income to India in 1994. South Asian countries include Bangladesh, Pakistan, Nepal, Sri Lanka, and Bhutan

1.2 While poverty, disparity and challenges remain, robust economic growth has already allowed millions of people to emerge from poverty. The national poverty ratio has halved from 36 to 18 percent in less than ten years, from 1994 to 2002 (National Institute of Rural Development (NIRD), 2003). Estimates suggest that about 300 million of the approximately one billion population has joined the middle class² in India.

¹ Defined as those living on less than one US dollar per day (purchasing power parity).

² United Nations Environment Program (UNEP) defines middle class as those earning in excess of US\$ 7,000 per

Environmental Implications: Risks

1.3 Rapid economic growth and the resulting changes in consumption patterns are drastically changing the nature and scale of impact on the country's environment and natural resources, thus testing the carrying capacity of the natural ecosystems upon which much of the country's economic growth depends.

1.4 Growth of India's economy is led by robust performance of the industrial sector. Impressive growth in manufacturing (7 percent average over the past 10 years) is a reflection of growth trends (Reserve Bank of India, 2005) including electronics and information technology, textiles, pharmaceuticals, and basic chemicals. These industries, belong to the "red category" of major polluting processes designated by the Central Pollution Control Board (CPCB), and have significant environmental consequences in terms of water effluents and/or air emissions and hazardous wastes (Table 1.1). The economic boom has also led to an increase in investments and activities in the construction, mining, and iron and steel sectors. This, in turn, is causing a significant increase in brick making units, sponge iron plants and steel re-rolling mills that use highly polluting processes.

1.5 The result is a visibly deteriorating environmental quality in many industrial townships, bringing back memories of earlier industrializations in the 1960s and 1970s (Box 1.1) and highlighting the importance of stepping up efforts to manage the externalities of accelerated growth. The Government of Orissa, for example, is expecting over 600 percent increase in the installed capacity of iron ore-based industries in the future³, and has recently banned the location of new sponge iron industries in six areas of the State due to concerns over growing air pollution and public complaints.

1.6 A frequent (and valid) argument from the industrial community is that new investments in large industrial projects bring modern and clean technologies, and big companies, particularly those with global market outreach, increasingly adhere to sound management practices. In reality, the impact of industrial growth is more nuanced and complex. An estimated 70 percent of the total industrial pollution load is attributed to small and medium enterprises (SMEs) many of which, especially small-scale units, continue to use obsolete technologies with no or primitive pollution control methods.⁴ With about 40 percent of the total value of industrial production and over 4.5 million units⁵ across the country, the SME is a major engine for growth, employment and poverty reduction, raising a dilemma of balancing economic and environmental objectives. Furthermore, even with advanced technologies minimizing the impact of individual units, the *cumulative* impact of growth at such a scale and of such diversity, involving a mix of large and small industries from multiple sectors and inducing unwieldy urban development as well as outpacing the capacity of supporting infrastructure, is (and should be) a matter of concern.

³ Data from the Department of Steels and Mines, Government of Orissa

⁴ Source: Ministry of Environment and Forests (MoEF) Website, <http://www.envfor.nic.in/>

⁵ As per 3rd All India Census of small scale industries, there are around 4.4 million units employing 24.9 million persons

Table 1.1: Major Polluting Industries	
Industry	Key Environmental Aspects
Aluminum	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 from material handling and air emissions from stack; energy consumption.
Copper	Sulphur dioxide and dust emissions; water pollution from electrolytic bath and other processes; disposal of slag from smelter.
Distillery	Water pollution due to highly organic effluent from spent wash; soil contamination.
Dyes and dyes intermediates	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, dust emission from sintering, pelletization, pig iron plants; slag and dust disposal.
Leather	Water pollution, particularly from hexavalent chromium and salt in discharge.
Pesticide	Air pollution due to particulate and volatile organic compounds; effluent containing pesticides 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 malodorous emissions of reduced sulfur compounds and VOC.
Refinery	Water pollution from effluent containing organic and inorganic material, oil and solvent; air emission of particulate matters, sulfur dioxide, “benzene, toluene, and xylene”, VOC.
Sugar	Water pollution due to high biological oxygen demand (BOD) and chemical oxygen demand (COD) effluent and spillage of molasses; air pollution due to combustions of bagasse, coal, etc.
Thermal power plants	Air emission from combustion, coal handling, water pollution due to discharge of boiler blow down, overflow from ash pond; land contamination due fly ash disposal practices.
Zinc	Air pollution due to fugitive zinc dust, water pollution containing residues, disposal of solid and hazardous waste.

Source: CPCB – List of “Red Category” Polluting Industries.

Box 1.1: The Singrauli Region: Legacy of Unsustainable Economic Development

Located about 1000 km southeast of Delhi, the Singrauli region was, until the early 1960s, a relatively isolated rural and economically under-developed region. Today Singrauli's landscape is dominated by massive open-cast coal mines (producing 50 million tons pa and with enough reserves to triple the region's current production), six thermal power stations with operating capacity of 7,800 MW, installed hydro power capacity of 400 MW, a significant number of large public and private energy-dependent heavy industries (including cement, aluminum (150,000 tons per annum), caustic soda (33,000 tons per annum), and a number of other small and medium ancillaries), power transmission towers, belching smokestacks, quarries, and a number of crowded, congested and polluted urban centers ("Boom Town Effect"). The region is a remarkable example of what almost half a century of induced development without adequate social and environmental safeguards can produce: a much needed economic productivity and corresponding severe social deprivation/fragmentation and environmental degradation.

On the socio-economic side, the region's development has brought disruption to the traditional way of life (including impact on indigenous forest-based people), several waves of displacement (300,000 people by some accounts, due mainly to the formation of the Gobind Ballabh Pant Sagar lake), unfulfilled promises of equitable and permanent resettlement (some families have been relocated several times), lack of adequate infrastructure and public amenities, as well as lack of economic opportunities. Air and water pollution are of great concern, especially the presence of mercury in the food chain and other chemicals and heavy metals in water resources.

In 1991, the Government of India (GoI) designated the region as a critically polluted zone, for which a comprehensive remedial Action Plan has to be developed and implemented. Environmental management plans were designed for each of the local industries, with a significant level of monitoring and oversight from environment and local authorities.

An apex Committee was set up headed by a Chairman, Special Area Development Authority (SADA), for regular review of progress. Recent evaluation shows that the situation has improved to some extent with respect to compliance with the Action Plan recommendations. The Committee further recommended better monitoring of air and water quality in the long term that includes undertaking an assessment of the carrying capacity of the region, adopting cleaner coal technologies, and environmental capacity building.

(Source: Bose and Leitmann, 1996)

1.7 To achieve and sustain the targeted 8–10 percent rate of economic growth, India has to invest massively to expand and upgrade its overstretched infrastructure, particularly power supply and roads, which are currently regarded as major bottlenecks to growth by investors (World Bank, 2004c).

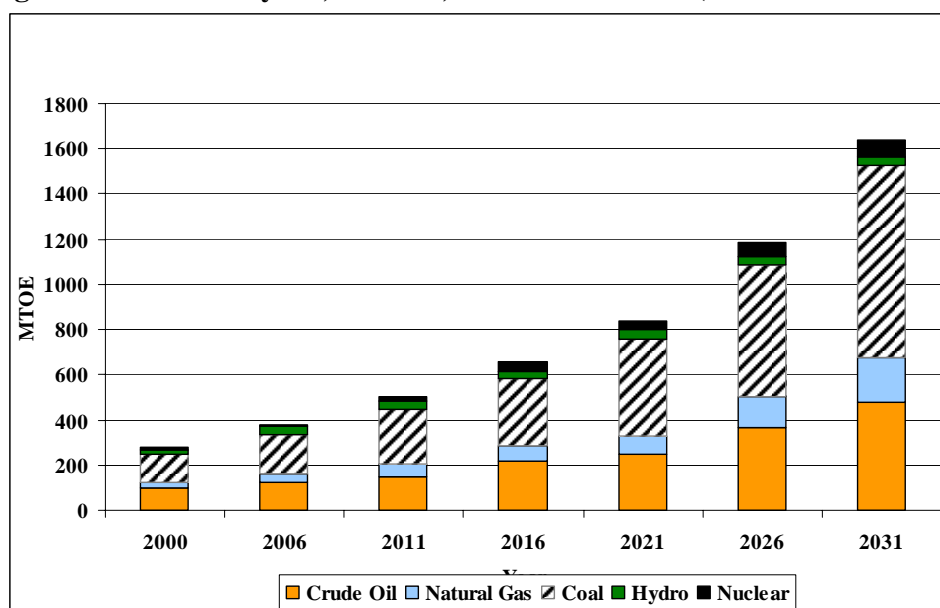
1.8 The capacity deficit in **the power sector** is already resulting in severe power shortages as peak load shortages reach 12 percent (Ministry of Power (MoP), 2005). According to the 2001 census, over 50 percent of households lacked access to basic lighting (Registrar General and Census Commissioner, 2001). Furthermore, the *per capita* electricity consumption in 2003 was still relatively low at 435 kWh, against 1,400 kWh in China, 2,400 kWh world average and 13,000 kWh in the USA (IEA, 2005). Considering that the Government of India (GoI) aims at universal access to electricity by 2012 and the need to improve power supply to industrial and urban consumers, sizeable additions to generation, transmission and distribution (T&D) capacity are urgently required, along with efficiency improvements, demand-side management, and reduction of substantial losses in the T&D networks. To fill the significant demand–supply gap, India plans to nearly *double* its current installed capacity (115,500 MW as of January 31, 2005) by 2012 through public and private power generation companies (MoP 2005). It is expected that about 30,000 MW will be added during the Tenth Plan (MoP, 2005).

1.9 This scale of development cannot happen without significant environmental implications. The power sector is associated with a host of environmental externalities, manifested at different spatial levels — local, regional and global (Box 1.2). The key environmental concern for India is linked to heavy reliance on coal, which accounts for about 60 percent of power generation. While special efforts are made by GoI to increase the share of hydro and other alternative energy sources, coal is likely to remain the dominant fuel for many years (Figure 1.2) given India's vast indigenous coal resources.

Box 1.2: Key Environmental Issues in the Power Sector

- Coal-based thermal power has significant environmental effects due to gaseous emissions, particulate matter, fly ash and bottom ash, and water effluents. The impact is further exacerbated by the high ash content of India's coal and aging facilities lacking modern pollution control;
- One of the most serious effects of coal power stations is land requirement for ash disposal and percolation of hazardous elements into ground water through ash disposal in ash ponds. Due to enormous quantity of ash content in India's coal, approximately 1 acre per MW of installed thermal capacity is required for ash disposal. If this trend continues, by the year 2014–2015, 1000 square km of land, equal to the size of the Honk Kong area, or 1 square meter per person, should be required for ash disposal only;
- Coal-based generation is also the main contributor to India's carbon dioxide emissions, linked to changes in global climate;
- Hydropower projects, while having no air emissions or ash, might put stress on ecological systems by accelerating soil erosion and changing water flows, and lead to resettlement of populations with the resulting change in land use pattern; and
- Transmission projects can disrupt sensitive ecological areas on the way and alter land use patterns.

Figure 1.2: Forced Hydro, Nuclear, and Gas Scenario (Fuel Mix Year Wise)



Source: Planning Commission (2005a)

1.10 Major investments are required in the roads and highways sector to support India's continued economic growth, improve connectivity, and assist with reducing poverty. The density of India's road network relative to its land area is 768 km/1,000 square km, which is similar to the United States of America (USA; 657), and far higher than China (141) or Brazil (203). However, the road density relative to the population is only 2.53 km/1,000 people, higher than China (1.08) and lower than Brazil (10.28), United Kingdom (UK; 6.33), or USA (22.68). In addition, although roads carry almost 85 percent of the country's passenger traffic and about 65 percent of its freight, most highways in India are narrow, congested and have poor surface quality. Therefore, GoI is implementing a multi-phase program, with an allocation of US\$ 13.5 million (Rs. 59,490 crores) in the Tenth Plan period (2002–2007) for the central sector roads. A major part of this allocation is for improvement and capacity augmentation of 65,569 km of national highways. Similarly, the States are expanding and upgrading State highways (comprising 16 percent of the total State roads network while carrying about 40 percent of the total traffic), which often are main bottlenecks to the economic development agenda of States. These massive construction programs are transforming India's landscape, and the scale of environmental impacts is yet to be appreciated (Box 1.3).

Box 1.3: Environmental Impacts in the Highways Sector

The range of applicable environment issues and impacts is most often accentuated and should be prioritized in the context of their geographical location. Key *direct impacts* include: *soil degradation*, i.e. loss of top soil and reduction in the productive capacity of soil covered by road; *water resources modifications* and *drainage* related issues leading to changes in surface and ground water flows and water quality degradation; *air quality changes* due to air pollution caused by construction equipment and traffic related emissions; *noise pollution* due to increase in vehicles and construction and maintenance activity. *Biodiversity* may be directly impacted due to habitat loss, fragmentation, alteration, and restriction in animal migration paths. *Cultural heritage*, which has a high social value, is impacted by the potential damage to sites and the remains of archaeological, historical, and religious structures.

Furthermore, there are multiple linkages throughout the entire process of accelerated highway construction activities that may lead to significant *indirect impacts*, often affecting larger geographical areas. The examples of such impacts due to forward linkages include the degradation of surface water quality by the erosion of land cleared as a result of a new road; increased deforestation of an area; increase in poaching in eco-sensitive zones during the construction works; changes in land use and settlement patterns due to migrations from rural areas, as a result of improved transportation facilities and better access, leading to growth of urban and semi-urban townships that are unplanned with fragmented infrastructure facilities. *Road safety* continues to be a major concern, especially for the poor groups who suffer from transport-related accidents because they use vulnerable modes such as walking and non-motorized transport. The main impacts from backward linkages related to mining and quarrying. For example, airborne silica generated from stone crushers is found to increase morbidity and mortality from silicosis. Dust from these operations affects local communities often located in close proximity to such facilities.

(Source: information collected by the study)

1.11 Mirroring the country's size and diversity, the environmental risks and problems are wide-ranging. India's dual features of a low and middle income economy are reflected in the environmental damage estimates. These damages are still dominated by "poverty-related" risks, such as lack of sanitation and indoor air pollution in rural areas. The share of "growth-related" risks manifested by the deteriorating urban environment, industrial waste, and chemical pollution is however increasing (Hughes and others 2001; Lvovsky 2001). In the second decade of strong economic performance, India is making and planning future massive

investments in infrastructure, urban development, and industrialization. Not surprisingly, the issues of managing the environmental impacts associated with rapid growth are coming to the forefront of public attention⁶.

Environmental Implications: Opportunities

1.12 Importantly, economic growth also brings in resources, technologies, policies, capacity, and *public demand* for improved environmental performance and quality.

1.13 One of the most comprehensive measures of a country's environmental performance is the *Environmental Sustainability Index (ESI)*, which is a composite of 21 indicators that cover five broad categories of environmental pressure.⁷ Cross-country data reveal a strong positive relationship between the ESI and per capita gross domestic product (GDP), measured at purchasing power parity (PPP) exchange rate, shown by Figure 1.3⁸. India appears to have a considerably better ESI score than China or Pakistan; nevertheless, and as all large South Asian countries, it has a lower ESI score than its level of income forecasts (indicated by its position that falls below the regression line).

1.14 Cross-country analysis also shows that there is a positive relationship between the rise in per capita income and national enforcement of environmental regulations — even at relatively low-income levels (Dasgupta and others 2001). A critical mediation role of environmental policies and institutions, which mature with growth in the growth–environmental outcomes relationship, is illustrated by the diagram below (Figure 1.4).

1.15 India has a strong environment policy, legislative framework and well-established institutions at the national and State level. The Constitution of India, through Articles 48(a) and 51(a)(g), has articulated the responsibilities of the central government and citizens for ensuring protection and improvement of the environment, and Article 21 includes the right to live in a pollution free environment. The institutional capacity of regulatory agencies, such as the Central and State Pollution Control Boards (CPCB/SPCB), has improved over time and there are documented successes in addressing certain problems (some of which will be illustrated in this report). Among the many recent initiatives of the MoEF and CPCB are the establishment of a task force to oversee the implementation of environmental action plans for 17 categories of the highly polluting sectors; developing the Chapter on Corporate Responsibility for Environment Protection jointly with the industry; and conducting an

⁶ This has been a message from extensive discussions and consultations during the study when representatives of all three sectors unanimously conveyed that “the environment” for making investments and doing business today is very different from that 10–15 years ago, on account of much larger sensitivities over environmental and social issues.

⁷ ESI is a collaborative venture of the Yale Center of Environmental Law and Policy and CIESIN at Columbia University. The subcomponents measure performance in the following areas: (i) environmental systems, (ii) reducing environmental stresses, (iii) reducing human vulnerability to environmental stresses, (iv) societal and institutional capacity to respond to environmental challenges, (v) global stewardship (Esty and others 2005). As with any other aggregate index, the ESI is not without its shortcomings. Given the lack of information in many countries, the rankings are an approximation of sustainability, based on an aggregation of a wide array of indicators. A major weakness of the ESI is that it gives equal weight to all its sub-components and so assumes that environmental stresses are uniform in their impact across countries.

⁸ The regression of ESI (Esty and others 2005) on per capita GDP (World Bank, 2006c) is controlled for population density, primary school enrolment rate (World Bank, 2006c), civil liberty and political rights index (www.freedomhouse.org), and democracy index (Jagers and Marshall, 2000). The regression includes 128 countries/observations, and only some of the countries are selected for presentation here.

inventory hazardous waste generation, including identification of old and abandoned contaminated sites, which could be potentially used to develop a national plan for cleaning up of contaminated areas.

Figure 1.3: Environmental Sustainability Index and Income

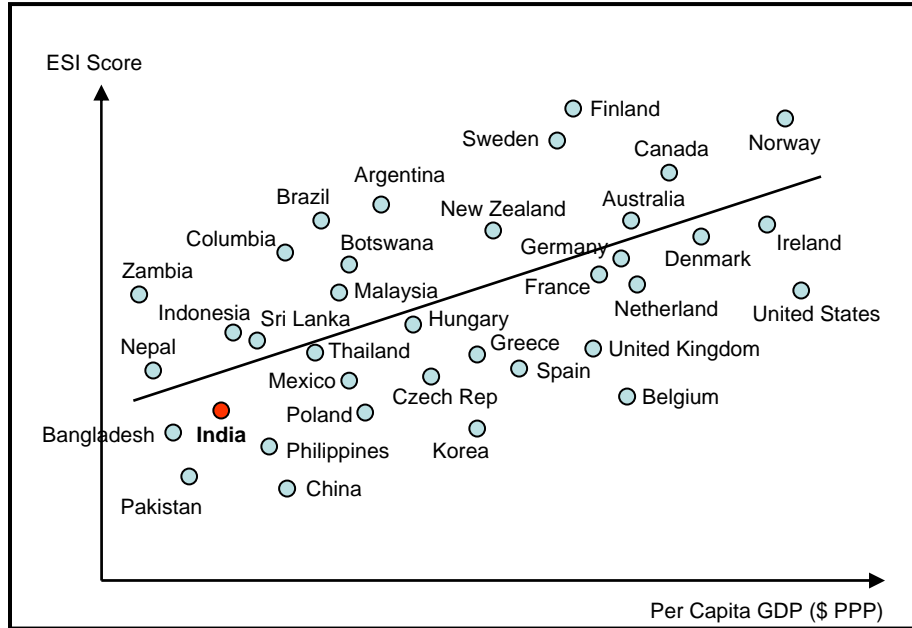
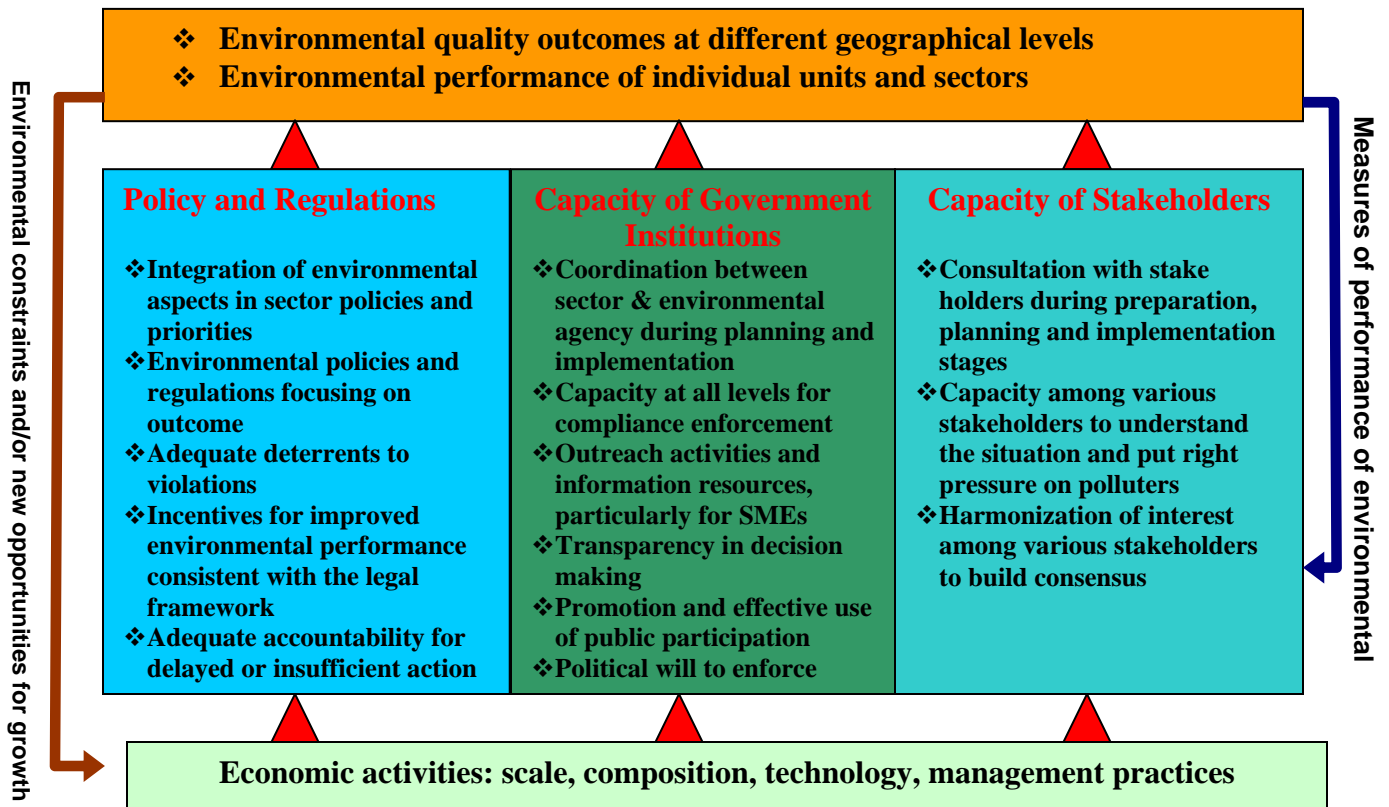


Figure 1.4: Linkages Between Economic Activity, Environmental Outcomes, and Institutions



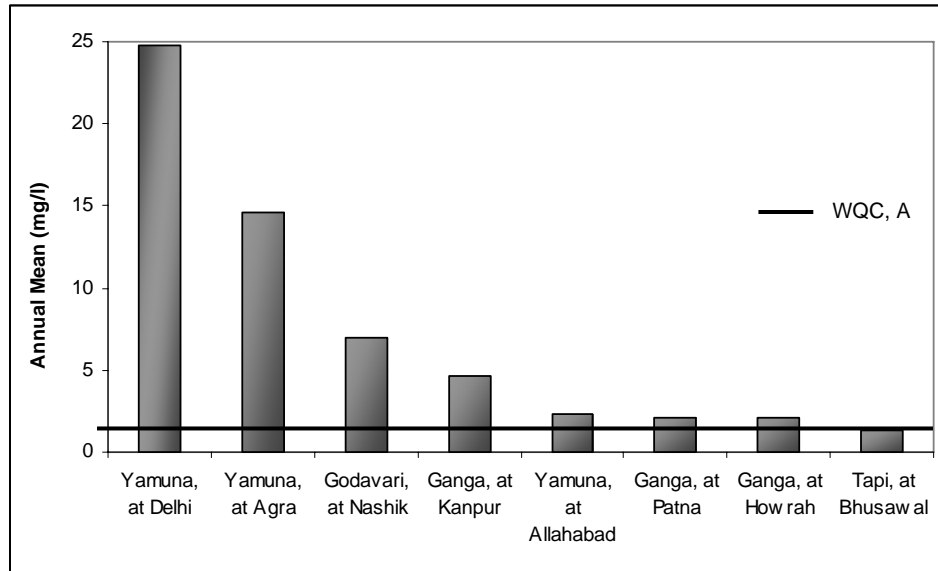
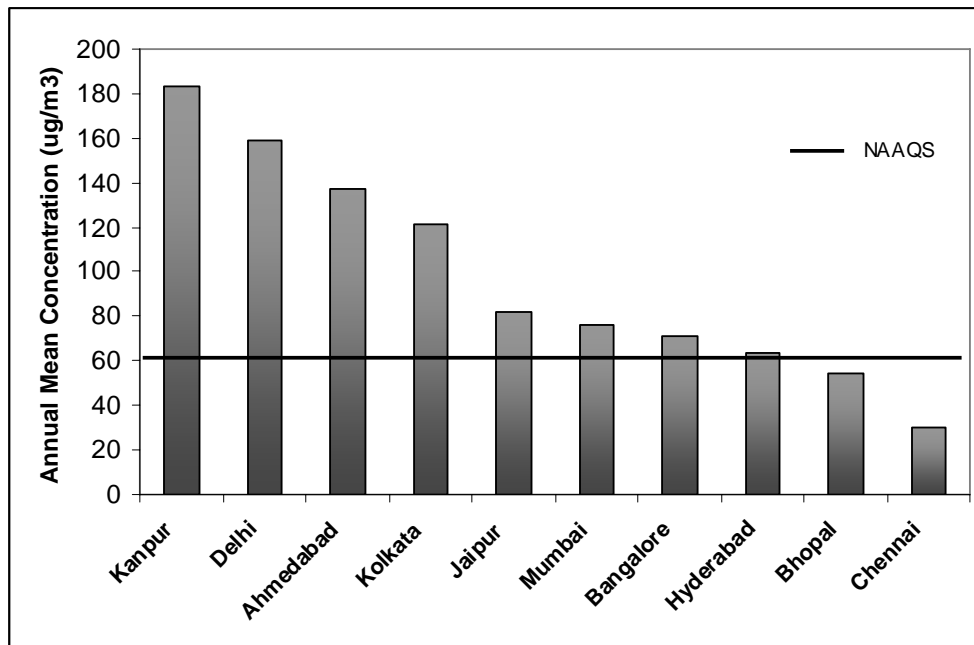
1.16 Importantly, over the past years there has been an increase in *public demand for better environmental quality* from the growing and increasingly assertive urban middle class, as demonstrated by drastic measures to improve air quality in Delhi, which now has the largest compressed natural gas-driven public bus fleet⁹ in the world. All over the world, starting with industrialized countries in 1960s, it is *this broad-based constituency for change*, created by both the environmental impacts of unmanaged growth and economic well-being brought by growth, which has transformed environmental management from an obscure science into a backbone of modern government structures. This public demand is being increasingly matched by voluntary environmental performance obligations and initiatives from the large-scale Indian industry asserting a prominent role in the global market.

Environmental Implications: The Need for More Effective Action

1.17 Despite an enabling legislation and progress in institutional development, keeping up with the environmental challenges of rapid urban growth, industrialization, and infrastructure development (including provision of adequate environmental infrastructure to booming urban areas) has proved difficult. This is evident from the persistent high levels of environmental pollution in excess of national ambient standards (Figures 1.5 and 1.6). In 2003, of the nearly 3,000 ambient water quality observations, the levels of prevalent organic pollution, measured as biochemical oxygen demand (BOD), exceeded water quality criteria for Class A water bodies in over 1,000 cases. The country-wide ambient air quality monitoring carried out by CPCB at 201 monitoring stations revealed that National Ambient Air Quality Standards (NAAQS) for respirable suspended particulate matter (RSPM), the main air pollutant of public health concern, were violated at most of the monitoring stations (MoEF, 2005). The estimated annual economic cost of damage to public health from increased air pollution, based on RSPM measurements for 50 cities with the total population of 110 million, reached US\$ 3 billion (Rs.15,000 crores) in 2004¹⁰.

⁹ For more information on the Delhi case, see Greenspan and others 2004; World Bank 2005; and Narain and Greenspan 2004.

¹⁰ Estimates based on the conventional benefit-transfer methods. For details, see Lvovsky and others 2000; World Bank, 2005.

Figure 1.5: Biochemical Oxygen Demand (BOD), Major Rivers, 2004**Figure 1.6: Respirable Suspended Particulate Matter, Residential Areas, 2004**

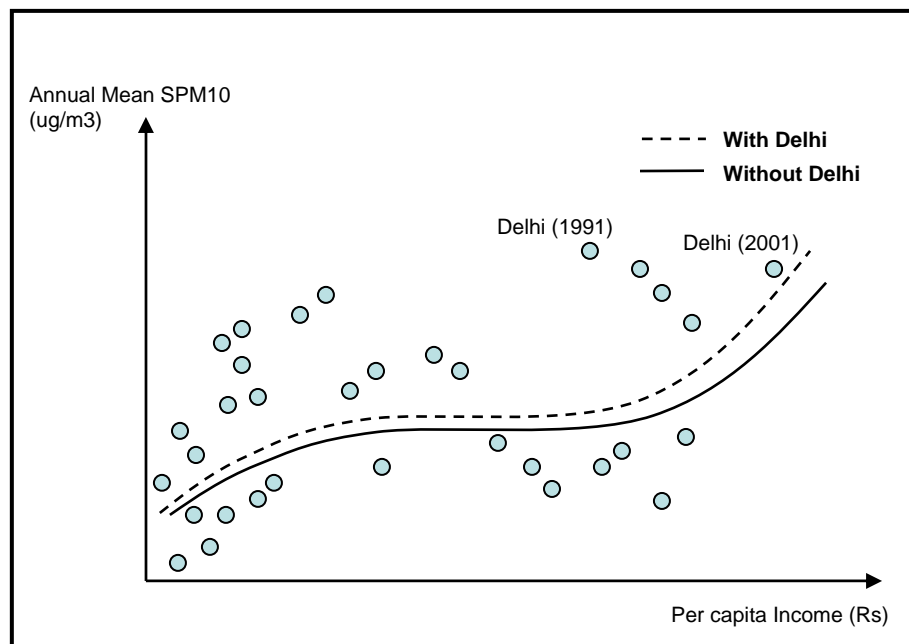
Source: CPCB website, <http://www.cpcb.nic.in/>

1.18 Empirical evidence from India on the impact of growth on environmental quality outcomes, based on a limited analysis across States, shows that the country is still recording an upward trend in the levels of major air pollutants — suspended particulate matter less than 10 microns (SPM-10) and nitrogen oxides (NO_x) — in urban areas (Figure 1.7).¹¹ It must be

¹¹ A state-level panel regression analysis was carried out between 1991 and 2001. Air quality levels are averages for all monitored cities in a state, combining measurement in both industrial and residential areas (source: <http://www.cpcb.nic.in>). State GDP data are obtained from www.indiastat.com. The analysis controls for institutional

stressed that this finding is subject to caveats and *cannot* be generalized for other environmental quality/pollution indicators, an analysis of which was not done because of the lack of suitable data.

Figure 1.7: Economic Performance and Urban Air Pollution in India's States



Source: Analysis undertaken by the study

1.19 Importantly, there is also an indication (albeit not yet sufficient to change the overall trend) of a decrease in SPM-10 pollution in Delhi, evident from Figure 1.8 and recorded by other studies¹². Air quality data and trends highlight an emerging phenomenon of *conflicting trends* for different categories of cities, similar to that experienced by many other countries, and reflecting the complex forces behind the impact of growth on environmental action and outcome. Figure 1.9 reveals opposite trends among SPM-10 levels for a group of largest cities and a group of smaller cities over the past ten years (1995–2004).¹³ While the levels of air pollution decreased in the former group, they have been increasing for the latter group. Currently, the *average* SPM-10 exposure level in the group of smaller cities is slightly higher than that for the larger cities group. This is a result of greater attention and effort given to

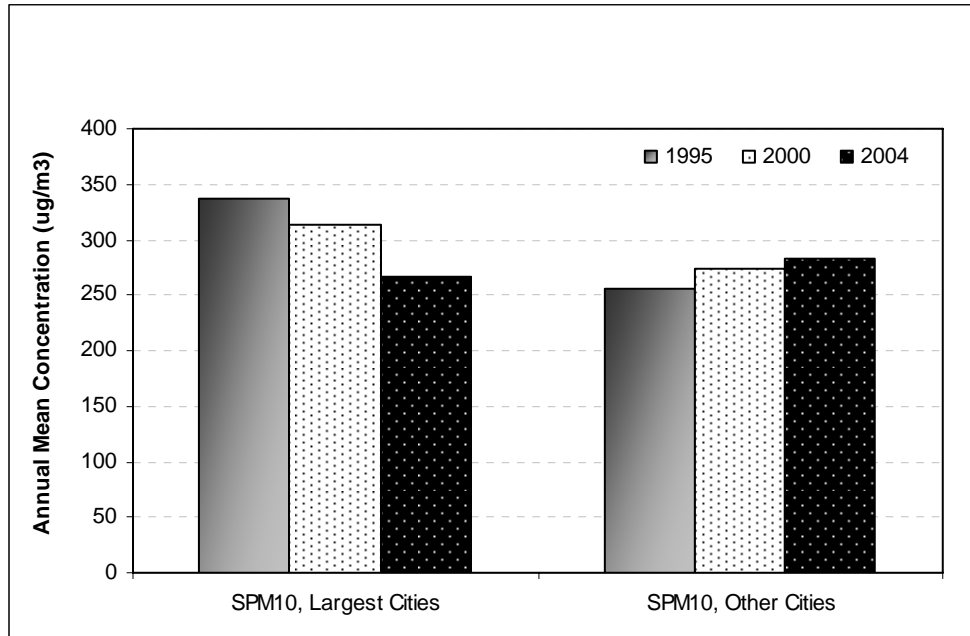
(Kochhar and others 2006) and demographic factors (World Bank, 2006c). Regressions without Delhi, which could be considered an outlier, and with Delhi showed similar qualitative results, illustrated on the Figure. Dropping some other higher income-higher air pollution cities did not change qualitative results either. To control for possible effect of winter heating in northern cities, same regressions were run for average SPM-10 levels during the months of April–November only and yielded similar qualitative results. Regressions for NO_x also showed similar qualitative results. However, SO₂ levels, which are very low, do not show a statistically significant relationship with an income.

¹² See, for example, World Bank (2005) for a detailed analysis of air quality trends in five major India cities.

¹³ Largest cities are Delhi, Mumbai, Calcutta, Ahmedabad, and Hyderabad. Other cities are Bhopal, Nagpur, Jaipur, Kanpur, Jalandhar, Indore, Faridabad, Surat, and Vishakhapatnam. CPCB data on annual average SPM-10 concentrations for these cities is used to calculate population-weighted average exposure for each group. (Source: CPCB website, <http://www.cpcb.nic.in>).

arresting air pollution in larger cities, which again demonstrates the power of environmental action and the huge unfinished agenda in making this action happen across the country.

Figure 1.8: India SPM-10 Trends, Largest and Other Cities, 1995–2004



1.20 The immense unfinished agenda underpins the growing dissatisfaction with environmental management in India by an increasingly vocal, active, and impatient “green” constituency. Some successes notwithstanding, the situation on the ground is considered inadequate by a wide range of stakeholders. Much of the problem is credited to weak implementation of laws and regulations.

1.21 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. The GoI’s Five-year Plan emphasizes that the national development agenda should prioritize environment conservation at the central, State and local levels by suitably “modifying unsustainable activities” and understanding cumulative cross-sectoral effects. The recently approved National Environment Policy (NEP) 2006, by the MoEF acknowledges the deficiencies in the existing policy and institutional framework, such as continued environmental degradation and delays with reviewing development projects. The NEP calls for wide ranging regulatory reforms, exemplified by an earlier initiated review of the EIA clearance procedures, commissioned by the MoEF and particularly highlights the need for: “*identifying and integrating environmental concerns in relevant sectoral and cross-sectoral policies through review and consultation...*” (MoEF, 2006).

The Study

1.22 This *country environmental analysis* was conceived with the objective of helping strengthen the environmental policy *implementation* framework to meet the challenges of a rapidly growing and extraordinary diverse India’s economy. The focus was on identifying and proposing ways to address major gaps in the existing institutional arrangements, regulations and incentives for good *environmental compliance and performance*. In support

of NEP priorities, significant attention was paid to developing, *jointly with multi-sectoral government counterparts and by way of a broad-based consultative process*, actionable and commonly shared recommendations to influence sectoral and cross-sectoral decision making towards more environmentally sustainable development practices.

1.23 . Given the size and diversity of India's economy and geography and the resulting multiplicity of environment development pressure points, the study approach was to exercise strategic selectivity. The scope of work developed through extensive consultations with MoEF (the main counterpart) and multiple other stakeholders allowed to focus on priority issues, not covered by, and complementary to, recent or on-going work (for example, a review of the environmental assessment (EA) process that the MoEF previously commissioned and which was nearing its completion at the time this study was about to start). It also allowed drawing of wide-ranging conclusions relevant to a variety of stakeholders despite the limited breadth and depth of the analysis that was possible within a reasonable timeframe.

1.24 The study specifically focused on the following issues:

- Promoting greater accountability, transparency, and public participation in environmental management
- Strengthening monitoring and enforcement of policies and regulations
- Addressing capacity needs of environmental institutions
- Improving institutional incentives for integrating sectoral and environmental priorities.

1.25 The assessment covered the three select sectors that are among the key drivers of growth: industry, power (including three distinct sub-sectors: coal-based power generation, hydro power generation, and transmission), and highways. Together, these sectors represent a variety of environmental issues, such as water and air pollution, and hazardous wastes, as well as impacts on water flows, land and vulnerable ecosystems. They also represent diverse sources of environmental impact — large *point sources* (power plants, large industry), small *areas-based sources* (small-scale industry), and *linear sources* (transmission lines, highways — requiring different regulatory and enforcement approaches. These sectors anticipate substantial scale-up of future investments from both private and public sources. The analytical framework used by this study was a combination of sector-wide reviews, based on secondary data of issues, policies, regulations and institutions, with several case studies of implementation experiences and specific projects in the selected sectors (Box 1.4 for case studies description). The case studies covering seven States of India, aimed at gaining a deeper understanding of the obstacles (as well as contributors) to better environmental compliance and performance on the ground. The case studies involved primary data collection and consultations with local stakeholders. Selective reviews of international experience in environmental management were also conducted. The findings from all reviews and case studies were integrated to leverage support for corrective actions building on a growing number of good practices in India and internationally.

Box 1.4: Case Studies of Implementation Experience

Industrial Sector

The two case studies are:

- Naroda Industrial Estate in Gujarat (established in 1964 near Ahmadabad by the Gujarat Industrial Development as the first industrial estate in the state); and
- Patancheru Industrial Estate in Andhra Pradesh (established in the year 1975 in Medak district of Andhra Pradesh about 15 km from Hyderabad)

These two are representative of the nature of challenges in environmental management, types and capacities of industrial sector and factors responsible for varying degree of environmental management. While Naroda represents an industrial area that has predominance of small and medium scale chemical industries, Patancheru symbolizes an area that has a mixed type of industries many of which are in the chemical or pharmaceutical sector.

Power Sector

The three case studies covered three power sub-sectors and included:

- Dadri Coal Power Plant in Uttar Pradesh of the National Thermal Power Corporation (NTPC). It is in commercial operation since 1995, and was the first NTPC plant in the country using beneficiated coal;
- Koldam Hydro Power Project in Himachal Pradesh, also by NTPC. Construction started in 2001 and is expected to be completed by 2008–09. Located on river Satluj, this run-off river project is a good example of the new generation of hydro-power projects in India; and
- Dhauliganga-Bareilly 400 KV DC transmission line crossing Uttar Pradesh and Uttaranchal, commissioned by the PowerGrid Corporation of India Limited (PowerGrid) and the National Hydro Power Corporation (NHPC). This is an example of the transmission project completed (over the period 2000–2005) in some of the most difficult and demanding social and environmental conditions (passing through different ecological areas — mountains, valleys, forests, rivers and wildlife sanctuary, as well as multiple villages and towns).

Highways Sector

The two case studies selected were:

- Western Transport Corridor project (NH-4) in the state of *Karnataka*, 259 km, funded by Asian Development Bank (ADB); and
- Jaipur-Kishangarh part of NH-8 in *Rajasthan*, 93 km, implemented on Build Operate Transfer basis.

These two road sections are part of the prestigious National Highway Development Project (NHDP) proposed to augment the major traffic corridors (North–South and East–West) and the projects are being implemented by the National Highway Authority of India (NHAI). The issues however, are similar and can be applied to State Highway Projects where the implementing agency is the state Public Works Department.

(Source: Data collected during the study)

Consultative Process

1.26 A central feature throughout this country environmental analysis was the extensive consultations and dialogue with the concerned sectors and players. Roundtable discussions, meetings, brainstorming events and workshops took place in December 2004, April 2005 (launch workshop), June 2005, August 2005, December 2005 (multi-sectoral consultation workshop on early findings) and July–August 2006 (consultation on the draft final report). A major public (non-governmental organization; NGO) consultation workshop was held in July 2006, followed by meetings with government representatives of all the sectors involved (environment, industry, power, and highways). In addition, several consultations were held by study consultants during the summer of 2005 with local stakeholders at the project sites selected as case studies. The draft report was also posted on the Internet for broader public review and feedback during June–July 2006.

1.27 The consultative process has been particularly important because from the onset the main added value of this exercise was in reconciling different perspectives and helping to develop a *commonly shared* vision by all principal stakeholders on the way forward. As articulated in the following chapter, the lack of trust and constructive dialogue among opposing stakeholders is becoming a key constraint to environmental management reforms. This study was guided by the related “process-oriented” outcomes set at the beginning of the process, namely:

- A deepened understanding shared by various stakeholders of institutional development needs for improved good environmental management, performance and compliance;
- An agreement on the actions to be taken by all concerned stakeholders to improve environmental outcomes; and
- A better informed and accelerated process of change and regulatory reforms towards a more effective regulation and improved performance.

Road Map to the Report

1.28 This report is a synthesis of all background reviews and studies. This introductory chapter is followed by three chapters presenting, respectively, the main findings and recommendations under the three “pillars” of successful environmental management which emerged as a priority for India. These are: consensus building through effective multi-stakeholder dialogue and public participation (Chapter 2); facilitating compliance through a balanced combination of a credible threat, encouragement and knowledge (Chapter 3), and aligning sectoral incentives with national environmental objectives (Chapter 4). A summary of key messages and conclusions, with implications for various stakeholders, is given in Chapter 5.