

IV. Aligning Sectoral Policies and Incentives

4.1 Discussions, surveys and media coverage in India show that the environmental regulator — represented by the Ministry of Environment and Forests (MoEF), State departments of environment and forests, Central Pollution Control Board (CPCB) and State Pollution Control Boards (SPCBs) — is most often to be blamed for various environmental problems by both the public and development authorities. Development authorities feel that their role is to promote projects while that of SPCBs is to enforce compliance, and that while they are doing their job, SPCBs are not doing theirs. This attitude is reinforced by the legal situation where a lawsuit for an environmental violation is filed against the SPCB for failing to enforce and not directly against a polluter for failing to comply.

4.2 Capable and effective enforcement institutions are critical for environmental improvements, as is a vocal civil society. However, there are a number of fundamental ways through which economic development and policies in India (and elsewhere) affect environmental resources, which are beyond the issue of “compliance” with the given set of environmental regulations and standards. This is particularly evident in the power sector. There is also a fundamental need, demonstrated by a history of environmental management worldwide, for sectoral agencies to *facilitate* better environmental compliance and performance of individual projects and more sustainable development of the sector as a whole.

4.3 The present review of national and international experience in the three selected sectors — industry, power and highways — also shows that sectoral institutions have a major facilitating role to play in managing the environmental impacts of sectoral projects, programs and development plans. While not providing a complete account of environmental impacts and opportunities linked to sectoral development and performance, this chapter summarizes the key issues highlighted by the three sector reviews.

The Role of Industrial Policy and Institutions

4.4 The important role of voluntary initiatives and approaches by industry stakeholders is well recognized and demonstrated by the Charter on Corporate Responsibility for Environmental Protection (CREP) — a product of collaborative effort between the industry and MoEF/CPCB. Also important is that the level of attention State institutions (responsible for the development, implementation and oversight of State industrial policies, such as departments of industry and industrial development authorities) give to promoting environmentally sound behavior by industries can have a significant influence on the subsequent environmental impacts from new investments and operating facilities.

4.5 This is elucidated by the industry sector case studies that revealed a relative difference in overall environmental performance of the two, in many ways alike, industrial estates in the two States where pollution control boards are similarly active and strong. The analysis showed that the difference is in part reflected in the level of environmental awareness and communication between regulators, industries/industry associations, and communities, and in part by the important role played by the State Industrial Policy, the Industrial Development Corporation and industrial associations (Box 4.1).

Box 4.1: Key Reasons for Relatively Better Environmental Management in Naroda Industrial Estate (as reported in focused group discussions)

- Proactive role was played by the Gujarat Pollution Control Board by creating regulatory incentives for industry to improve their environmental performance;
- Relatively better coordination among partners led to a reasonable level of performance of the common effluent treatment plant (CETP), as per the design;
- A number of industries in Naroda have benefited from advisory support from Gujarat Cleaner Production Center on cleaner technologies and production as well as best practices to improve environmental performance;
- The waste exchange program in Naroda improved sharing and access to information on environmental compliance of individual industries within the industrial estate and reduced the cost of compliance;
- Proactive Gujarat Industrial Policy 2003 issued in 2004 catalyzed improved environmental performance through financial incentives and an award for the industry that demonstrates exemplary application of cleaner production techniques in SME;
- Gujarat Ecological Commission provided a platform for NGOs to undertake scientific analyses and play an advocacy role;
- Naroda Industrial Association through its work has catalyzed enhanced accountability for each stake holding institutions, particularly the environmental regulators;
- A number of large and small scale industries (more in Naroda and a few in Patancheru) improved compliance by adopting voluntary environmental management system standards based on ISO 14001; and
- Several universities, research organizations, and private investors in Andhra Pradesh and Gujarat, as well as Naroda Industrial Association have demonstrated a successful business model through sharing of technical information on waste minimization to improve industrial productivity and operation of CETP and treatment, storage and disposal facility (TSDF).

Source: World Bank-CII Stakeholder Consultation workshop, Ahmedabad, July 2005

4.6 Both the Gujarat and Andhra Pradesh case studies also highlight the importance of and opportunities for industrial institutions, such as Industrial Development Authority (IDA), as well as estate management and business associations, to influence the environmental performance of individual industries and estates as a whole. One example is an initiative by the Naroda Industrial Association to introduce environmental auditing to improve the knowledge of resource utilization and generation of waste. Key opportunities, identified by the study, are summarized below.

Integrate Environmental Objectives in the State Industrial Policy

4.7 During the past decade India has seen the most significant reforms in industrial policy being implemented with support from a diverse range of sector institutions, both at the central and State level, triggering its economic growth. However, integration of environmental objectives in this process has lagged behind, and the current situation differs in various States. For example, the industrial policy of Gujarat boldly promotes good environmental performance, while some other States emphasize the need for “expeditious clearance of proposals” for development investments, without emphasizing the importance of ensuring that new investments should be made in an environmentally sustainable manner. It

would be important for the Ministry of Industry to raise awareness of “good practice” examples of integrating environmental provisions in the State-level policy, such as those of Gujarat or Maharashtra, and encourage all rapidly industrializing States to follow this approach.

Link Industrial Promotion to Environmental Performance

4.8 To promote and attract investments in the State, IDAs tend to offer attractive concessions and tax holidays to the project proponents in many cases without considering the environmental sensitivities of investments or their cumulative effect. This policy has led to a mixed variety of industries being attracted to the area affecting ancillary support industries, predominantly SMEs, which have little or no environmental facilities. For example, Gujarat has attracted significant investments for the production of dyes, dye intermediates, and textile processing in the small scale sector, which reportedly has led to significant contamination in the surface and ground waters and land environment. It is time for India to start integrating environmental considerations in industrial promotion incentives, using, for example, the instrument of environmental performance bonds, described in Chapter 3. In this case, IDAs would require certain type of companies, identified jointly with environmental authorities, to secure environmental performance bonds, to receive the concessions or tax holidays, or to obtain a license to set up the plant for particularly polluting processes. A particular opportunity, as well as a significant risk if this opportunity is neglected, is provided by the recent process of setting up Special Economic Zones²⁰ that could potentially house industries, commercial establishments and residential complexes with possible pressure on land and natural resources in these areas. Paying due attention to environmental considerations, opportunities to reduce the pressures through better planning and incentives to clean production in the process of establishing these zones and granting licenses will go a long way in harmonizing the growth and sustainability objectives.

Coordinate with Local Government and SPCB for Better Planning, Infrastructure Provision, and Zoning

4.9 The two areas selected for the case studies reflected the important role and results of the planning process. The case studies showed that many environmental issues found in the Patancheru industrial area (Andhra Pradesh), and to some extent in Naroda (Gujarat), related to inadequate planning, provision of environmental infrastructure and choice of location of the polluting industries. That the Naroda industrial estate was better planned and provided with better infrastructure, as compared to the Patancheru industrial estate, was a key factor in comparative environmental performance. However, for neither area was there evidence that an assessment was undertaken in advance to evaluate whether adequate infrastructure facilities (such as water supply, effluent treatment, hazardous waste management, sewage management) would be sufficient and available to ensure environment management and overall compliance.

²⁰ In 2000, the Government of India replaced the old Export Processing Zone regime by a new scheme of “Special Economic Zones” (SEZs) with several significant incentives/benefits that were not available in the earlier scheme. In 2005, it enacted the SEZ Act and the SEZ Rules were notified in February 2006. (Source: *Economic and Political weekly*, November, 2006; “*Special Economic Zones: Revisiting the Policy Debate*”)

4.10 Traditionally, the planning process for the new industries started at the local level and was mostly driven by promoters with very little consideration to the environmental consequences of making a decision unless the site area had been declared environmentally sensitive. To address this pitfall, the spatial planning programs initiated by the CPCB and SPCBs, including the development of a zoning atlas, built-in a district-wise environmental assessment guideline for the siting of industries. The work has been extended to cover 142 districts in different States and union territories, and is expected to enable the planner to decide on the suitable areas and zones for new developmental projects. Although the zoning atlas is considered to be useful by many environmental planners at the State level, the use of information for actual siting of industries is still modest and uneven. There is an evident need to more effectively integrate the environmental zoning program by SPCBs with the State industrial development programs and locational decisions by IDAs using recent good practice examples from some States such as Andhra Pradesh where the Andhra Pradesh PCB has managed to start exercising a major role in industrial zoning.

Raise Awareness of Business Opportunities Linked to Good Environmental Management

4.11 Many industries, including SMEs, would volunteer to switch to better and cleaner production processes and technologies, if it also helps them reduce the costs of inputs, increase the value of output and increase the overall profit. For example, a cluster of export-oriented glass industries near Bangalore switched to gas-fueled boilers, resulting in drastic decrease in air emissions and significant reduction of glass rejection ratio, which compensated well for the cost of conversion. Another example is from the textile processing sector in Ludhiana, where a large number of small units adopted measures, such as changing processing machines, optimizing the washing/rinsing operations, and reducing the processing steps. These investments had a short pay back period, which is very important for SMEs in determining the need for such investments. The measures resulted in cost savings from reduction in the use of inputs including water, energy, dyestuff and chemicals. The majority of the measures also had a significant impact on reducing emissions²¹.

4.12 While environmental protection is still viewed by many industries solely as a compliance issue, which needs to be managed to minimize the business risks of closure or public complaints, there are a growing number of examples — in India and internationally — of commercial opportunities and gains accompanying improved environmental performance. It is an important task and public duty of industrial agencies and associations to collect and effectively disseminate information to increase knowledge and awareness of commercial benefits from better environmental performance among investors and developers.

Foster Partnerships Between Larger Industries and Smaller Suppliers

4.13 It is evident that industrial associations and leaders in environmental performance among industries themselves are much better positioned than the environmental regulator to guide investors and developers to understand and realize business opportunities associated with improved environmental management (such as quality of products, waste reprocessing, energy efficiency). International experience has shown that SMEs are more likely to accept and adopt compliance measures where industrial associations provide the incentives and where large companies act as environmental mentors. The incentives are particularly strong

²¹ Information collected by the study

and the chances for success higher when there is a direct business relationship between a mentor and a small business, such as in Mexico where small suppliers were responsible for mentoring (Box 4.2).

Box 4.2: “Greening Supply Chain” Initiatives

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 SMEs, 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 Mexico, the Guadalajara Environmental Management Pilot was established to assist 20 SMEs 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. Half the participating SMEs said they would not have participated in the program if they had been invited by the government or university, showing that the motivating factor was commercial ties with their major clients.

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.

Source: World Bank, 1998b; information from study consultations.

Expand the Role of Business Associations in Knowledge Sharing and Training

4.14 Many Indian industries have leveraged the knowledge of local and international practices (such as local substitutes for raw material or locally reuse/recycle some waste byproducts) to implement environmental management programs under the corporate social responsibility charter. The industrial associations, such as the Federation of Indian Chambers of Commerce (FICCI) and Confederation of Indian Industries (CII), have developed important initiatives to share best practices, provide compliance assistance and promote voluntary initiatives. For example, the Association of Chambers of Commerce and Industry (ASSOCHAM) and FICCI have organized workshops on ISO 14000, developed courses in internal auditing of environmental management systems, and provided technical assistance on pollution prevention and waste minimization. Both CII and FICCI have also developed programs targeting SMEs.

4.15 However, the role of these and other business associations in promoting good environmental performance as inherent part of good business practice is uneven across the States. A worrisome observation is that the poorer states with weaker government institutions where massive development with potentially significant environmental risks has now picked-up (for example, Chhattisgarh, Jharkhand and Orissa), have less active business associations with few environmentally friendly programs. Hence, many investors and developers in these States, who are emerging on a massive scale, have limited access to information on environment friendly technologies and management practices and business opportunities associated with their adoption. It is critical to support and expand the environmental

programs by the national and State business associations in those “emerging” States that are experiencing massive development investments.

Environment as a Driver in Power Sector Development

4.16 Environmental impacts of the power sector are wide-ranging, significant and in public spotlight: they are visible locally, whether it is a smoky stack, an ash pond, or a reservoir displacing a settlement; they cross boundaries of sovereign countries, as in case of acid rains; and lately, they have become of major global concern due to anticipated climate changes largely caused by carbon dioxide emissions from burning fuels (Box 4.3). It is also widely recognized that these impacts are a function of policies and institutional performance in both sectors — power and environment.

Box 4.3: Energy and Environmental Challenges: A Global Perspective

The way that energy and environmental challenges are addressed in the next two decades will, to a large degree, determine sustainable growth, environmental quality, and national security.

Climate change presents an additional challenge to economic development in general, and the energy sector in particular. To reduce the threat of human-induced climate change will require a significant reduction in the emissions of greenhouse gases globally, of which carbon dioxide is most significant. While Organization for Economic Cooperation and Development (OECD) countries will remain the largest per capita emitters of Greenhouse Gases (GHGs), the growth of carbon emissions in the next decades will come primarily from developing countries. The Inter-governmental Panel for Climate Change (IPCC) estimated that carbon emissions would increase by 2050 relative to 2000, globally by a factor of 1.6 to 3.5, and in developing countries by a factor of 2.3 to 5.2 in the absence of policies to address climate change and a transition to a low-carbon economy. Between 2020 and 2030 developing country emissions of carbon will exceed those of developed countries in aggregate but still lag far behind on a per capita basis.

Transformational policies and strategies will be needed to meet national expectations of secure, safe and clean energy and to deal with the implications of climate change. The energy sector accounts for about 80 percent of worlds’ greenhouse gas emissions. The widespread commercialization of energy efficiency technologies is an effective strategy to both reduce local and regional air pollutants and address climate change without affecting economic growth as well as addressing energy security concerns. Although, energy intensities are declining due to structural changes, technological effects, and globalization, much remains to be done in transforming energy efficiency markets. Decisions taken today on technologies, particularly in the power sector, and policy will have profound consequences on development paths for 40 to 60 years. Carbon intensive energy infrastructure and energy inefficient cities that are being rapidly built and expanded today will perpetuate the pattern for carbon intensive development for decades. Policies and incentives that promote new, cleaner and more efficient technologies and the international aid to help developing countries reduce the cost, access and adopt cleaner technologies on a commercial scale would be critical.

(Source: World Bank, 2006a)

4.17 The main impacts on the environment from the power sector in India are defined by:

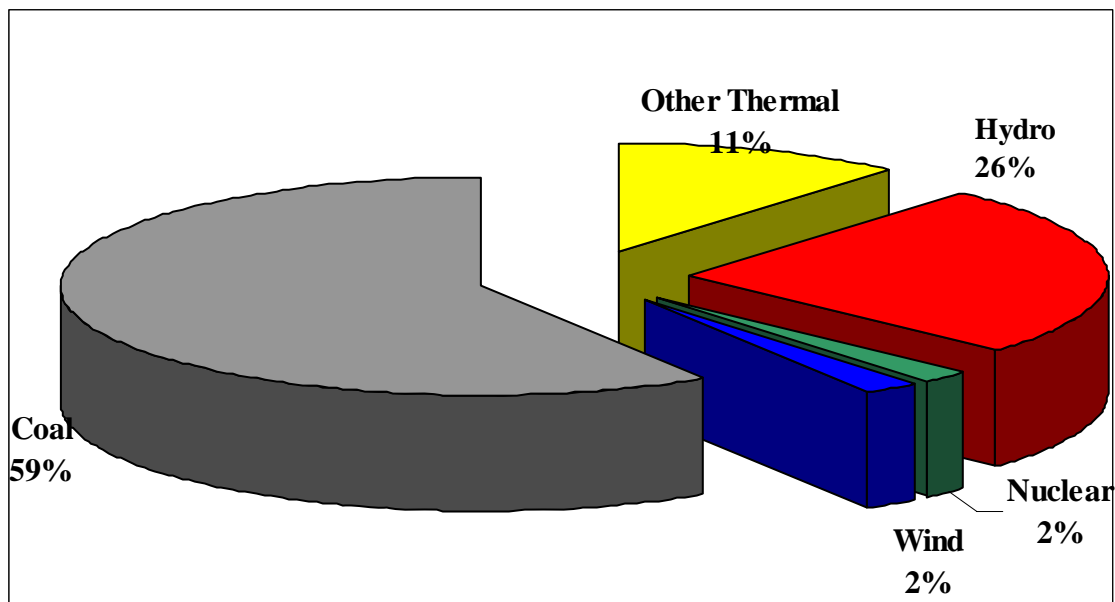
- Primary energy source and technology choices for power generation, which heavily relies on high ash-content coal (Figure 4.1);
- Sector governance and performance, particularly such indicators as high transmission and distribution (T&D) losses increasing the need for additional generation; erratic supply and outages, forcing users to resort to inferior back-up options; inadequate T&D networks preventing optimum utilization of generation

capacity; poor demand-side management; and bankrupt State-owned utilities unable to invest in modern technology and pollution control; and

- Environmental performance and compliance of individual facilities.

4.18 While India must vastly invest in generation, T&D, and reform of the power sector to overcome current supply shortages and provide electricity for all and meet future demands of the growing economy, it faces an additional challenge of increasing attention to the environmental implications of power generation technology choices at the local, regional and global levels. Furthermore, energy security has recently emerged as a priority area for India's development prospects. All of these point to a critical need for a long-term power sector development strategy that addresses, in a balanced manner, the issues of (i) meeting the growing demand for electricity at affordable cost; (ii) ensuring the security of primary energy supply through an appropriate mix of sources; and (iii) minimizing the environmental impacts.

Figure 4.1: Installed Capacity of Power Generation by Source (percentage), 2005



Source: MoP (2005)

4.19 Importantly, there is significant synergy between all these three objectives among the various areas of sector development recognized as a priority by the government, namely:

- Increasing the share of hydro, as opposed to coal, in new generation capacity addition.
- Renovating and modernizing old coal-fired power plants, with the resulting improvement in operating efficiency and environmental performance.
- Expanding the inter-regional transmission network, which would also enable the transfer of electricity from hydro power concentrated in north-east part of the country to other locations.
- Upgrading inadequate and ageing sub-transmission and distribution networks contributing to power cuts and local failures, which in turn lead to increased use of back-up diesel generators that are inefficient and contributor significantly to

local air pollution in urban areas, where significant numbers of people are exposure to their harmful impacts.

- Reducing T&D losses and theft, the scale of which is currently equal to new annual capacity addition.
- Promoting energy efficiency among end-users of electricity.
- Optimizing utilization of the existing generation capacity.
- Providing rural access through distributed generation based on renewable applications.

4.20 Progress in all these areas will be highly beneficial for both sectoral and environmental objectives. A series of earlier analyses of the long-term environmental issues in India's power sector at the national level and for selected States, conducted by the World Bank (World Bank, 1998a; 2004a; 2004b), demonstrated significant financial and environmental gains for utilities from improved T&D performance and demand-side management incentives. This is consistent with evidence from other such studies undertaken in India and elsewhere.

4.21 Key sectoral priorities, as articulated by government documents, such as the Electricity Act 2003, the Energy Conservation Act (2001), the national Tenth Plan and major MoP programs (Renovation and Modernization (R&M) of coal power plants, Accelerated Power Reform and Development Program, etc.) appear reasonably consistent with the above environmental objectives. This reinforces the importance of overcoming a host of barriers — institutional, regulatory and financial — to proceed with these measures in practice. Paradoxically at first sight, current power shortages already associated with substantial economic, social and environmental costs have emerged as one of the main bottlenecks for realizing India's plans to cleaner power generation in the future (Box 4.4).

4.22 The three case studies, prepared for this report and involving a hydro power project, a coal fired power plant and a major high voltage transmission line (Box 1.2 in Chapter 1), indicated that environmental impacts can be reasonably managed in all these sub-sectors. It must be qualified that the case studies included relatively recent projects undertaken by large and financially strong central government corporations — the National Thermal Power Corporation (NTPC), the National Hydro Power Corporation (NHPC) and the Powergrid Corporation — that were able to comply with environmental regulations, as well as exercise a socially responsible approach.

Box 4.4: A Planned Transition to Cleaner Electricity Generation is Complicated by Severe Shortages of Power

While India is planning to increase the role of hydro, nuclear, and clean-coal technology within its energy mix, load shedding has put a premium on getting generation plants on line as quickly as possible. This naturally favors an approach of focusing on reliable, conventional coal-fired units, as supported by data below.

India's Tenth Plan envisions a shift to hydro power. Within the Ministry of Power (MoP) planning framework, about one-third of the planned capacity addition of 100,000 MW during the period 2002–2012 would be hydro, which would contribute to the shift. About half of the planned capacity would be thermal (most of which will be coal-fired), and the balance would be nuclear and non-hydro renewable. The majority of capacity additions are slated to come from the central sector and majority state-owned firms such as NTPC and NHPC. The balance is expected from state-level generators and the private sector.

In practice, the NTPC (the central sector thermal generator) has come closest to meeting its planned capacity addition target, and most of this capacity has been coal-fired. Overall, the country is likely to add about 75 percent of the planned 41,000 MW envisioned by 2007. This performance will likely leave India considerably short of *both* the 100,000 MW target for 2012 and the desired shift in the primary source mix towards a less import and coal dependent energy base, addressing energy security and environmental concerns.

Furthermore, power shortages are among key reasons for under-performance of India's Renovation and Modernization (R&M) program for coal power plants. One of the main barriers to R&M today is that many of the best candidates for R&M are owned by States that desperately depend on cheap power from these older plants for a significant portion of their overall supply and cannot afford a temporary shutdown of such a plant for R&M.

Source: MoP (2005) and Bank Staff

4.23 The Powergrid Corporation has adopted a comprehensive set of environmental and social policies that may exceed the requirements of the respective government policies and regulations (Box 4.5). For the Dhauliganga–Barrely transmission line going through ecologically sensitive areas of Uttar Pradesh and Uttaranchal, a “good practice” effort was made to conduct a preliminary survey for project alignment that would avoid developed areas, human settlements and cultural and historical places.

4.24 The Dadri Thermal Power Plant of the NTPC, that started commercial operations in 1995, was the first power plant in India using beneficiated coal. In combination with relatively advanced technologies and a good (ISO14001 certified) management system, the plant was able to meet the regulatory requirements with respect to the environmental impacts. Although clean (beneficiated) coal is more expensive, financial performance of the plant is better than many other coal power facilities. Nevertheless, ash disposal remains a challenge, and the case study highlighted the need for better technology and incentives for management of coal ash. Among the recent NTPC initiatives, a proposed plan to set up four ultra mega coal based power plants (of 4,000 MW each) using supercritical technology has the potential to demonstrate improved environmental management from both national and global perspectives.

4.25 As mentioned in Chapter 2, the Koldam hydropower project (also of the NTPC) sets a good practice example of working with the community. At the same time, the case study and further consultation with the hydropower developers emphasized the need for standard guidelines by the MoEF for environmental flow downstream of the dam/diversion structures

so that the impact of change of flow regime downstream on aquatic flora and fauna could be minimized.

Box 4.5: PowerGrid — Corporate Leadership in Sustainability

Powergrid Corporation of India Ltd. (PowerGrid) is one of the largest transmission utilities in the world playing a strategic role in the Indian power sector operating the national grid. PowerGrid is presently operating about 47,757 circuit km of transmission lines and 82 sub-stations having transformation capacity of 46,461 MVA.

Transmission projects are generally environmentally clean and non-polluting in nature and its impact on environment are restricted to only Right of Way. PowerGrid, has demonstrated its commitment to achieve the goal of **Sustainable Development** through implementation of a comprehensive “*Environmental Social Policy & Procedures*” (ESPP) based on the principles of **avoidance, minimization and mitigation**. The implementation of ESPP in all PowerGrid’s projects has resulted in significant mainstreaming of environmental sustainability in its operations, particularly through:

Reducing deforestation. The data shows that the forest cover, which was about six percent of total 27,000 circuit km Line until 1998 has reduced to two percent with proactive and systematic approach in 20,500 circuit km line constructed during last six years.

Greening of PowerGrid sub station sites. PowerGrid has undertaken massive plantations in sub-stations areas and about 2 to 4 acres of land with suitable species of plants in almost each of their commissioned sub stations.

Provision for **rain water harvesting and collection** of even used/waste water for its conservation and recharging of ground water in all upcoming buildings and substations.

Protecting wild life through design modification: Adoption of an innovative tower design, such as multi-circuit and very tall towers, to protect wildlife and trees in ecologically sensitive (In Tehri transmission line tree felling is reduced to 14,739 against earlier estimated 90,000 trees in Rajaji National Park due to placing of 85 m high towers.) areas and providing financial assistance to state government/ institutions for conservation of flora and fauna.

Eliminated use of poly chlorinated biphenyls. PowerGrid has eliminated the use of poly chlorinated biphenyls, a known carcinogen, in all electrical equipment.

PowerGrid has initiated design and implementation of an integrated management systems, viz. **ISO 14001 for Environment Management, 18001 for Occupational Health & Safety and ISO 9001 for Quality management.**

(Source: PowerGrid website)

4.26 Summing up, there is some degree of convergence between sector development plans and environmental objectives. Furthermore, the same reforms in sector governance and incentives that would improve environmental performance are desperately needed for meeting the sector’s own performance targets. At the same time, the sector review and case studies highlight a number of areas where further alignment of sectoral policies and programs with environmental considerations is required and can be done by the sector itself or in coordination with environmental authorities. These are listed below.

Develop a Consistent Framework for Integrating Environmental Externalities in Power System Planning and Investment Decisions

4.27 A framework for capturing environmental externalities, related to the power sector, has been evolving in India in response to specific environmental priorities. For example, India’s coal has very high ash content and is very low in sulfur. This resulted in a decision to set source emission standards on ash (measured as SPM), but with no emission standard for

sulphur dioxide (SO₂). The emission standard is regulated by prescribing the height of the stack to ensure good dispersion. While there is no nitrogen oxides (NO_x) emission standard for coal-based power plants, NO_x emission norms for oil and natural gas-based power plants are more stringent in India than in many other countries. Companies wishing to use forested land had to pay the MoEF for afforestation of two hectares for every hectare of forest land lost. Resettlement and rehabilitation components associated with, inter alia, hydro and transmission projects are mandatory items.

4.28 The possible impact of the cumulative regulations on power sector technology choices have not been considered so far, nor is it expected to be done per initiative of the environmental authorities preoccupied with building and enforcing a reasonable multi-sectoral regulatory framework. These considerations come together in India's power generation planning process, where it remains a strong centrally planned impetus, provided by the Central Electricity Authority (CEA) for new capacity development by central government utilities. For a long time, however, the recognition of the role that environmental regulations might play in sector development plans was mute.

4.29 The issue of accounting for environmental externalities and incorporating those costs in the power planning process has come to the fore in India in October 30, 2002, with a Supreme Court ruling on a matter involving forest conservation and requiring the user agency (except for projects like clinics and schools) to pay the *Net Present Value (NPV)* for diverted forested land. The payment was set at Rs 580,000 – Rs 920,000 per hectare and *in addition* to the compensatory afforestation payment, which, as per latest revision, is set at about Rs 35,000 per hectare if land is provided by the developer, or up to double that amount if land is not provided.

4.30 The impact of the ruling was particularly felt by hydro projects, which are typically located in forest areas and could cause a large loss of forest land due to inundation, as well as land requirement for locating project facilities. The introduction of NPV was estimated to add 5–7 percent to the project costs, according to the National Hydro Power Corporation (NHPC)²², affecting power tariffs and the viability of hydro power projects. Several public utilities petitioned against this order, emphasizing the extraordinary high amount of payment and double-counting with the payment for compensatory afforestation. In recognition of this controversy, a Committee, headed by Dr. Kanchan Chopra, was set up in September 2005 to review and update the methodology for NPV calculations, as well as recommend whether additional types of projects should be exempted from paying NPV. The Committee released the report in June 2006.²³

4.31 The introduction of NPV has illustrated that environmental regulations can, and increasingly will, influence the cost structure for future generation and transmission projects. However, the ultimate impact of an environmental regulation on future power sector technology choices, in the short and long term, can be established only through a comprehensive and rigorous analysis. It is therefore critical that power planners are able to perform such an analysis and provide well-substantiated inputs to the MoEF and the Supreme Court on such matters.

²² Based on data for Arunachal and Sikkim projects

²³ Chopra Report on NPV. Source: <http://iegindia.org/npvreport.pdf>

4.32 Importantly, the impact of NPV on the cost structure of power projects highlighted a broader issue — the need for a comprehensive methodology that power planners and others in India could use for estimating all relevant externalities (and the economic costs and benefits) of alternative power sector technology choices at the project and system level. For example, one of the immediate concerns in the power sector was that the NPV payment could result in an unintended consequence of an even greater reliance on coal-fired power plants to meet future energy demand, which would ironically be detrimental to the environment. Therefore, a framework for accounting for externalities at the planning stage should make sure that the extent to which externalities are incorporated with the hydro development process is comparable to that for thermal power projects. (If the extent and rigor of integrating externalities in different types of power projects are different, the resulting power generation plan will be sub-optimal from both economic and environmental viewpoints.) The development of such a framework should also address the question of whether global climate change related externalities should be incorporated as well, and if so how these should be calculated. In the end, only a consistent consideration and integration of all these issues would lead to a system of environmental regulations that corrects the market for the development of new generation and transmission projects in a socially optimal manner.

4.33 The next issue is how exactly India's power generation planning and development process should adapt owing to the increased significance of environmental costs and benefits. The key questions to be considered are whether and how to incorporate identified cost and benefit streams within individual energy projects (implying that revenues to the project are sufficient to cover these costs, and that revenue streams from benefits are also established); which costs and benefits to recognize outside the project structure (and if so, who absorbs the costs or gains the benefits); and which costs and benefits to leave aside for future consideration; and what incentives, regulatory and/or financial, are to be provided to private investors to ensure optimal technology choices?²⁴

4.34 To illustrate the last point, private developers in India's power generation increasingly use imported coal with higher sulfur content but are able to save on the cost of SO₂ control technology due to the lack of a source emission standard. In the situation when emission norms for NO_x for oil and natural gas-based power plants are quite stringent in India (more so than in many other countries) this situation would give coal-based generation an additional edge over "cleaner" fuel choices. It should be also noted that the average actual SO₂ emissions (1,200 mg/m³) from power plants using Indian coal is less than the standard in the European Union (1,200–2,100 mg/m³). Thus, setting such a standard in the future would not affect these plants while it would more effectively regulate pollution from the use of higher sulfur imported coal.

4.35 Power sector agencies, notably the MoP and CEA, have a natural advantage and a definite business need for developing capacity to analyze power system development plans and technology choices taking into account the entire range of environmental externalities. And, it would be beneficial for both the power sector and the environment if these agencies and the environmental authorities could work together on the appropriate system of environmental regulations and incentives, based on a good analysis of their impacts. An already existing example of a joint effort by MoEF/CPCB and power generators to build on

²⁴ A World Bank has supported a parallel study to analyze these issues and recommend possible approaches to addressing them.

is an agreement to a set of actions to improve environmental management and reduce pollution including greenhouse gas emissions under the CREP.

Intensify Efforts to Promote Energy Efficiency and Conservation

4.36 The Energy Conservation Act (2001) provides a sound, comprehensive regulatory framework which introduces both voluntary and mandatory programs for energy efficiency. However, implementation of the Act has been uneven and impeded by a prolonged process of making the Bureau of Energy Efficiency, established by the Act, fully operational. And while a wide range of energy efficiency initiatives are underway, energy conservation is still not a mainstream business concept in a country with perhaps the highest electricity tariffs for industrial users in the world (with unreliable power supply by utilities being, again, one of the counter factors). There is a definite need for a focused effort, backed by strong political commitment, to translate the ambitious provisions of the Act into an actual set of incentives and results on the ground.

4.37 A major project on assessing barriers and opportunities for energy efficiency in three countries — Brazil, China and India — has been undertaken by the joint United Nations Development Program (UNDP)–World Bank Energy Sector Management Assistance Program (ESMAP) in collaboration with United Nations Environment Program (UNEP). The key emerging recommendations of this assessment for India are summarized in Box 4.6.

Box 4.6: The Brazil–China–India Energy Efficiency Assessment: Recommendations for India

Adopt a more strategic approach to promoting energy efficiency: Against the backdrop of multiple initiatives and programs, there is a need to refocus on generating the best results in terms of actual energy efficiency gains. This would require a strong strategic review at the national level, involving the central Government, to assess priorities for work on energy efficiency development in the coming years, and to focus sustained, multi-year attention on the implementation of the policy initiatives and market-oriented investment mechanisms that can provide the biggest contributions. Such an integrated and strategic review would also be useful for establishing national priorities for support under current and new international clean energy and climate change initiatives. A review might begin at the macro level, assessing energy intensities and potential savings in different sectors, and the practical investment areas which could yield the biggest benefits. But the most important point would be to establish priorities for specific programs to generate the necessary investment.

Decide on the importance of Energy Service Companies (ESCOs) and support accordingly: ESCOs as well as energy auditors have made little progress so far. This is partially due to their small size and limited reach, and lack of credibility and relationships with other important actors. Support for these two groups whose prime business deals with energy efficiency and who could become important promoters of energy efficiency investments in India could contribute to increasing commercially-based energy efficiency investments. While ESCO development may or may not be considered a priority, past experience in India and elsewhere shows that India's ESCOs are unlikely to develop significantly without sustained government support, through ESCO market creation initiatives (perhaps through proposed public building energy efficiency initiatives) or other means.

Support the promising new energy efficiency lending businesses being developed by Indian banks. The launching of dedicated energy efficiency finance schemes by five major banks in India is a significant achievement. Several specific areas where follow-up efforts would yield significant returns include:

- Further assistance to the participating banks to refine and standardize loan applications/appraisal procedures, and minimize transaction costs. This requires specialized technical assistance to each individual bank and follow-up training assistance. Additional work on options to “ring fence” the negative incremental cost stream achieved in energy efficiency projects for partial use as loan security also would be beneficial.
- Intensive support to the local bank branches in marketing and refining their energy efficiency lending schemes. Much work remains to be done in disseminating information about these schemes to energy efficiency project developers and client enterprises. Further efforts are also required to improve capacities and the efficiency of arrangements for the technical assessment aspects of the lending schemes.

Provide sufficient flexibility to encourage business-driven initiatives. Finally, it is important to emphasize that while government support for energy efficiency is required, it should not result in the government stifling the activities of other actors by telling them what type of energy efficiency schemes to formulate or end-user segments to target. Actors on the ground need to make their own decisions based on their business objectives.

(Source: World Bank, 2006b)

Strengthen Energy Efficiency and Environmental Considerations in Upgrading Old and Constructing New Coal Power Plants

4.38 Of the 83 coal plants in India, 31 are yet to comply with the national emissions standards and 27 are yet to comply with the effluent standards. These plants are old, in poor condition and typically owned by cash-strapped State government utilities. The Government of India's Renovation and Modernization (R&M) program to rehabilitate and upgrade such plants has been implemented for about 20 years, since the Seventh Five-Year Plan. At the

initial stage, the progress was good; however, over time, R&M requirements have increased rapidly (in part due to environmental regulations) and the implementation of R&M schemes has slowed down for several reasons. Of the Tenth Plan (2002–2007) target of 10,400 MW, less than 20 percent has been completed or undertaken by the end of 2005. India's nodal technical and planning agency, the CEA, estimates that up to 30,000 MW of the capacity base is in urgent need of rehabilitation now or in the near future.

4.39 While it is critical to urgently address a set of barriers to speeding up the program, it is also important to use an opportunity, provided by the program, for greater integration of energy efficiency and environmental considerations. For the past and planned R&M, the primary criterion is capacity enhancement and life extension while any energy efficiency improvement achieved is incidental and not a criterion for R&M project design. Nor does this major investment program, which will define the performance of the renovated plants for the future, attempt to consider and address the likely future trends in environmental regulations, which are being continuously expanded and tightened for the power sectors around the world.

4.40 Undoubtedly, this cannot be achieved without a supportive regulatory environment and financial incentives. Therefore, it is necessary to work out suitable packages of financial support, technical assistance and regulatory incentives to eligible utilities that would promote additional enhancements in energy efficiency and/or environmental performance. Given the synergy between these enhancements and mitigation of greenhouse gas emission, this should be a key area of focus for exploring and utilizing, to the extent possible, opportunities provided by global climate change financing instruments, such as Carbon Finance.

4.41 Building new coal-fired power plants is another opportunity to adhere to stricter energy efficiency and environment performance standards that address heightened — within India and internationally — environmental concerns about local and global impacts. For this, again, it would be important to develop and pursue a strategy of maximizing access to concessional funding instruments that are available to cover the incremental cost of a higher efficiency and cleaner technology.

Enable Better Ash Management

4.42 The Dadri thermal power plant case study highlighted that ash management is a challenge even for a modern facility using beneficiated coal. It is estimated that approximately one acre per MW of installed thermal capacity is required for ash disposal. The CPCB and MoEF have taken a number of initiatives to address this, including promoting the use of Pozzolena cement; collection of dry ash directly from electrostatic precipitator hopper; promoting high concentration slurry disposal; back filling of ash in used coal mines; and encouraging the use of fly ash in road construction and brick industry. Specifically, the Fly Ash Notification (1999) by MoEF promotes use of fly ash in the manufacture of building materials and construction activity (within a specified radius of coal or lignite based power plant); and mandates the use of only washed or beneficiated coal by thermal plants located beyond 1,000 km from the pit head.

4.43 Various thermal generation stations of the NTPC are taking measures to minimize the land requirements for ash disposal resulting from ash utilization, such as by raising the height of ash dyke using fly ash or giving it to cement manufacturers, wherever possible. The Dadri plant has taken some innovative steps to minimize the land requirement by using only about 480 acres of land (for 840 acre) for disposal of fly ash and plans to utilize about 0.1 million tons of fly ash per annum through a brick making plant, resulting in savings of approximately

one acre of land per year. The implementation of this rule on a wider scale is, however, constrained by the lack of enforcement mechanisms and incentives for many power plants (particularly those State-owned utilities that acquired large areas of government land at low cost) to dispose of fly ash at no charge. On the other hand, an incentive for construction companies to collect ash greatly depends on plant location. Developing specific sectoral guidelines in support of this notification and providing special incentives for remotely located power plants to follow those would be an important contribution to minimizing the environmental impacts of coal-based generation.

4.44 Land requirements for ash disposal and carbon dioxide emissions are likely to be the two main long-term issues for power generation growth in India, continued to be dominated by high ash content coal. These two issues, while sounding very different, are closely linked in India: the high ash content of coal available in India does not lend itself to a wide use of very high efficiency technology [such as ultra super-critical and Integrated Gasification Combined Cycle (IGCC) technology], which can help capture carbon emissions, unless there is a breakthrough in R&D. There are significant financial costs associated with any further option for making Indian coal and power generated from its burning cleaner (across a range of effects over a life cycle) and being less carbon intensive. This brings to fore the importance of strategic R&D efforts that would take into account the cost and benefits of removal of ash at various stages of coal production and processing chain, to maximize the full range of benefits, including reduced land requirements, local pollution effects and carbon emissions.

Improve the Regulatory Environment for Renewable Energy

4.45 India is the only country with a dedicated Ministry for Non-conventional Energy Sources (MNES) and has a distinguished record of promoting renewable energy, particularly wind power. The importance of renewably energy for India's development is emphasized by a growing recognition, as articulated in the draft Renewable Energy Policy (made available for public comment in 2005), that achieving universal electrification would be difficult without a greater use of distributed generation options using indigenous resources available to remote communities. There is a need to finalize the Renewable Energy Policy consistent with the country's broader environmental agenda. Another important area of action is to build capacity of State-level electricity regulators for setting transparent rules for renewable energy providers, who currently experience significant regulatory uncertainty resulting in a negative impact on the industry. An independent analysis of the relative "true" economic costs and benefits of renewable and conventional generation would be useful to support individual State regulators in determining "fair" prices for renewable energy.

Maximize Opportunities Provided by the Environmental Agenda to Support the Development of a Modern and Efficient Power Sector

4.46 Increasing attention to environmental impacts of the power sector, particularly global, can be, and often is, considered as a competing consideration diverting attention from more important sector issues. *It does not need to be so.* First, the multiple synergies articulated above suggest that the protection of the environment should be seen as an additional impetus, rather than a constraint to achieving the very objectives the sector has set for itself. Secondly, environmental requirements often act as an important motivation for technological innovation, energy conservation and management improvements that, in the longer-term, become very beneficial for sector performance. Third, the global climate change agenda in

particular provides an opportunity to seek and use grant-based and other concessional climate change financing instruments, along with knowledge, technical assistance and technology transfer, in a manner that reinforces and advances sector development objectives and national environmental priorities, such as energy efficiency, enhanced R&M of coal power plants or a greater use of renewable resources.

4.47 For example, India represents one of the largest potential markets for low-cost carbon-reducing investments. It is currently one of the three largest potential suppliers of carbon credits to buyers around the world, under the Clean Development Mechanism (CDM), introduced by the Kyoto Protocol. Most of these measures/projects also produce benefits that further India's national development and environmental objectives, which the application of global environmental financing instruments can help facilitate.

4.48 Furthermore, following a meeting of G-8 countries in summer 2005, attended by India, the International Energy Agency (IEA) and the World Bank were requested to develop, in collaboration with other International Financial Institutions, an "investment framework" for promoting cleaner production and use of energy. This request recognizes that the magnitude of financing needs, required for such a shift to cleaner energy on a large scale, is likely to exceed greatly the resources currently available from existing instruments, such as CDM, Carbon Finance, facilitated by the World Bank, and the Global Environment Facility (GEF). *The Investment Framework for Clean Energy and Development*, expected to be developed over the next two years with the help of country-specific consultations and in-depth analyses, is intended to accelerate investment so that countries, such as India, can meet their energy demands for growth and poverty alleviation in an environmentally sustainable way. It is therefore important for government agencies and private sector players in India to be an active participant of this process, *influencing* its outcome. This also highlights the importance of a strategic assessment of options, specific to India, to maximize synergies between lowering the carbon intensity of the economy, accelerating the rate of growth, enhancing energy efficiency and supporting the core objectives of power sector development.

Facilitate Environmentally and Socially Responsible Performance by All Actors in the Sector

4.49 Attitude, attention and initiatives by key government institutions dealing with the power sector at the national and State levels are among the key determinants of environmental performance by developers and operators of the facilities. For further improving environmental performance, the following additional specific recommendations are made:

- *Develop sectoral guidelines* for establishing transparent and accountable processes and procedures for interaction with the community and taking their views into account on key aspects of the project affecting their lives, such as acquisition of land;
- *Facilitate access to and sharing of international and national best practices* in key environmental management areas where major technical challenges remain, such as blasting, soil erosion and tunneling for hydro plants, ash control and handling for thermal plants;
- *Encourage a wider adoption of social corporate responsibility policies* that would include environmental policies and ISO 14001 certification; and

- *Improve management and disclosure of environmental information* related to the sector. Given the range and importance of environmental issues in the sector, a computerized environmental database and data management system, adapted to sector needs, could be developed and maintained by the MoP/CEA, in collaboration with MoEF/CPCB, as part of the MoP regular information database. The data would be used for power generation system planning needs, discussed above, and benchmarking and tracking progress on key indicators relevant to sector performance. Some of the key environmental performance indicators could be also made available online and included in MoP annual reports, which currently omit environmental information.

Building Highways in an Environmentally Sustainable Way

4.50 Over the past (approximately ten) years, environment management in the highways sector has been increasingly addressed as an important component of sector development. Highways design and construction practices have provided opportunities for mobility and safety improvements, as well as social and environmental enhancements to address community concerns. The high priority attached to the sector by the GoI, substantial support to State-wide and national-level efforts by multi-national aid agencies, such as the World Bank and the Asian Development Bank (ADB) with their attention to environment and social considerations, and parallel strengthening of the MoEF's Environmental Assessment (EA) clearance have all further increased awareness and incentive within implementing agencies to address these issues. The value of integrating the EA process has begun to demonstrate a growing number of good practices, such as an example from Gujarat (Box 4.7).

4.51 The current Road Transport Policy gives serious attention to environmental issues and attempts to correlate highways development with wider impacts than just "pollution". It acknowledges the impacts of multiple contributors beyond narrowly defined roads or highways construction, including energy and land demand, congestion and hazards. As described in Box 4.8, the Policy mentions the induction of new technology and upgradation of existing ones to reduce fuel consumption and pollution highlighting a cross-sectoral process.

4.52 *Operationalizing* the policy provisions remains a significant challenge as the procedures have not been clearly spelt out for either the project proponent or the regulator. Some important factors such as land-use and occupational changes, impoverishment, rehabilitation, water-logging and long-term environmental impacts that might require cross-sectoral and cross-boundary considerations have not been included. The onus to ensure that these are addressed is on the MoEF through the EA clearance process vis-à-vis the MoRTH's own planning and execution processes.

4.53 The mandates of various policies, including environmental acts, address the above stated issues in limited ways. Most of the applicable environment regulations, for example, the rules regarding noise, air, coastal zones, environmental impact, use of fly ash, and plantations, address direct impacts on a sectoral basis. As a result, ambiguities have emerged with respect to the identification and management of *indirect* impacts, such as the degradation of surface water quality by the erosion of land cleared as a result of a new road, and particularly *induced* impacts of development, such as increased deforestation of an area stemming from easier/more profitable transportation of timber and produce to markets. These

impacts are more difficult to measure and over time can lead to irreversible changes affecting larger geographical areas than anticipated.

**Box 4.7: Internalizing Environment and Social Processes in Road Projects
The Gujarat State Highway Project (GSHP) Implementation Experience**

As the benefits of implementing the Environmental Management Plan became more visible on ground, the interest and attention from decision makers, engineers, local leaders and communities towards environment and social management aspects increased. With progress in project implementation, it became increasingly clear that such measures substantially reduce resistance, help in generating support from local authorities and the public during construction, reduce project delays and enhance the over-all benefits of the project.

It was felt that with systematic efforts and minimal resources (most of which are a part of the contractual obligations), such measures generate tremendous goodwill, appreciation and support from the communities in general and local leadership in particular. This can be achieved through better integration of the environment and social management practices into planning, design and construction of civil activities.

This realization eventually garnered itself into the ‘Vision and Achievements Document’ of Roads and Buildings Department, Government of Gujarat (GoG) published in 2003. Two separate statements, one on ‘environment’ (Mother Earth) and the other on ‘social’ (People Matter) aspects were made a part of the document titled ‘Road to the Future’ — a reflection of awareness and commitment of the GoG in recognizing the importance of such practices in the developmental works.

To advance this initiative further, the GoG initiated a training program, under which more than 500 engineers have already been trained. Awareness generation and basic training including field exposure has been introduced as a part of all the training programs conducted by the Staff Training College, Gandhinagar. Environment and social management modules were introduced four years back and will continue to be a part of the training agenda in all future programs as well.

The experience gained from implementing the Gujarat State Highways Project (GSHP) and Gujarat Emergency Earthquake Reconstruction Project (GEERP) is also being used to develop an Environment and Social Management Framework (Guidelines) for planning, construction and maintenance of roads in the state. The Roads and Buildings Department has also established a Policy and Planning Unit (PPU) staffed with multi-disciplinary expertise and has confirmed that the Environment Management Unit, created under the GSHP will be a permanent feature in its organizational set-up. The two units will take forward environment and social management initiatives in other projects as well. An Environment Information System (EIS) has also been created under the Gujarat Road Management System (GRMS), which will be used in planning and designing all future road projects in the state. Initial operation of this system has begun with data collection for all state highways in five pilot districts.

These efforts are being made to ensure that at least some of the ‘good practices’ learnt or developed during implementation of external funded projects are internalized in the longer run and do not become limited achievements in specific projects.

(Source: Bank staff and Project Implementation Unit, GSHP)

Box 4.8: Environmental Intervention in the National Road Transport Policy

The National Road Transport Policy addresses environment considerations in the following manner: “In the Road Transport Sector, energy planning has a special significance, because transport is the second largest consumer of energy. The growth of transport not only leads to pressure on limited availability of non-renewable energy but also gives rise to broader environmental issues. As the demand for transport services rises, it leads to increased use of scarce land and contributes greatly to atmospheric pollution. Sound pollution and road congestion are other environmental hazards due to transport. It is therefore, necessary that environmental concerns should be built into road infrastructure project planning at the beginning itself, i.e. at the stage of site selection or alignment finalization. The government is aware of these concerns and has mandated that all road infrastructure projects require environmental clearance before they are taken up.”

(Source: MoRTH website, <http://morth.nic.in>)

4.54 Recognizing some of these ambiguities, the MoEF has issued Gazette notifications and Circulars regarding the highways sector, which have resulted in guidelines and some codes of practices by MoRTH. Assessment of real-life experiences shows, however, that their effectiveness is often compromised by subjective application, open-ended interpretation, lack of quality control, and outdated/irregular revisions, as well as lack of incentives for contractors to translate the EIA and Environmental Management Plan (EMP) provisions into engineering designs and construction plans. Several recommendations have emerged from the study to address these challenges and shortcomings.

Strengthen Mechanisms, at Both Policy and Implementation Levels, for Better Accounting of the Indirect, Induced Cross-sectoral and Cross-boundary Impacts

4.55 These aspects are particularly significant for linear highways projects that extend over large ecological and administrative boundaries. Many of these impacts have not been documented or studied in detail in India and information about international practices available with regulatory and monitoring agencies remains sketchy. Therefore, it is useful to review practical mechanisms adopted by other countries and emerging from best practices in India, for dealing with these issues and develop approaches suitable to India. Some of the good international practices in this area are summarized in Box 4.9.

Box 4.9: Institutional Mechanisms to Promote Comprehensive Integration of Environmental Impacts in Highways Development — International Good Practice

United States. The Federal Highway Administration (FHWA) is a major agency of the United States Department of Transportation (DoT). FHWA has the broad responsibility to ensure that transportation system plans, technologies, and innovations improve safety of the public and the human and natural environments, and that the decision processes include the full and open participation of the public. The [National Environmental Policy Act](#) (NEPA) of 1969 directs Federal agencies, when planning projects or issuing permits, to conduct environmental reviews to consider the potential impacts on the environment by their proposed actions. Environmental reviews involve an interdisciplinary and interagency process, including inputs from the public, as well as from other agencies, to guarantee that all environmental protection (as well as other) issues are addressed. FHWA and its partners have made substantial contributions to the environment and communities, through planning and programs that support wetland banking, habitat restoration, historic preservation, air quality improvements, bicycle and pedestrian facilities, context-sensitive solutions, wildlife crossings, public and tribal government involvement, and more.

These principles have been operationalized within FHWA through the Vital Few Goals (VFG) that tightly interlink environmental stewardship and streamlining to improve project delivery without compromising environmental protection while addressing the mobility and safety needs of the public. VFG sets expectations, measures, and methods for advancing an improved and efficient environmental review process. At the systems level this is accomplished through earlier and better coordination of environmental concerns during the transportation planning process. At the project level, such integration can be enhanced through the application of context sensitive solutions. This challenges all state transportation agencies and Federal Lands Highway (FLH) divisions to reach beyond their normal processes at the systems planning or project level, and to search for solutions that demonstrate an improved compatibility between the natural and ‘built’ environments.

Australia. The Department of Main Roads, Australia, through its Environment Policy, commits to managing the road network to optimize environmental outcomes for natural, human and built environments. The department uses knowledge of the actual and potential impacts of road infrastructure on these environments during planning, design, construction, and maintenance phases. Continuous improvement in environmental performance is sought by developing and implementing management systems and integrating environmental processes within general management practices; monitoring, reviewing and reporting on environmental performance; providing appropriate environmental resources; delivering environmental awareness training; developing and implementing environmental practices which minimize predicted impacts; consulting with the public and other stakeholders to provide for well-informed decision making. To achieve this, Main Roads employs a multi-disciplinary team of environmental scientists, environmental engineers, environmental planners, landscape architects, cultural heritage and re-vegetation officers state wide. These officers are located in district, regional, corporate and commercial positions. In addition, recognizing the value of continuous engagement with stakeholders, and correlating the same with sustainable project designs, the department has developed a specific manual on “Community Engagement” policy, standards, and principles with detailed guidelines for all levels of staff to implement and achieve these standards. These publications assist with the day-to-day running of the department and provide external stakeholders with information about the department including how to manage environmental requirements. The department also has an exhaustive Road Planning and Design manual which includes environment and social elements.

Provide Technical Guidance on Environment Management through Sectoral Guidelines

4.56 A need for good sectoral guidelines on various aspects of environmental management has emerged very strongly to overcome the “environment knowledge gap” that exists within the sector. Existing guidelines (such as the Indian Roads Congress (IRC): Guideline on

conducting EA) are limited in coverage and outdated. There is a need for a more comprehensive set of guidelines developed on the basis of sound technical research and implementation experience. The effort could be led by MoRTH, in coordination or through IRC or Center Road Research Institute (CRRI), and with guidance from MoEF. A parallel can be drawn with The American Association of State Highway and Transportation Officials (AASHTO) in the United States in the context of promoting technical excellence at the national level through highways associations.

4.57 A list of issues, identified by sector review and consultations, where guidelines will be helpful, includes:

- Public consultation and community engagement;
- Health and safety of highway construction workers;
- Integrating environment management in the project cycle, to better integrate EMP in project designs as well as methodology for assessing cumulative and induced impacts;
- Spot-checking storage, transportation, and use of explosives; disposal of bituminous waste based on studies of decay and transport characteristics; use of fly ash and other waste materials in road construction with appropriate safeguards;
- Restoration of borrow areas; environment management measures for bridge and tunnel works; and
- Protection of water courses and water bodies, wildlife areas and eco-sensitive regions; relocation and enhancement of cultural and common properties, in coordination with the Archaeological Survey of India (ASI).

Strengthen Contract Provisions to Improve Environmental Performance of Contractors

4.58 A major part of the EMPs in highways projects address construction related impacts and are often of great importance. The primary responsibility to implement these parts of EMPs lies with the contractors. EMPs are normally attached with the contract documents. However, most contractors view EMPs as an add-on, and their focus is in implementing the main body of works specified in the contracts, which constitute general and specific conditions of a contract, conditions of particular application, Ministry of Road Transport & Highways (MoRTH) technical specifications, relevant and referred IRC codes and guidelines, and the bill of quantities. Most of these conditions, specifications, codes and guidelines do not have adequate provisions for environmental management, do not necessitate proper implementation of EMPs, and sometimes may conflict with the provisions of EMPs.

4.59 Thus, there is a substantial scope for including environmental provisions in these specifications, codes and other contract mechanisms that would improve and streamline the implementation of EMPs and the overall construction process. For example, mainstreaming environmental management measures in the main construction documents and contract management procedures will mean that the need for preparing EMPs for typical construction-related impacts will be obliterated. Such impacts would then be addressed through the regular management of contracts, while EMPs could then focus on additional impacts, if any.

4.60 The following specific actions are recommended:

- Establish a system of periodic revision of old IRC codes, to bring them up to date with technology development in the sector;
- Strengthen and integrate environment management measures in the IRC codes and the MoRTH technical specifications using experience with implementing EMPs (Box 4.10);
- Develop new IRC codes/guidelines in consultation with expert technical institutions to guide preparation of projects to integrate environmental concerns, so that the conflicts between implementation of engineering designs and EMPs could be avoided;
- Introduce an environment checklist to help ensure that all required environment related items are included in the Bills of Quantities; and
- Develop a specific manual explaining how EMPs would be translated in contract clauses, and integrated in the contract documents. For example, a contract condition could include recovery of payments for non performance of EMP activities.

Box 4.10: Integrating Environment Management Measures in Construction Codes and Technical Specifications

National Rural Roads Development Agency. As part of the World Bank-supported Rural Roads Project, implementing agencies in four states have begun to utilize environment management tools such as Environment and Social Management Framework and Environment Codes of Practices (ECOPs) since end-2004. For understanding and improved utilization of these instruments in the field, during project preparation and implementation, targeted training is being provided to implementing agency staff in all the states. Another separate but encouraging development is that the latest revision (February 2005) of the Operations Manual for the entire National Rural Roads Programme (Pradhan Mantri Gram Sadak Yojana) includes the salient features of many of the ECOPs, most importantly the transect walk.

Karnataka Public Works Department. The Departmental Code of the of the PWD has been recently augmented to address environmental issues arising out of construction of roads, bridges and buildings by responding appropriately during design, construction and operation and maintenance phases. It aims at (i) providing details of environmental management aspects of PWD projects; (ii) minimizing adverse environmental impacts of projects by environmental screening and management framework; (iii) encouraging good construction practices; (iv) ensuring compliance with the statutory requirements; and (v) carrying out environmental monitoring.

Access to Training, Knowledge and Capacity Enhancement

4.61 The study identified several priority areas for strengthening the role of highways sector agencies in building the knowledge base and technical capacity to minimizing the environmental impacts in the sector projects. To carry these out, an increased allocation of manpower and resources within highways agencies to environmental issues would be necessary. Specific recommendations include the following:

- Facilitate the development of the national quality standards for services and products to be delivered in the highways sector;

- Strengthen the documentation and dissemination of relevant good practices and research findings;
- Initiate certification and accreditation programs on environment and associated construction management;
- Strengthen capacity of existing academic institutions that specialize in Environmental Management Training for the highways sector, such as National Institute for Training of Highway Engineers (NITHE) and Central Road Research Institute (CRRI), to provide high quality and well rounded environment training of international standard at low cost;
- Impart training on environmental management curriculum drafted by NITHE and/or CRRI with inputs from the MoEF on regulatory aspects through local and regional institutions such as the Staff Training Colleges;
- Perform periodic audits of environmental management in projects under implementation focusing on replicating good practices with the help of academic institutions and/or planning/quality control divisions of implementing agencies with participation from regulatory agencies, wherever appropriate; and
- Strengthen and influence highways and civil engineering curriculum on environment management in national technical institutions.

Addressing Cross-sectoral Challenges

4.62 All reviews and case studies highlighted that the lack of effective mechanisms for inter-agency coordination is too often at the root of environmental management problems, including difficulties with compliance and enforcement. While formulating a new environmental regulation, the draft regulation is sent to other concerned ministries as well as to Planning Commission for comments and inputs. However, more cross-sectoral coordination is needed in implementation and enforcement of regulations. Majority of sector experts suggest that improved coordination between sector agencies and environmental authorities early in the planning process could immensely enhance the environmental sustainability of sector investments as well as make better investments in environmental infrastructure.

4.63 The two case studies in the industry sector particularly highlight the importance of cross-sectoral coordination during the decision-making process for the siting of industries, which are typically the responsibility of State Industrial Development Corporations. When environmental institutions are consulted much later in the process after the planning is complete (which has happened in most cases so far), only marginal improvement can be made, if any, and most cost-effective opportunities to ensure long term sustainability of environmental resources in the area get missed. There are also numerous examples from the highways sector of the critical need for, and significant benefits from, improved collaboration between sectoral and environmental agencies.

4.64 One example that emerged from the two sectors (i.e. power and highways) when cross-sectoral collaboration could enable *compliance* with environmental regulations relates to fly ash management. To facilitate the implementation of the Fly Ash Notification by the MoEF (1999), both the power sector and highways authorities could provide some regulatory incentives to dispose of and collect fly ash respectively, as well as necessary technical

support. A good practice example is provided by the Allahabad Bypass Project — a four to six lane expressway, approximately 90 km long. The EMP of this project includes appropriate mitigation measures for handling ash, developed with the help of the Fly Ash Cell in NTPC, while contract provisions ensure the use of ash in its construction. Providing the right set of incentives, facilitation and oversight, developed jointly by both sectors, to ensure large-scale replication of such approaches would be necessary.

4.65 It is therefore important for both sectoral and environmental authorities to evaluate, share and promote national best practice examples of policies and institutional mechanisms in the planning and design of infrastructure and industrial projects that enable early and meaningful participation of environmental agencies in the project planning cycle. Some of the good examples are the Environment and Social Management Framework for the Highways Sector in Gujarat and industrial zoning efforts in Andhra Pradesh. It is also important to increase the level of consultation and coordination with sectoral agencies in drafting the environmental rules and regulations concerning their sector activities, including specific agreements on their roles and responsibilities in facilitating implementation and enforcement.

The Role of Local Governments

4.66 New priorities and programs, such as urban air quality action plans or other area-wise pollution management programs, will require even greater cross-sectoral cooperation and integration. There is an obvious need for formal institutional mechanisms for such integration; however these cannot be easily created. Consultations during the study conveyed a very strong message from experience that creating new institutions (including various inter-sectoral committees) is generally not effective and must be avoided. It is thus important to align the development and implementation of new area-wise or/and multi-sectoral environmental programs with on-going institutional processes. The decentralization process set in motion by the 73rd and 74th Constitutional amendments appears the best fit and the best hope for delivering on location (city)-specific area-based environmental management programs.

4.67 On a larger scale of replication, cross-sectoral integration and coordination for better environmental management, such as of the scope and depth envisioned by the area-based pollution management approaches (discussed in Chapter 3), would not be possible without a greater empowerment and involvement of local government bodies, as the 73rd and 74th Constitutional amendments dictate. Several examples from the highways sectors highlighted that the cooperation of local bodies was necessary for the control of land use, safe disposal of waste materials; prevention of accidents that cause spillage of chemicals on the road side; community-led road safety; land allotment for social amenities, recreation and location of ideal sites for bus stands and markets; information boards for locally important features; and equitable utilization of benefits from the road. Devolving more powers to and building capacity of local governments for developing and implementing environmental management programs aimed at measurable improvement of environmental quality in the areas of their jurisdiction, with the participation of all concerned sectors as well as citizens, would pave a vital road into an environmentally sustainable future.