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India
Bihar Social and Environmental Analysis
Concept Note[1]

1. Background and Relevance

India's strong economic record since the 1980's has been associated with a significant reduction of poverty levels and important socio-economic gains, including increases in literacy and life expectancy. As conditions have improved at the national level, policymakers have increasingly shifted their attention to regions that have not benefited from India's economic dynamism.

The State of Bihar has been identified as a region that calls for priority attention. Bihar is the poorest state in India and faces some of the most adverse economic and social conditions in the country. While facing formidable development challenges, Bihar also has substantial potential for economic growth, as the state has a rich endowment of resources that include arable land, plentiful water resources, a young population, and amenities with vast potential to develop a robust tourism industry.

The state election of November 2005 brought into power a new reformist government that has showed a strong commitment to increase public spending (with fiscal adjustment), strengthen governance, and improve social services delivery as means to accelerate economic growth and overcome the political and structural obstacles that have historically hampered the state's development. Policy reforms undertaken by the GoB since it came into power include key legislation to manage its fiscal deficit responsibly, modernize financial and procurement procedures, strengthen police services, promote rapid clearance procedures for establishing enterprises and issuing required licenses, and introduce a standardized and decentralized system to recruit teachers based on their academic credentials, among others.

In this context, coordinated support from the donor community offers an opportunity to assist the Government of Bihar (GoB) in implementing its bold reform agenda, while also responding the needs of one of the most densely populated and poorest regions in the world. Assistance from the World Bank to Bihar is likely to include three kinds of lending instruments: Development Policy Loans (DPL) to support policy reforms, investment loans to assist in the building and upgrading of physical and social infrastructure, and technical assistance operations to build GoB's implementation capacity.

A programmatic DPL—a series of 3 or 4 operations over a period of time—is currently being prepared to support cross-cutting reforms as well as reforms in selected sectors where overarching policy issues are pending in order to pave the way for future investment operations by the GoB and donor agencies. Cross-cutting reforms that are

[1] Ernesto Sanchez-Triana.(esancheztriana@worldbank.org)

likely to be supported by the DPL include those in the areas of fiscal policy, public financial management, governance, Investment Climate and Monitoring and Evaluation (M&E). Sectoral policies that may be supported by the DPL include roads, health, power, education, water supply, and social protection and social welfare services.

The Bank's Operational Policy (OP) 8.60 on Development Policy Lending requires the Bank to determine whether specific country policies supported by the operation are likely to cause significant effects on the country's environment, forests, and other natural resources. For country policies with likely significant effects, the Bank is required to assess the borrower's systems for reducing such adverse effects and enhancing positive effects, drawing on relevant country-level or sectoral environmental analysis. If there are significant gaps in the analysis or shortcomings in the borrower's systems, the Bank must describe in the Program Document how such gaps or shortcomings would be addresses before or during program implementation, as appropriate.[1]

The requirements established by OP 8.60 offer an opportunity to initiate a dialogue with Bihar's Department of Environment and Forests (DoEF) and Pollution Control Board (PCB) with the aim of supporting GoB to identify environmental priorities and strengthen its capacity to enhance the positive impacts and mitigate the potential negative effects of policy reforms to be supported by the DPL.

The Government of Bihar, DoEF and PCB have recently completed the State of Environment Report, Bihar. The conclusions and recommendations of this report underscore the need to identify potential short and medium term cost-effective interventions to improve environmental quality in Bihar. A Bihar State Environmental Analysis (BSEA) might be prepared to identify such interventions

The proposed BSEA will provide an analytic basis to proactively address the environmental requirements of the Bank's OP 8.60. To develop this analytic foundation, the BSEA will identify priority environmentally-related development activities --i.e., activities with a high potential for reducing poverty and improving the lives of the most vulnerable groups -- and focus on issues linked to mainstreaming environmental considerations into the DPL being prepared in the State. The BSEA will also assess the capacity of Bihar's environmental management institutions to implement existing environmental regulations and policies as well as to conduct future activities associated with integrating environmental considerations into design and implementation of polices, programs and projects supported by the Bank's DPL.

The rest of the Concept Note provides the context in which the BSEA will be prepared, focusing on economic and governance issues. The Note then highlights controversies surrounding water projects in Bihar, because, among all natural resources, water plays a particularly significant role in the state. The Concept Note continues by providing details about the objectives and content of the proposed BSEA. Emphasis is given to the proposed BSEA's need to identify and prioritize Bihar's environmental problems, to analyze the State's environmental management institutions, and to recommend actions to strengthen the State's capacity to effectively implement existing environmental

management programs and carry out mainstreaming activities, including compliance with OP 8.60. Complementary information on issues raised in this Note can be found in the annexes, as indicated throughout the text.

2. Context

a. Bihar's General Context

With an estimated 2006 population of about 90 million, Bihar is India's third-largest state.[2] While it has roughly 8% of India's total population, Bihar has less than 3% of its total land area. The resulting population density, 800 persons per square kilometer, is one of the highest in India. Moreover, Bihar is the least urbanized of the major states in India, with nearly 90% of the population living in rural areas.

Urbanization statistics for Bihar are striking because they do not show high rates of growth in urban population, and this is different from general patterns in many other Indian states. In Bihar, there has been relatively little rural–urban migration, and this has been attributed to a number of factors, including the absence of suitable jobs in cities for landless laborers and educated youth.[3] According to a recent government report, landless laborers from rural areas seek employment mostly in the construction sector, but "there is little by way of urban construction or renewal in Bihar."[4] And "educated youth particularly those with vocational training and technical education gravitate toward industrial centers." However, industrialization levels in Bihar are low.[5] Indeed, because of shortcomings of the State's educational facilities, "Bihari students migrate in large numbers to other states for education."[6]

Based on 2003 data, per capita income in Bihar was only Rs. 5,780, a little over 25% of the national average of Rs. 21,142. In that year, Bihar ranked the lowest among the 18 larger states in terms of per capita net state domestic product.[7] A recent Bank report provided a comparative summary of various development statistics showing conditions in Bihar relative to India as a whole in 1999.[8] For some indicators - households with electricity and toilets, and immunization of children less than 12 months - Bihar lagged more than 50% behind India as a whole. Even for indicators in which Bihar's performance was relatively strong (e.g., child malnutrition, and child mortality), the State still was behind India as a whole. The Bank report also noted that "for critical indicators, such as net primary enrollment, immunization, use of contraceptives, and access to sanitation facilities, progress has been slow or nonexistent."[9]

b. Bihar's Economy: Agriculture and Industry

Bihar's economy is centered on agriculture and agro-based industries.[10] In 2001, more than 77% of the employed workers were classified as "cultivators" or agricultural laborers, compared to about 58% for India as a whole. [11] Estimates of gross state domestic product (GSDP) for 2004-05 indicate that agriculture and animal husbandry accounted for 38.2% of the total.[12] Other primary industrial activities included forestry, fishing, and mining and quarrying, but collectively they amounted to less than 5% of

GSDP. Manufacturing, construction, and other secondary activities amounted to about 9%. Within the tertiary sector, the dominant activity was trade, hotel and restaurants.

Although about 90% of the people in Bihar live in rural areas, and agriculture is the primary driver of the rural economy, several factors combine to make agricultural productivity in Bihar among the lowest in the country.[13] Levels of mechanization are low, in part because 83% of the individual holdings are of less than one ha. Moreover, use of electricity (0.8 KW per ha) is only half of the recommended level (2 KW per ha).[14] In addition, many farmers are unable to obtain information on best agricultural practices for the crops they grow. Notwithstanding the knowledge transfer efforts that have been made by agricultural extension services, estimates for 2003 suggest that "a mere 0.5 percent of farmers access information on modern technology from extension workers." [15]

The result of poor transfer of information on best practices to farmers is inefficiency in operations and wasted resources as well as damage to the land itself. For example, the lack of knowledge about soil quality on fields has been blamed for the very poor nitrogen: phosphorus: potassium (NPK) ratios on lands in Bihar.[16]

Rice and wheat constitute about 77% of the total crop area in the State, and productivity in those crops has been falling because of limited availability of high quality seeds and poor seed replacement rates. [17] However, the drop in output of wheat and other cereals has been partly due to a Government of Bihar policy to shift from cereals to fruits and vegetables, particularly mango, litchi, banana and makhana.

In comparison with all states in India, Bihar ranks third in the production of vegetables and accounts for 9.8% of national vegetable production. Bihar ranks sixth among Indian states in terms of fruit production. Based on area in production, the principal fruits are mango, litchi, banana, and guava.[18]

Animal husbandry constituted about 25% of the total value of agricultural output in 2002-03 and is particularly significant among the landless and households holding less than one ha. Milk and meat accounted for about three quarters of the value of output from animal husbandry.[19] Bihar is currently trying to increase the productivity of the fisheries sector.[20]

In terms of industrial development, the State lags far behind India as a whole. For example, while (registered and unregistered) manufacturing units represented only 3.2% of gross state domestic product in 2002-03, it accounted for approximately 20% of GDP in India as a whole.[21] As of 2007, Bihar's industrial base, as measured by either net value added or value of output, was dominated by two industry groups: food, beverages and tobacco; and petroleum products.[22]

The State's level of industrialization is far below its potential, particularly for agro-related industries. Bihar's total value of output of agro-based industries in 2002-03 corresponded to only 0.6% of the total for all of India.[23] The State's Finance Department estimates that "Bihar has the potential to produce about 5-6% of the total agro-based

industrial products in India, and this will enable the industrial sector of the State to become one and [one] half times of its present size…."[24]

Sugar occupies a place of special prominence in plans for expanding Bihar's agro-based industry. Currently, the State's 9.5% sugar recovery rate is about 9% below the national average,[25] and many sugar mills managed by the state-run Bihar Sugar Corporation were closed due to obsolete equipment and an inadequately skilled workforce. [26] Problems in maintaining law and order exacerbated problems in Bihar's sugar production.

In November 2006, Bihar's Chief Minister called investment in sugar and ethanol production "the need of the hour". The Government of Bihar views the sugar industry as an unused opportunity to develop the State, and has thus taken measures to promote new high yielding varieties of cane, developed tissue culture labs, increased tube well irrigation, and tried to revitalize old, closed mills;[27] the privatization of some of old state sugar mills is also being considered.[28] The State has set a target to increase sugarcane production by a factor of ten in two to three years. Fourteen new cane sugar mills have been approved in the State totaling an investment of about Rs. 3,600 Crores (877 million USD), and eight sugar mills are being expanded via investments totaling Rs. 763 Crores.[29] Since the sugar industry in Bihar is poised to expand, cane sugar wastewater will be an increasingly significant concern.

Sugar processing is not the only activity targeted by the current government for new growth. [30] Other sectors singled out for industrial development in the Finance Department's *Economic Survey 2006-07* include: petroleum and natural gas, mines and minerals, textiles, tourism and makhana. In addition, the Bihar Industrial Area Development Authority has a policy encouraging expansion of units that export agricultural products, medicinal plants, and outputs from food processing industries.[31] The Authority is currently creating five industrial growth centers.

c. Bihar's Politics: Caste, Governance and Violence

Caste-Based Politics

Caste-based politics in Bihar has been linked to low rates of economic development because caste-related issues, not demonstrated economic development, has been a key factor in electoral politics in recent decades.[32] The fact that caste has played such a central role in Bihar's elections means that caste-based politics and governance have been inseparable.

Links between caste-based politics, governance, and economic development have been particularly pronounced in two areas: (1) the relative lack of government progress in providing adequate infrastructure, and (2) high levels of general lawlessness and caste-based violence. Both factors have been linked to allegations that Bihar's governments during the 1990s and up to the 2005 elections were more concerned with raising the "dignity" of the lower castes then with raising their levels of economic development.

Although the reputation of Bihar as a backward and lawless state has persisted for many years, an examination of the period since 1990 is especially instructive since that period has been dominated by Lalu Prasad Yadav (commonly referred to simply as "Lalu" or "Laloo"), a political figure who was unable to offset the reputation of Bihar as a dangerous and backward state. Lalu's success in Bihar's politics has been attributed to his party's use of the "MY" (or Muslim-*Yadav*) electoral strategy: i.e., a reliance on political alliance between Bihar's lower caste Muslims and *Yadavs* to deliver votes.[33] The ability to consistently bring in the votes of Muslims and *Yadavs* meant Lalu could be confident of approximately 30% of the votes, which was sufficient to keep his party in power from 1990 through 2005.[34] However, things changed with the 2005 election, when Nitish Kumar led the National Democratic Alliance to victory in the Bihar Assembly elections.[35]

How did Bihar's political history under Lalu influence the State's economic development? Analysts have argued that Lalu held on to power by restoring dignity to his lower caste supporters and ending "years of political dominance by upper-caste leaders and parties."[36] But some claimed that

> [T]his has happened at the expense of development - Bihar is backward in roads, schools and hospitals and there has been a breakdown in law and order.
>
> Voting along caste lines has given rise to a violent political culture where most political parties field candidates with criminal records, and mercenary private caste gangs intimidate and kill rivals.
>
> More than 1,000 political workers and leaders have been killed in the state since 1990, according to police records.[37]

One of the impediments to economic development that carries over from the period in which Lalu's party was in power is lack of progress in developing basic infrastructure. In addition, the State failed to shake off a reputation as being "in the throes of economic chaos and unprecedented social tension."[38] Clearly, potential investors see high risks in investing in a state characterized widely in the press as lawless and anarchic. Indeed, a 2005 Bank report calls for strengthening the investment climate as a "pillar" in the strategy to improve Bihar's economic growth. And not surprisingly, the report cites "inferior infrastructure" and "poor law and order" as among the several factors contributing to the weak investment climate.[39] The Bihar Finance Department's *Economic Survey 2006-07* reinforces the point regarding the adverse influence of poor infrastructure on development. It observes that the "highest sickness [referring to large and medium industries officially classified as 'sick' from an economic perspective] in Bihar is due to inadequate infrastructure facilities."[40]

The perception of Bihar as a poorly governed state with alarming levels of crime has been recognized by the recently elected government. The Government of Bihar's Finance Department, in its recent "White Paper on State Finances and Development," argues that reasons for inadequate investment flows to support economic development include "poor governance in terms of [an] alarming law and order situation...."[41] In short, the report

acknowledges the linkage between problems of governance, Bihar's reputation as a lawless state, and the lack of investment funds for economic development.

What of the prospects for change under Bihar's recently elected Chief Minister, Nitish Kumar? He and his coalition face huge challenges in rebuilding Bihar. According to a BBC News report:

> He has to meet the aspirations of the caste groups who voted for him, rein in a possible backlash by the upwardly mobile backward castes and private upper caste armies which may be looking to settle scores, and keep winners with criminal records out of the state government.
>
> He also has to deal urgently with the rising and violent ultra-left movement of Maoist rebels fighting for more rights and a more equitable society.
>
> "But the biggest change is that development will finally get its place in Bihar. The middle class will again start taking interest in Bihar," says Shaibal Gupta [an analyst at the Bihar-based Asian Development Research Institute].[42]

The Kumar government has put much emphasis on removing the image of Bihar as a lawless state. Although the government has suffered setbacks, there have been signs of progress.[43]

Caste-Based Violence

The impacts of caste are not just felt in politics; they are also at the center of a debilitating wave of armed conflict within the State. Caste-based violence has characterized Bihar for more then three decades. According to Arvind Das, a well-known sociologist who was a native of Bihar, the source of this caste based violence is the social tension stemming from agrarian inequality.[44]

An active *Dalit* resistance took the form of landless laborers aligning with Maoist Naxalite groups.[45] In India, the term "naxalite" refers to left wing extremists who are members of three leftist extremist groups -- the Communist Party-Marxist Leninist, the People's War, and the Maoist Communist Centre.[46] Issues linked to minimum wages and land reforms are high on the agendas of these groups.[47]

For upper caste (e.g., *brahmin* and *bhumihar*) landlords operating in what was then central Bihar (before the State of Jharkhand was split off from southern Bihar in 2000) and is now south Bihar, the response during the 1970s was to create private armies. Later, in 1994, landowners in Bhojpur district formed *Ranvir Sena*, an amalgam of several existing private armies. Over a period of time, *Ranvir Sena* spread to several other districts in south Bihar, including Jahanabad, Patna, Bhabhua, and Gaya.[48]

According to Chahdhuri, writing in *Frontline*:

> Among the different castes that constitute the Dalit community in Bihar, it is the landless Musahars whose plight is the worst…. For centuries, Musahars have

> been at the receiving end of atrocities by upper caste landlords.

Chadhuri cites numerous examples of violence and carnage among the extreme left and the private armies as well as violence perpetrated by still another caste-based army, a group organized by the *Yadav* caste.

News accounts of this caste-based violence includes armed conflict that has led to many hundreds of deaths and numerous accounts of violent beatings, rapes and other forms of extreme violence.

3. Environmental Controversies Surrounding Water Projects in Bihar

Caste-based politics and caste-based violence have created impediments to economic development in Bihar, but those have not been the only controversial subjects with impacts on potential future development. An additional source of tension has been the controversies around the impacts of water resource development projects in Bihar.[49]

An analysis by Gyawali details the concerns of environmentalists and other activists over the adverse environmental effects of flood control and irrigation projects in North Bihar during the last half century. Gyawali cites documents written in Hindi by activists in Bihar that describe cases (linked to water projects) that include claims of "environmental mishaps and social ruin that are taking place in the North Bihar plains."[50]

Among the key concerns of activists are embankments constructed along riverbanks to protect adjacent lands from flooding during high flows in the monsoon. These embankments also keep water that accumulates outside the embankment area during the monsoon from draining back into the river after flooding subsides. Areas outside the embankments therefore remain inundated for long periods, during which residents remain stranded without access to food or safe drinking water.

These problems are compounded by the effect of irrigation canals, roads and railways built in directions that cross natural drainage paths in the North Bihar plains. Consequently, drainage to the tributaries is blocked and land that would have been flooded for a few weeks is inundated for months, the result being severe water logging: "agriculture and even daily living [becomes] impossible in an otherwise highly fertile area."[51] Gyawali's assessment is that water resources officials with the government are insensitive to the way the embankment projects have adversely affected farmers in the area.

In describing the effects of the embankments, Action Aid India, an NGO, had this to say:[52]

> Embankments built to save villages from swollen rivers have the opposite effect by silting of the river beds, preventing natural drainage of flood water, water logging and blocking of tributaries.

Other sets of issues addressed by activists include environmental and social problems alleged to be linked to the following:

- Construction of a proposed Barahakshetra high dam in Nepal.
- The Kosi Multipurpose Project
- The "protected area" established by the Kosi embankment.
- Proposed flood protection and irrigation works in the Bagmati basin.[53]

A group called the "Rivers for Life" has come out strongly against India's national program of "river interlinking," and they oppose proposed projects in Bihar. The group describes itself as "an independent research action group comprising of engineers, concerned citizens and other professionals which works on water issues in India with members based in the US and India."[54] In addition to making an argument against the Government of India's overall approach to inter-basin water transfers and to citing environmental damages that the group expects will result, Rivers for Life urges a return to more traditional water harvesting schemes as an alternative to the proposed inter-basin transfers.[55]

Notwithstanding this type of opposition to river interlinking, officials in Bihar have long seen the interbasin transfers as essential to ensuring Bihar's share of water from the Ganges, especially as development projects upstream of Bihar have cut back on water available in Bihar from the Ganges. Support for interlinking extends to the government of Chief Minister Nitish Kumar, who has come out solidly in favor of interbasin transfer projects. A May 2006 article in *The Hindu* reported that the Minister felt "[t]he water scarcity in drought prone south Bihar could be tackled by inter-linking of rivers."[56]

4. Objectives and Scope of the BSEA

a. Objectives

The proposed State Environmental Analysis for Bihar will have four *overarching objectives:*

1) **Prioritization** -- Examine and prioritize the State's environmental challenges, and clarify the influence of those challenges on the poor and most vulnerable.

2) **Environmental Management Institutions** -- Evaluate Bihar's environmental management institutions and make specific recommendations for improving the State's capacity, efficiency and effectiveness in designing and implementing environmental policies and programs.[57]

3) **Mainstreaming** -- Provide recommendations aimed at improving how environmental concerns are considered in project level planning and decision-making, and on the *integration of environmental concerns* into state-level programming, policy dialogues, and adjustment and programmatic lending

operations.

4) **Analytic Base** -- Strengthen the analytic foundation of future Bank activities—in terms of both development policy loans and investment loans within the State; in addition, enhance the analytic basis for implementing Bank priorities related to its safeguard policies and OP 8.6.

The BSEA will, among other things, identify and prioritize the most important current and projected environmental challenges in the State. Particular consideration will be given to important environmental issues that primarily affect the poor and most vulnerable. The prioritization effort will reflect concerns of a wide range of stakeholders, including NGOs.[58]

In addition, the BSEA will include an assessment of how the Government of Bihar has responded to its environmental challenges by developing an environmental management framework and how that framework relates to national environmental laws, policies and regulations. This analysis will examine the legal instruments and entities created to address specific areas, including air and water pollution, solid and hazardous waste, forests, and biodiversity. The analysis will also investigate the degree to which elements of the environmental management system are integrated and the ability of the Government of Bihar to account for and manage the environmental effects of sectoral policies and plans as well as environmental impacts of individual investment projects.

The BSEA will also include an analytic framework to support the efforts of the Government of Bihar in integrating the principles of sustainable development into its policies and programs, and reversing the loss of environmental and natural resources. The findings of the analysis will be directed toward the design and implementation of policies to:

- Bolster the Government of Bihar's environmental management capacity;
- Improve the effectiveness and efficiency of the State's environmental management system, particularly in terms of monitoring, compliance and other implementation issues;
- Integrate principles of sustainable development into key sectoral policies programs as well as investment projects;
- Foster public participation, environmental awareness and environmental education; and
- Enhance the lives of the most vulnerable groups.

b. Scope of the BSEA

The BSEA will, at a minimum, include the following elements:

- **Trends in environmental degradation.** The analysis will contain information on how environmental quality has changed over time and how environmental liabilities have accumulated.

- **Institutional capacity for environmental management.** In addition to identifying milestones in the evolution of environmental management in Bihar over the past several decades, the analysis of institutional capacity will include several broad areas: conservation and management of water and other natural resources, conservation of biodiversity, control of air and water pollution from point and nonpoint sources, management of solid and hazardous waste, environmental health, and control of land loss caused by water logging, soil salinization, and forest clearing. In addition, the analysis will examine the capacity of the State to deal with natural hazards, including earthquakes, floods and droughts, as well as its ability to mitigate anticipated effects of global climate change. The analysis will also consider environmental management activities within government departments that do not have environmental management as their principal mission

- **The cost of environmental degradation.** The analysis will identify environmental issues associated with the most significant environmental damages, expressed, wherever possible, in monetary terms.[59] Attempt will be made to place monetary values on environmental problems (e.g., inadequate water supply and sanitation) that cause drops in worker productivity and other economic losses as well as disease and death.

- **Costs to the most vulnerable groups.** In conducting analysis of monetary damages, income classes that suffer from these damages will be identified; some categories of damages are likely to be especially burdensome for the very poor.[60] The BSEA will also determine whether the priorities reflected in government funding of environmental management programs are consistent with environmental management priorities identified by the public, including the very poor.

- **Prioritization.** The previously mentioned prioritization effort will provide a basis for gauging the relative significance of environmental problems.

- **Environmental effects of policies within specific sectors.** Bihar is not well connected (in terms of roads, electricity and telecommunications) and its current economic base in agriculture is much influenced by connectivity considerations as well as water-resource related issues. Policies, plans and proposed projects in infrastructure and other sectors likely to receive external investment funding may have significant environmental impacts, and therefore the nature of the environmental effects of sectoral policies and plans as well as proposed infrastructure projects will be identified as part of the analysis. In addition, investments made to enhance *education* will be examined to the extent that such investments involve educating citizens regarding the environment. Links between enhanced literacy and potential improvements in sanitation deserve special attention. The low literacy rate in Bihar, particularly among women (who play the lead role in hygiene at the household level) has been linked to problems of

morbidity and mortality due to inadequate water and sanitation.[61]

- **Effectiveness and efficiency of existing policy, legislative and regulatory frameworks to address priority environmental concerns**. The analysis will clarify opportunities and challenges for the effective management of priority environmental concerns in Bihar.

c. Identifying and Prioritizing Bihar's Environmental Problems

In attempting to characterize the State's most pressing environmental problems, measures of significance can be based upon:

- Qualitative analysis of the impacts of environmental degradation on the poor and other vulnerable groups.

- Surveys of samples of the general population and particular stakeholders (including NGOs) to determine the most urgent needs as perceived by various constituencies (e.g., government experts and administrators, and representatives of the very poor).

- Quantification of the major private and public costs and risks that environmental degradation imposes on the society; e.g., environmental damages may be calculated as a percent of gross state domestic product.

In addition to examining current environmental issues, the prioritization exercise will also consider environmental problems likely to arise in the future, such as the effects of global climate change on agriculture, effects of increased private ownership of motor vehicles, and the adverse environmental effects that may accompany the increasing "consumerism" likely to be linked to the expansion of upper-middle income and high income classes in India.[62] As noted by Sawhney:[63]

> The new global consumer class in India consists of the urban population in the high income and upper middle income brackets. Globalization has now made these consumers aspire toward consumption patterns observed in the developed countries, and not merely to doing better than before, or better than their immediate neighbors. In other words, greater information flow (as well as advertisement) is moving the affluent Indian class to conform to the global consumption class.

Although Bihar is a poor state, it still has a wealthy class. The State reports that 9.8 % of the families in rural Bihar are "rich," and the corresponding figure for urban areas is 13.9%. Motor vehicle ownership as of 2001 was still very low. Only 0.9% of families in Bihar had four wheeled vehicles, whereas the percent of families with two wheel vehicles (other than bicycles) was 3.6%.[64] If Bihar followed vehicle ownership trends in India as a whole, these motor vehicle ownership figures (which are for 2001) would be higher now,

and they can be expected to increase in the future.

The following will be among the subject areas that receive significant attention in the prioritization effort:

- Problems linked to inadequacies in safe and easily accessible domestic water supply, basic sanitation services and hygiene at the individual and household level, particularly negative health impacts, time spent gathering water, and adverse effects of inadequate waste disposal on drinking water sources.[65]

- Water quality problems, including those associated with agriculture, such as bacterial pollution due to runoff over animal manure, as well as a variety of chemicals from pesticides, animal manure, and commercial fertilizers;[66] other water quality problems have been identified in connection with arsenic contamination of groundwater used for drinking water supplies, and these problems will be examined as well.[67] The analysis of water quality issues will also include traditional point sources of municipal and industrial wastewater.

- Water logging problems; these are particularly acute when surface water ponds during the rainy season. Factors that have been linked to water logging include high silt loads that clog river beds, poor surface water drainage conditions, excessive canal irrigation in *rabi* season, and pour subsurface drainage conditions.[68] Water logging has been linked to a "major diseases [,such] as malaria, polio, foot rot, liver fluke infestation and other diseases of animals and plants (as root rots)…."[69]

- River erosion; the State has identified over 300 river erosion sites.[70] In addition, land erosion is reported to affect over 500,000 hectares in the State.[71]

- Salinity buildups in Bihar's soils; these have been linked to "natural and anthropogenic processes" and "constitute a major environmental hazard and threat to agricultural production."[72]

- Flooding and landslides; these have been increasingly influenced by human activities that modify environmental conditions and affect both urban and rural populations. "Bihar has always been a worst [sic] victim of flood, particularly the areas north of Ganga."[73] Floods have caused damage to crops, public property, houses, and infrastructure, in addition to loss of lives and problems associated with people being stranded without food or safe water for long periods during floods.

- Other water-related issues, such as those linked to droughts in south Bihar,[74] and projected effects of global climate change on agriculture.[75]

- Seismicity problems; these have plagued Bihar and "caused immense loss of lives and property mainly due to damage of structures."[76]

- Environmental effects linked to the processing of agricultural crops, with particular attention to the State's continuing efforts to expand the number of sugar mills. In addition, given the Government of Bihar's focus on intensifying agricultural output and agro-based industries, increases can be expected from both nonpoint sources of pollution as well as industrial point sources, e.g., water pollution from sugar mills.

- Indoor air pollution, particularly where fuel wood is used for cooking and heating.

- Outdoor air pollution, particularly in urban areas where the growth in the number of motor vehicles is likely to rise as the expansion in upper-middle and upper income classes allow increasing numbers of people to purchase and use of motorized two- and three-wheeled vehicles and private autos.[77] The State has reported levels of suspended particulate matter in Patna at levels well above applicable ambient air quality standards; this has been tied to "automobile exhausts, road dust, exhaust of D. G. [diesel generator] sets, industrial units at patliputra[78] & the large channel/sandbars of the Ganga & Sone, burning of coal by roadside tea shops and hotels, and burning of dry leaves garbage etc."[79]

- Solid and hazardous wastes. Consideration will also be given to changes in the composition of solid a waste (e.g., the increased fraction linked to plastics); and the special challenges associated with the growing levels of discarded electronic products in India's waste streams from urban areas with residents affluent enough to afford electronic equipment.

- Noise pollution in Patna, Muzaffarpur and Gaya and other urban agglomerations; noise in the previously mentioned cities have been identified at levels above applicable standards. Violations of standards have occurred because of motor vehicle traffic, use of unauthorized vehicles in certain zones, etc.[80]

- Low levels of forest cover; the State asserts a "need" for "33% forest cover," yet, due to increased population pressures, "only 7% of forests remain in Bihar." Problems linked to low forest cover include "soil erosion, low size of pure sewing land and above all decreasing wildlife…."[81]

- Loss of biodiversity; "some of the notable game animals … like tiger, deer, buffalo, duck etc., are fast disappearing."[82]

The portion of the analysis concerned with prioritization will also consider steps that can be taken to mitigate potential future adverse effects.

d. Analyzing Bihar's Environmental Management Institutions

A sophisticated system of environmental laws and regulations exist at the national level

in India.[83] Indeed, a report of the Government of India's Planning Commission suggests that India's system of national environmental laws and regulations is somewhat comparable to similar systems in highly developed countries.[84] As the Planning Commission report notes, however, the main issues do not concern the need for new laws; rather, they concern the inadequacy of resources devoted to implementing existing laws, e.g., monitoring and enforcing compliance with existing environmental requirements.

Much information is available on environmental management in India at the national level from easily obtained books and reports and from the Internet. In contrast, little such information can be accessed easily on the status of environmental management in Bihar.[85] This type of information will have to be gathered in the field.

As mentioned, some aspects of pollution in India have been changing in recent years, as the wealth associated with India's high rate of economic growth has led to a new class of relatively wealthy consumers, a group that is embracing the level of material consumption commonly associated with OECD countries.[86] Manifestations of this increased emphasis on material consumption are already being seen in the context of recent rises in numbers of privately owned motor vehicles and increases in the fractions of plastics and electronic waste in refuse. If Bihar succeeds in meeting its aspirations to enhance its wealth by improving its agro-industrial economic base and attracting new investment, it will need to face new challenges associated with a growing "global consumer class."

Ongoing problems as well as increased intensity of future environmental problems will require augmented capacity on the part of Bihar's environmental management systems at both the state and district level. In order to provide a baseline understanding of the extent of augmented capacity required to deal with these environmental challenges and to implement existing laws and regulations effectively, the BSEA will include an analysis of the effectiveness and efficiency of the existing environmental management system and alternative interventions to cut the cost of environmental degradation. The analysis will also review the environmental sector's institutional framework and organizational capacities, focusing on the identification of gaps or weaknesses that may constrain the authority's capability to address environmental degradation. The analysis will further identify opportunities for institutional strengthening and capacity building. Such an analysis can be used to integrate principles of sustainable development into key sector policies, with an emphasis on protecting the most vulnerable groups.

Questions that can be used to structure an analysis of Bihar's environmental management institutions include:

- What is the effectiveness and efficiency of existing laws, regulations, and management frameworks to address priority environmental concerns, and what gaps exist in the government's capacity to anticipate and respond to environmental effects of new infrastructure investments and policy reforms? Does the existing system of environmental regulations provide an adequate basis for

managing the State's environmental problems?

- How can the State's environmental management capabilities (e.g., management capacity and technical capabilities of staffs) be characterized, and what is needed to fully coordinate environmentally-related activities among governmental units and improve the State's efficiency and effectiveness to address priority environmental concerns?

- Who are the key non-governmental stakeholders in environmental management and what steps are being taken (or can be taken) to improve the education and awareness of those stakeholders as regards Bihar's environmental challenges and potential interventions to deal with those challenges? Is public participation integrated into the process of environmental policy design and implementation? More generally, are accountability and transparency integral parts of Bihar's environmental management systems?

- What is the Government of Bihar's process for priority setting regarding environmental planning and policy making, and how well is the government equipped to identify and address environmental priorities of the most vulnerable groups?

- What steps can be taken to provide incentives (e.g., penalties, taxes or subsides) that would encourage private parties, such as factory owners, to comply with the State's environmental requirements or otherwise engage with the State in implementing its environmental policies, plans and programs?

- What efforts can be undertaken, in accordance with the roles and responsibilities granted to state authorities by the legal framework in place, to integrate the numerous existing acts and regulations that govern the environmental sector in order to facilitate compliance?

- Are any duties and functions of the traditional sector agencies (especially infrastructure agencies) in conflict with those of environmental management agencies? Do suitable incentives and mechanisms exist for interagency coordination within and outside of individual sectoral departments of the Government of Bihar?

- Are resources for environmental management allocated in a way that aligns with the State's environmental priorities?

An analysis based on the questions above can provide a basis for proposing environmental policy reforms and for suggesting interventions the Government of Bihar can undertake to assess the environmental effects of reforms in transport, energy, industrial development and other policies not traditionally concerned with environmental management.

e. Mainstreaming: Environmental Impact Assessment and Sectoral Environmental Management

Preliminary work undertaken regarding the Bank's likely approach to improving economic and environmental conditions in Bihar is summarized in a 2005 Bank report: *Bihar: Towards a Development Strategy*. According to this report, a "pillar" of a development strategy for Bihar is "improving economic growth through strengthening the investment climate." This pillar would involve strengthening sector level policies in four infrastructure areas: roads, power, water, and telecommunications. The report emphasizes two key infrastructure service areas requiring public sector delivery: "water management and roads.[87]

In terms of water resources, it can be anticipated that there will be a focus on capital investment and maintenance of single- and multi-purpose water resources development projects, and the delivery of water supply and sanitation services. Investments are also likely to be made in electric power, with a focus on decentralized models of power supply from rural areas. The aforementioned report also emphasizes agriculture and agro-based industry, two areas that are also emphasized in various reports produced by the Government of Bihar.[88]

Investments in water resources projects deserve special scrutiny because of the multitude of water–related problems in the State. Any efforts to mainstream environment into development would be informed by a clarification of the environmental effects of existing water projects (e.g., embankments in North Bihar) since these have been subject to major differences of opinion between NGOs and government officials.

The previously cited Bank report's second pillar, "strengthening social service delivery," is also relevant to the BSEA, especially because of linkages between literacy and hygiene at the personal and household levels. In addition to health services, the social service delivery issues highlighted in the Bank's report include literacy and education. As the report notes, "[e]ducation enrollment and literacy rates are far below the national average and reveal large differences in education outcomes across gender, social and economic groupings."[89] And as previously mentioned herein, literacy rates for women lag far behind those of men in Bihar, and women play the principal role in matters related to household level hygiene, particularly the hygienic practices of children. Given the significance of linkages between water supply, wastewater disposal, hygiene, and morbidity and mortality levels, notable opportunities exist to employ development activities tied to literacy and education to improve the quality of the human environment, especially among those who do not have access to safe water and wastewater disposal facilities.

Bank lending activities in Bihar are likely to include both policy revisions and project investments in the aforementioned sectors, and thus the BSEA will respond to a number of questions related to how environmental considerations are being integrated into sector level projects, plans and policies concerning education, roads, water, electric power supply and distribution, and telecommunications in Bihar.

- Are processes for environmental impact assessment (EIA) and environmental clearances standardized and applied consistently and uniformly (e.g., in terms of EIA content) within all sectoral ministries?

- Is strategic environmental assessment (SEA) used to integrate environmental factors into sectoral plans, programs and polices?

- Is tiering in SEAs being used to eliminate the need for EIA's for projects that pose no significant environmental impacts other than those adequately accounted for in SEAs.

- What are the opportunities for public participation in the EIA and SEA processes and is citizen participation in these processes meaningful?

- How well are commitments concerning environmental mitigation and monitoring (identified as a result of EIA and SEA) implemented and enforced?

5. Building on Previous Analytic Work on Bihar

The main prior analytic work on Bihar is *Bihar, Towards a Development Strategy*, issued in 2005. The report provides a profile of poverty in Bihar and characterizes the challenge faced in improving economic growth in the State. It cites causes for the large difference between current and optimal agricultural production as including the following: "low investment rates, lack of water management with annual flooding of the Gangetic plain districts, and weak transport and marketing infrastructure."[90] The report also emphasizes the declining level of investment in Bihar and the inefficiency in the way the State has used program resources allocated by the central government. Problems of low social service delivery and public administration and governance are highlighted. The overall strategy presented by the report has two pillars: "improving economic growth through strengthening the investment climate," and "strengthening social service delivery."[91]

6. Consultations with Client and Other Stakeholders

The proposed BSEA will be developed by the Bank in partnership with GoB, DoEF, and PCB. The proposed BSEA is expected to help the GoB to identify environmental priorities and institutional gaps weaknesses that will need to be addressed to safeguard the environment during the implementation of projects supported by other development partners, including the Asian Development Bank (ADB), Japan Bank for International Cooperation (JBIC), and the UK Department for International Development (DFID). Local consultants will be integral to the preparation of the BSEA. In this way, the BSEA will draw upon local expertise and help to build local capacity and ownership.

The BSEA would be launched in a workshop with the participation of representatives from GoB, GoI, and other stakeholders. A similar workshop would be held six months later to present the preliminary results from the BSEA.

7. Timeframe

BSEA Launching Workshop:
Concept Review Meeting:
Mission to discuss preliminary results:
Workshop with Stakeholders:
Decision Meeting:
Delivery to GoP
Dissemination

8. Resources

Task Team Leader

Ernesto Sanchez-Triana (TTL, SASDI),

Quality Assurance Measures

Peer Reviewers: Alnoor Ebrahim (Harvard University), Darrell Hueth (University of Maryland), Shi Lian Tu (Asian Development Bank), Leonard Ortolano (Stanford Universitty), Carter Brandon (EAP).

Attachments

Annex A – Introduction to Bihar

Annex B -- Bihar's Economy: Agriculture and Industry

Annex C -- Caste, Class and Politics

Annex D -- Water Resource-Related Issues

Annex E – Environmental Management in India

Annex F – NGOs in Bihar

Annex G – Global Climate Change and Agriculture

Annex A

Introduction to Bihar

Bihar sits within the Ganges River basin and lies just below Nepal in the Northeast of India. West Bengal lies to the east, Jharkhand is to the south, and Uttar Pradesh is to the west (see Figure A1). Bihar has a short border with Madhya Pradesh to the southwest. The Ganges runs from west to east through the plains, which are relatively flat.

Figure A1. Location Map of Bihar

With an estimated 2006 population of about 90 million, it is India's third-largest state.[2] While it has roughly 8% of India's total population, Bihar has less than 3% of its total land area. The resulting population density, 800 persons per square kilometer, is one of the highest in India. Moreover, Bihar is the least urbanized of the major states in India, with nearly 90% of the population living in rural areas. There are nine urban agglomerations, including Patna (the state capital); Gaya; Bhagalpura; Muzaffarpur; and Munger.[3]

The urbanization statistics for Bihar are striking because they do not show high rates of growth in urban population, and this is different from the general pattern in many other Indian states. In Bihar, there has been relatively little rural–urban migration, and this has been attributed to a number of factors, including the absence of suitable jobs in cities for

[2] Government of India, 2007, 2006-07 Economic Plan, p. i.

[3] Bihar State Pollution Control Board, Patna and Department of Environment and Forests, Government of Bihar, 2007. "State of Environment Report, Bihar," Bihar State Pollution Control Board, Patna. p.7.

landless laborers and educated youth.[4] According to a recent government report, landless laborers from rural areas seek employment mostly in the construction sector, but "there is little by way of urban construction or renewal in Bihar."[5] And "educated youth particularly those with vocational training and technical education gravitate toward industrial centers." However, industrialization levels in Bihar are low.[6]

The state is divided into nine divisions, each of which is divided into from two to six districts. There are a total of 38 districts. The population distribution across districts in 2001 ranged widely, with the three most populous districts being Patna (4.4 million); East Champaran (3.9 million); and Muzaffarpur (3.7 million).[7] The three least populous districts in 2001 were Lakhisarai (0.8 million); Sheikhpura (0.5 million) and Sheohar (0.4 million).

By far, Patna district is the largest in terms of economic activity. Using 1999-2000 data (in 1993- 94 constant rupees), the per capita gross district domestic product varied from a high of 6958 rupees for the Patna District (within Patna Division) to a low of 2800 rupees for the Gopalganj District (within Saran Division).[8]

In general, the relatively prosperous districts in Bihar are in the South, and this also holds if one looks only at the rural economy in various districts.[9] In terms of per capita income, the wealthiest three districts are Patna (6958 rupees); Rohtas (4615 rupees); and Munger (4321 rupees). In contrast, the bottom three districts are Araria (2879 rupees); Gopalganj (2800 rupees); and Sheohar (2219 rupees).

Based on 2003 data, per capita income in Bihar was only 5780 rupees, a little over 25% of the national average of 21,142. In that year, Bihar ranked the lowest among the 18 larger states in terms of per capita net state domestic product.[10]

A recent World Bank report provided a comparative summary of various development statistics showing conditions in BR relative to India as a whole in 1999 (except as noted).[11] For the following three indicators, Bihar lagged more than 50% behind India as a whole.

- Households with electricity as a source of lighting: 10.3% for Bihar compared to 55.8% for India as a whole.

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[4] *Ibid.* pp. 100-101.
[5] *Ibid.* p. 101.
[6] *Ibid.*
[7] Population data in this paragraph is from the Directorate of Statistics and Evaluation (Vital Section) as shown at http://gov.bih.nic.in/Depts/PlanningDevelopment/Statistics/table_5.pdf , except for the Sheohar district figure, which is from the Government of Bihar website, http://gov.bih.nic.in/Profile/Districts/Sheohar.htm , accessed June 5, 2007. The Sheohar figure was not available from the previously noted source.
[8] Government of Bihar, 2007, *2006-07 Economic Plan*, p. 8.
[9] Information in this paragraph is from Government of Bihar, 2007, *2006-07 Economic Plan*, p. 7.
[10] Government of India, 2007, *2006-07 Economic Plan*, p. 3.
[11] World Bank, 2005, *Bihar, Towards a Development Strategy*, Washington, DC, table 1.2, p.11.

- Children under 12 months receiving immunization: 11% for Bihar compared to 42% for India as a whole.
- Households with a toilet facility: 16.8% for Bihar compared to 36% for India as a whole.

For the following five indicators, percentages for Bihar were between 50% and 80 % of comparable figures for India as a whole:

- Contraceptive prevalence rate: 24.5% for Bihar compared to 48.2% for India as a whole.
- Incidence of tuberculosis per 100,000: 989 for Bihar compared to 544 for India as a whole.
- Female literacy: 33.6% for Bihar compared to 54.3% for India as a whole.
- Net primary enrollment ratio (in 1999-2000): 52% for Bihar compared to 77% for India as a whole.
- Poverty headcount in 1999 – 2000: 39.0% for Bihar compared to 28.6% for India as a whole.
- Ratio of female to male literacy: 0.56 for Bihar compared to 0.71 for India as a whole.
- Male literacy: 60.3% for Bihar compared to 76% for India as a whole.

For the remaining indicators, the differences in performance in Bihar and India were not nearly as great:

- Child malnutrition—underweight children below 5: 54.4% for Bihar compared to 47% for India as a whole.
- Child (under age five) mortality rate (per 1000 live births): 105.1 for Bihar compared to 94.9 for India as a whole.
- Maternal mortality rate (per 100,000 live births--1997): 451 for Bihar compared to 408 for India as a whole.
- Infant mortality rate (per 1000 live births): 72.9 for Bihar compared to 67.6 for India as a whole.
- Access to improved water resources: 75.4% for Bihar compared to 77.9% for India as a whole.

As indicated above, for some indicators - households with electricity and toilets, and immunization of children less than 12 months - Bihar's performance is particularly weak. Moreover, even for indicators in which Bihar's performance is relatively strong (e.g., child malnutrition, and child mortality), the state still lags behind the nation as a whole. The World Bank report indicates that "for critical indicators, such as net primary enrollment, immunization, use of contraceptives, and access to sanitation facilities, progress has been slow or nonexistent."[12]

[12] World Bank, 2005, *Bihar, Towards a Development Strategy*, Washington, DC, p.10.

Annex B

Bihar's Economy: Agriculture and Industry

Approximately 90% of the people in Bihar live in rural areas, and agriculture is the primary driver of the rural economy. However, as detailed below, a number of factors combine to make agricultural productivity in Bihar "among the lowest in the country."[13]

Land Distribution Patterns and Related Consequences

Arguably, one of the main challenges to enhancing agricultural productivity relates to patterns of land ownership and the size of land holdings. As regards the latter, of a total of 10.4 million holdings, about 83% are classified as "marginal" and are less than one ha. About another 10% are between 1 and 2 ha and classified as "small." Only about 0.1% of the holdings is larger than had 10 ha. Notably, about 10% of rural households are landless, and poverty levels among the landless have been increasing; the government reported that level as 56% in 2007.[14]

Other relevant distributional statistics concern "operational holdings," a term used to characterize the area of land that is actually farmed in comparison to the area of land that is owned. In Bihar, the 10.4 million individual holdings constitute about 6.8 million ha. Even though farmers owning four or more acres represented only 2% of the holdings, those farmers cultivate about 17% of the land. At the other extreme, the approximately 83% of the holdings of less than one ha represent 2.8 million ha, or about 41% of the operational holdings.[15]

One of the direct consequences of having such a huge fraction of very small farm operations is that levels of mechanization are quite low. For example, there are only 17 tractors per thousand ha in the state; the comparable figure for India is 68 tractors per thousand ha.[16] In addition, while the recommended electricity consumption for farming is 2 KW per ha, the figure in the heart is only 0.8 KW per ha. This has been attributed to the lack of availability of electricity.[17] As another example, the state's recent attempts to increase levels of fruit and vegetable output have been hampered by the lack of adequate cold storage facilities.[18]

Another consequence of Bihar's having enormous number of very small farms relates to the inability of many farmers to obtain information on best agricultural practices for the crops they grow. Notwithstanding that efforts have been made to transfer available technology from Bihar's agricultural research centers to farmers, "there is a huge breach

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[13] Government of Bihar, 2007, *2006-07 Economic Survey*, Department of Finance, Patna, p. 13.
[14] *Ibid*., p.43.
[15] *Ibid*., p.13.
[16] *Ibid*., p.43.
[17] *Ibid*.
[18] *Ibid*., p.39.

between the technology available in the agricultural universities/institutions and those on the field."[19] Bihar spends only 0.2% of agricultural GDP on agricultural research and education (e.g., agricultural extension services), which is half the comparable figure for India as a whole. Moreover, 95% of this expenditure on research and education goes to salaries and only 5% of it goes to operate research programs. Estimates for 2003 suggest that "a mere 0.5 percent of farmers access information on modern technology from extension workers."

The result of poor information transfer on best practices to farmers is inefficiency in operations and wasted resources as well as damage to the land itself. For example, the lack of knowledge about soil quality on their fields has been blamed for the very poor nitrogen: phosphorus: potassium ratios on lands in Bihar. The ideal N:P:K ratio has been reported as 4: 2:1, but the ratio in Bihar in 2005-06 was 7:1:1.[20]

Principal Agricultural Outputs

Rice and wheat constitute about 77% of the total crop area in the state, and productivity in those crops has been falling in recent years. The limited availability of high quality seeds and poor seed replacement rates are apparently one cause of this falling productivity. [21]

Under the Horticulture Mission of the Chief Minister, a plan has been put in place to expand the area under "fruit orchards, commercial flower cultivation, cultivation of medicinal plants, bee-keeping, integrated pest management, training of cultivators and officers, post harvest management etc."[22] Indeed, there has been a deliberate plan by the Government of Bihar to cut back on the areas planted in cereals and increase the production of other crops, particularly mango, litchi, banana and makhana as well as vegetables.[23] Interestingly, Bihar grows 90% of the 5000ha of makhana planted in India.[24]

In comparison with all states in India, Bihar ranks third in the production of vegetables and accounts for 9.8% of national vegetable production. Vegetables are grown on about 487,000 ha, and an additional 305,000 ha are devoted to growth of potatoes. In terms of total area in production, the ranking of vegetables in 2005 – 06 was topped by cauliflower (60,000 ha); lady fingers (56,300 ha); brinjai (53,800 ha); and onions (49,000 ha).[25]

Bihar ranks sixth among Indian states in terms of fruit reproduction. Fruit is grown on about 290,000 ha, which constitutes approximately 7.8% of the total area devoted to fruit production in India. Ranked according to area in production, the principal fruits are

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[19] Information in this paragraph is from Government of Bihar, 2007, *2006-07 Economic Survey*, Department of Finance, p.37.
[20] *Ibid.*, p.33-4.
[21] *Ibid*., p.30-1.
[22] *Ibid*., p.38.
[23] *Ibid*.
[24] *Ibid*.
[25] *Ibid*., p.40.

mango (150,000 ha), followed by litchi, banana, and guava, which were grown on about 28,000 ha each in 2005 -- 06.[26]

Animal husbandry is important in Bihar since it constitutes about 25% of the total value of agricultural output (TE 2002-03). Animal husbandry is particularly significant among the landless and households holding less than one ha of land. For example, 35% of rural households owned cattle in 2002 -- 03, but more than three quarters of these households were either landless or held less than one ha. Milk was the most important livestock product (50% of livestock output), followed by meat (24%).[27]

Bihar is making an effort to increase the productivity of the fisheries sector by providing loans for the maintenance and renovation of privately owned fish ponds. Between 2001 -- 02 and 2005 – 06, the share of the fisheries sector in total agricultural GDP increased, and the Government of Bihar that it will continue to increase.[28]

Rice

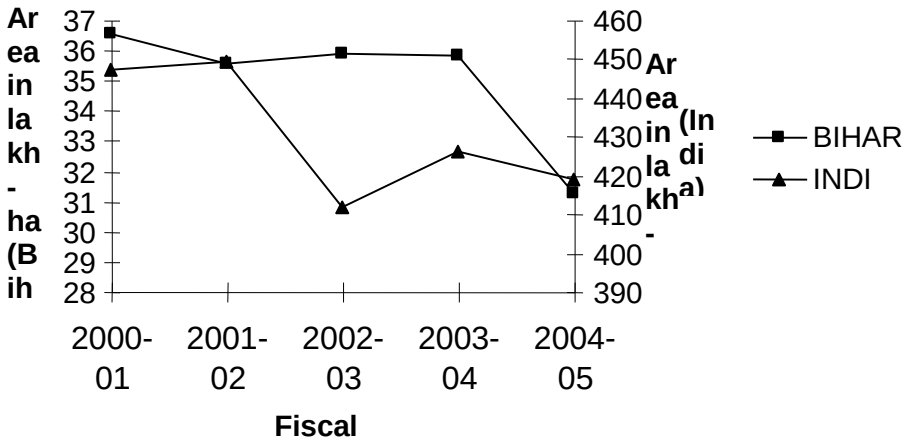
Because of its importance as a food crop, special consideration is given here to rice. In Bihar, rice grows in a temperate climate, with temperatures of 21-37 deg C, and a rainfall of 120-140 cm. It is cultivated in 37 districts in Bihar, and there exist 110 notified rice varieties. Irrigation is available to about 40% of the rice in Bihar.[29]

Kharif (June-October), Rabi (November-May), and summer (March-June) types of rice are grown in Bihar. A comparison of rice cultivation in terms of area, production, and yield, shows interesting comparisons between Bihar, and all of India. [30]

As seen in Figure B.1, the area under cultivation has remained relatively constant for Bihar in comparison to India as a whole since 2000.

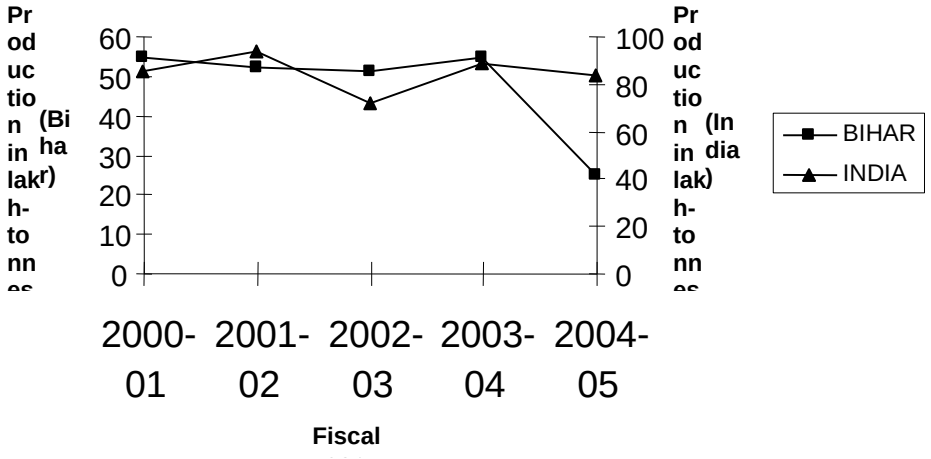
[26] *Ibid*., p.40
[27] *Ibid*., p.41.
[28] *Ibid*., p.42.
[29] Dept. of Agriculture and Co-operation, Govt. of India, 2007. http://dacnet.nic.in/
[30] All information about rice production is from the Directorate of Rice Development, Dept. of Agriculture and Co-operation, Patna, 2007. (http://drdpat.bih.nic.in/)

Figure B.1: Area under rice



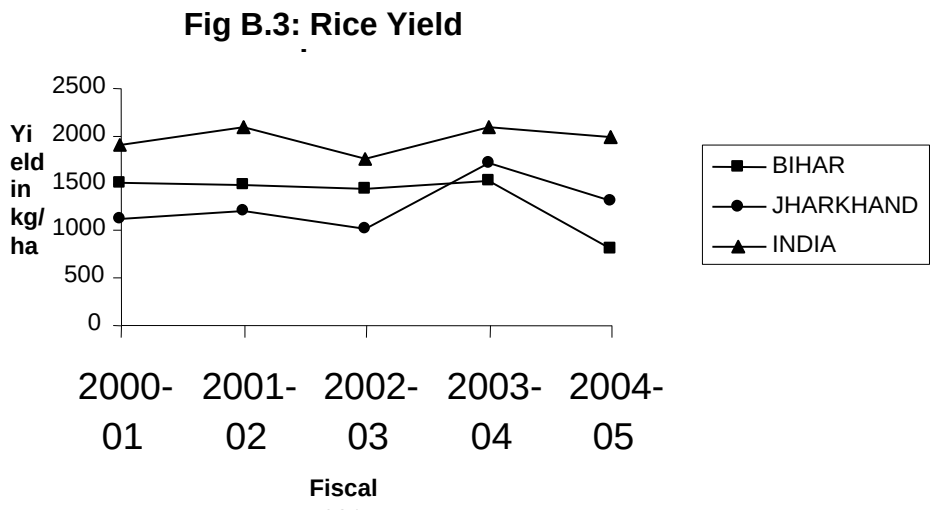
A comparison of production shows that while the Indian average dipped in 2002-03, there was no corresponding drop in Bihar. Moreover, in 2004-05, rice production fell off in both Bihar and India as a whole. (See Figure B.2)

Figure B.2: Rice production



A comparison of yield shows clearly that Bihar's yields are consistently much lower (on average about 30%) than yields for all of India. While yields remain flat for most years, there was a sharp drop in the 2004-05 fiscal year. For purposes of comparison, Figure B.3 also shows yields for Jharkhand. Interestingly, in the last few years, average yields in Jharkhand shot above yields in Bihar. It is an open question as to the cause of the recent

setback in rice yields in Bihar.



The use of manure, fertilizers, weedicides, insecticides, and pesticides is common in Bihar's rice production. These include (but are not limited to) Butachlor, Anilophos, Chlorpyriphos, Carbofuron, Carbendazim, and Zinc Phosphoid.

Agriculture as a Diffuse Source of Pollution

According to Agarwal, the following features of agricultural practice in India are significant in understanding the effects of nonpoint sources of agricultural pollution:[31]

•Extreme variations in rainfall and streamflow patterns,
•agricultural practices that are still largely traditional,
•a large cattle population with agriculture almost always linked to animal husbandry,
•the tradition of living close rivers in which the dominant in-stream uses include bathing, washing, waste disposal and cattle wading,.
•Extensive farming in floodplains, and little respect for regulations coupled with a weak law enforcement system.

Agarwal finds that during much of the non-monsoon periods, which may be as many as 10 months of the year, diffuse sources of pollution are not significant. During the monsoon, river flows are low and pollution is largely from in-stream uses as well as traditional point sources. Things are different during the monsoon season and the month or two that follow the end of the monsoon. During these times, runoff from agricultural

[31] All information in the remainder of this section on agriculture is from Agarwal, G.D., Diffuse agricultural water pollution in India, Water Science and Technology, 39 (39): 33 -- 47. Available at http://www.ingentaconnect.com/content/els/02731223/1999/00000039/00000003/art00030 accessed on June 16, 2007.

fields is a notable source of pollution. According to Agarwal, agricultural nonpoint sources make major contributions to the following: silt loads, dissolved salts, nutrients, bacteria, and heavy metals.

Silt causes major problems because it clogs the flow of channels and results in: "a vicious circle, which degrades the channel, increases flood damage, and is undesirable from ecological and sustainability points of view. High concentrations of salts and nutrients encourage growth of weeds and macrophytes after floods have passed. The presence of organics, heavy metals and bacterial contamination renders the stream water unfit for in stream use or abstraction."

Agarwal warns of the likelihood of increases in nonpoint source pollution from agriculture as modern farming techniques become increasingly adopted, since that will lead to the more intense use of fertilizers and pesticides, as well as an increase in the extent of irrigation.

Industrial Activities

The economic base of Bihar is dominated by agriculture and animal husbandry.[32] Estimates of gross state domestic product (GSDP) for 2004 -- 05 indicate that these activities accounted for 38.2% of the total. Other primary industrial activities included forestry, fishing, and mining and quarrying, and collectively they amounted to less than 5% of GSDP. Manufacturing, construction, and other secondary activities amounted to about 9%. Within the tertiary sector, the dominant activity was trade, hotel and restaurants, which amounted to about 16% of GSDP.

Bihar has suffered from a lack of industrial development, and it lags well below industrial development in India as a whole. For example, while industry represented only 3.2% of gross state domestic product in Bihar in 2002-03, it represented 20.1% of gross domestic product in India as a whole.[33] As of 2007, the industrial base, as measured by either net value added or value of output, was nominated by two industry groups: food /beverages/tobacco and petroleum products. Collectively, factories in these two basic industrial groups contributed to more than 85% of total industrial outcome in 2002 – 03.[34] other industrial groupings with a notable number of large and medium units in Bihar include: cotton, wool, it do, paper, and leather; and material, metal, machine, and transport equipment.[35]

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[32] This paragraph is based on Government of Bihar, 2007, *2006-07 Economic Survey*, Department of Finance, pp. 4-5.
[33] Ibid., p.46.
[34]The 29 factories in the coke/petroleum/nuclear fuel industrial group (NIC 1998 code 15-16) accounted for 60% of net value added and 65% of the value of output as of 2001 – 02). The food products/beverage/tobacco industry group (NIC 1998 code 23) was in the second position with the percentage of total net value added a 28% in the percentage of total value of output at 22 Government of Bihar, 2007, *2006-07 Economic Survey*, Department of Finance, p.62.
[35] Government of Bihar, 2007, *2006-07 Economic Survey*, Department of Finance, p.48.

Of Bihar's 259 large and medium units classified in different industrial groups, 32% are in the food/beverages/tobacco group, and more than half of these units are in two divisions: Patna and Tirhut. The only other division with notable concentrations of industrial activity – in terms of number of large and medium units – is Magdah. But with a total of 23 large and medium units, Magdah trails far behind Patna, which has 99 units, and Tirhut, which has 56 units.[36]

Bihar has an enormous number of industrial units officially registered as small, tiny, and artisan-based.[37] As of December 2006, about 96,000 units were registered as tiny, 64,000 units were registered as artisan-based, and 1400 were registered as small. Collectively, they employed over 530,000 persons.[38] Is contrast to the medium and large units, which are concentrated in a few divisions, the small, tiny, and artisan-based are spread throughout the state.

Bihar's *2006 -- 07 Economic Plan* makes a point of emphasizing that the eighth level of industrialization is far below its potential. In contrast to India as a whole, which had a total value of output of agro-based industries in 2002-03 of about Rs. 331,000 crore, the corresponding value of output for Bihar was only 2,000 crore, which amounted to only 0.6% of the total.[39] This is striking given the importance of agriculture in the state. Bihar's *2006 -- 07 Economic Plan* indicates that "Bihar" shell to produce about 5-6% to all the total Agro-based industrial products in India, and this will enable the industrial sector of the State to become one and half times of its present size…."[40]

Sugar

Of all the agro-based industry is in this state, sugar occupies a place of special prominence. Bihar has traditionally been one of the notable sugar producing states in

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[36] *Ibid.*

[37] The official definition of a *small scale industry* is as follows: "An industrial undertaking in which the investment in fixed assets in plant and machinery whether held on ownership terms on lease or on hire purchase does not exceed Rs 10 million." The definition of *tiny* is given by: "Investment limit in plant and machinery in respect of tiny enterprises is Rs 2.5 million irrespective of location of the unit." The registration scheme for small scale industries has no statutory basis. The objectives of registration are:

- "To enumerate and maintain a roll of small industries to which the package of incentives and support are targeted.
- To provide a certificate enabling the units to avail statutory benefits mainly in terms of protection.
- To serve the purpose of collection of statistics.
- To create nodal centres at the Centre, State and District levels to promote SS"

Website of the Ministry of Micro, Small and Medium Enterprises, Government of India, http://www.laghu-udyog.com/ accessed June 6, 2007.

[38] Government of Bihar, 2007, *2006-07 Economic Survey*, Department of Finance, p.64.

[39] *Ibid.*, p.50.

[40] *Ibid.*, p.51.

India. However, most sugar mills run by the state run Bihar Sugar Corporation had to be shut down due to old and obsolete equipment and inadequately skilled workforce. [41] The degradation of law and order in the state contributed further to the problem of maintaining Bihar's sugar production.

Present production of sugarcane is 13 million metric tones. The state of Bihar has plans to increase production to 46.72 million metric tons by 2015. [42]

Bihar has had the lowest sugar recovery rate[43], with a state average of 9.45% versus the national average of 10.36%[44]

In November 2006, the Chief Minister of Bihar called investment in sugar and ethanol production "the need of the hour". The state government views the sugar industry as an unused opportunity to develop the state, and has thus taken measures to promote new high yielding varieties of cane, developed tissue culture labs, increased tube well irrigation, and has tried to revitalize old closed mills. The government has even amended an old law, the Bihar Sugarcane (Regulation of Supply and Purchase) Act, 1981, to legalize the direct usage of sugarcane juice for ethanol production,[45] and is contemplating the privatization of some of its old state sugar mills.[46] The State has set a target to increase sugarcane production by 10 fold in 2-3 years and views the following as potential new investment opportunities:

1. New sugar mills, revival of old, non-functioning mills, and capacity expansion of old functioning mills.
2. Manufacture of ethanol.
3. Co-generation of power
4. Manufacture of paper from bagasse.

Fourteen new cane sugar mills have been approved in the State of Bihar totaling an investment of Rs. 3605.92 Crores (877 million USD), and 8 sugar mills are being expanded via investments totaling Rs. 762. 72 Crores. [47]

The present Bihar government seems very eager to develop the state's sugar industry, and has thus provided an incentives package to attract investors. The incentives are as follows:

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[41] Vision of His Excellency the President of India on Sugar Industry in Bihar. http://gov.bih.nic.in/depts/sugarcane/visionofpresident.htm, 1 May 2007.
[42] "Bihar in the Making" – a presentation before the Investment Commission, sourced from the Govt. of Bihar website on Industries. http://industries.bih.nic.in/Ppts/Bihar-in-the-Making.pdf, 1 May 2007.
[43] Kilogram of sugar obtained from kilogram of sugarcane
[44] Presentation by Chief Minister of Bihar, Mr. Nitish Kumar on 26 November 2006, at Indian Institute of Management, Ahmadabad, sourced from the Govt. of Bihar website on Industries. http://industries.bih.nic.in/Ppts/Presentation%20at%20IIM.pdf, 1 May 2007.
[45] "Bihar amends sugar act to boost ethanol output", 6 April 2007, Business Standard. http://www.business-standard.com/common/storypage_c.php?leftnm=10&autono=280131
[46] "Bihar provides a sweet cure for sugar sector- offers attractive incentive, plans PSU units privatization", The Hindu Business Line. http://www.thehindubusinessline.com/2006/02/24/stories/2006022401131200.htm, 1 May 2007.
[47] Bihar Government website http://gov.bih.nic.in/depts/sugarcane/, 1 May 2007.

For new sugar mills:

1. Reimbursement of central excise duty on sugar.
2. Exemption of purchase tax on sugarcane.
3. Exemption of stamp duty and registration fees on purchase of land.
4. Grant of 10% subsidy on capital investment (plant and machinery) to a maximum of Rs. 10.00 Crores.

For distillery and ethanol units:

1. Exemption of administrative charge on molasses.
2. Reimbursement of sales tax (VAT) on molasses.
3. Exemption of stamp duty and registration fees on purchase of land.
4. Grant of 10% subsidy on capital investment (plant and machinery).

For co-generation power units:

1. Exemption of electricity duty on co-generated power.
2. Exemption of stamp duty and registration fees on purchase of land.
3. Grant of 10 % subsidy on capital investment (plant and machinery).
4. Laying of transmission line from factory to the grid station by the Bihar Electricity Board

Bihar's Sugar Industry at a glance:[48]

Land under sugar cultivation	2.3 Lakh-ha
As a percentage of total land under cultivation	4.20%
Total production of sugarcane	129.95 Lakh-MT
Productivity of sugarcane (percentage less than national average)	56.5 MT/ha (19.3 %)
Cane crushed	44.52 Lakh-MT
Sugar produced	4.22 Lakh-MT
Recovery percentage (percentage less than national average)	9.49 % (8.4%)
Crushing duration	126 days

[48] All data is sourced from presentation to Expert Advisory Committee, Govt. of Bihar website for industries. http://industries.bih.nic.in/Ppts/Expert%20Advisory%20Committee.pdf, 1 May 2007.

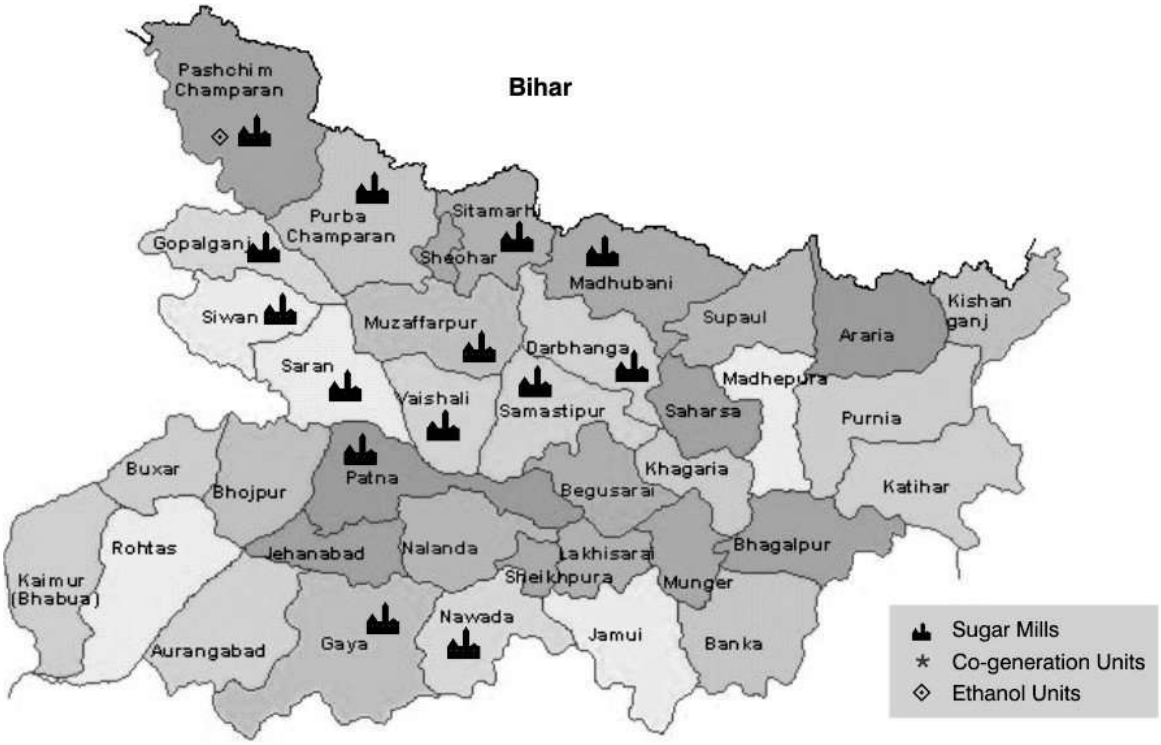

Figure B.4. Location of Activities Linked to sugar production source: Indian Sugar Mills Association website. http://www.indiansugar.com/sugarmap/Map%20of%20Bihar.htm, 1 May 2007

Pollution from the Sugar Industry

Since the sugar industry in Bihar is poised at a point of take-off, cane sugar wastewater forms an integral part of the discussion of pollution in the state. This is of concern since the Ministry of Environment and Forests of the Government of India places the sugar industry under the category of "heavily polluting"[49]. The Central Pollution Control Board also placed the sugar industry as one of 18 to be targeted for "priority action". [50] A total of 1551 medium and large industries which came into operation on or before 31st December 1991 got identified for priority action by thus program. Figure B.4 from the Central Pollution Control Board website shows that the sugar industry has the maximum

[49] "Parivesh"- a newsletter from Central Pollution Control Board, http://www.cpcb.nic.in/pollutingintro1.htm, 5 May 2007.
[50] "Parivesh"- a newsletter from Central Pollution Control Board, http://www.cpcb.nic.in/mjrind.htm, 5 May, 2007.

number of targets for non compliance.

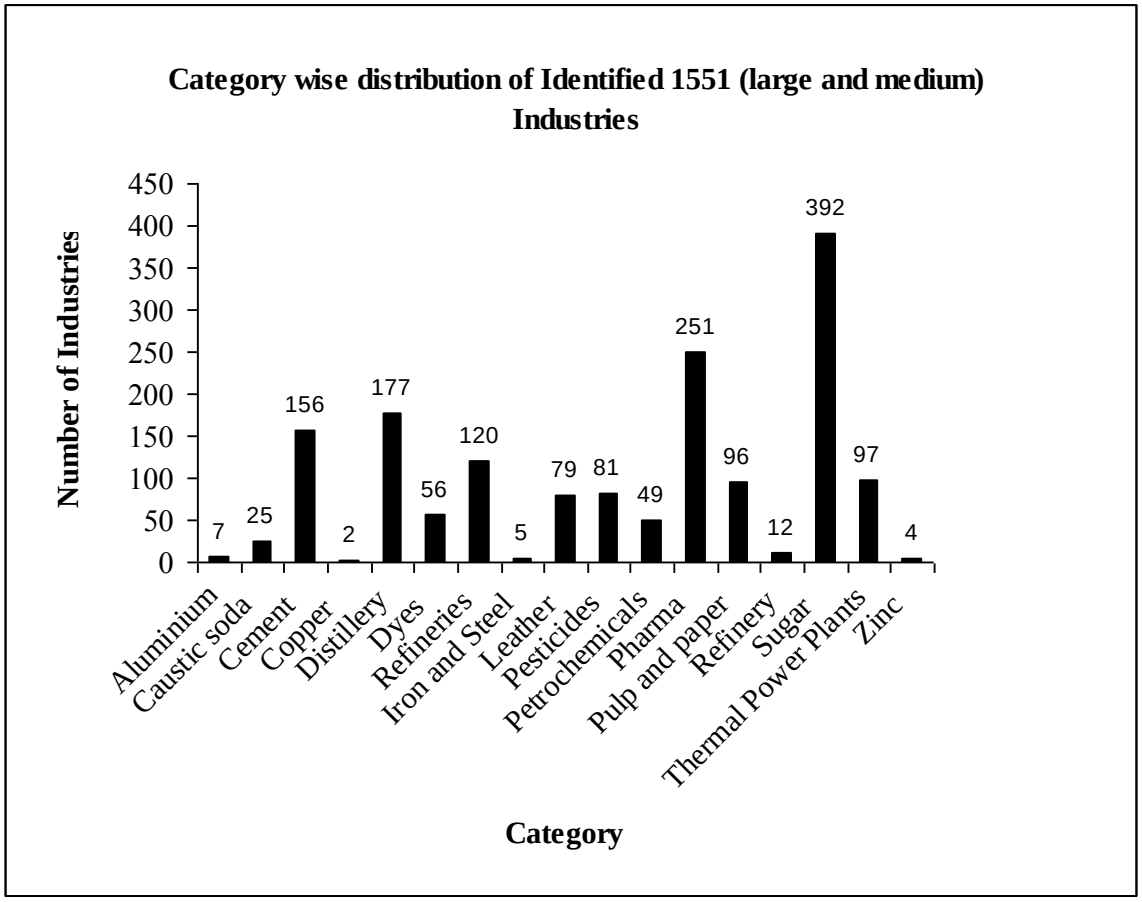

Figure B.4 Sugar in the Context of Other Large and Medium Industries

Factories that process cane sugar are characterized by wastewater of variable pH, and high BODs. [51]

Cane-sugar wastes may be classified into three categories (Guzman, 1962): (1) cooling and condenser wastes, (2) solid waste from filter cake, (3) concentrated wastes from spillage, scum leaks, washings, cleanings and lubricant from machinery.
The cooling and condenser wastewater forms a large part of the volume of wastewater generated, but is low in BOD. Concentrated wastes are the opposite – high in organic matter content, and low in volume. High pollution load effluents contain BODs of 2000-3000 ppm.[52]

Conventional treatment methods pose a difficulty due to the presence of volatile organic acids which inhibit microbial activity. Neutralizing agents such as lime or other alkalis

[51] "Industrial Water Pollution", Nelson L.Nemerow, p 306

[52] "Industrial Water Pollution", Nelson L.Nemerow, p 418

may be used to deal with this problem, and to prepare the waste for anaerobic treatment.[53]

Other Notable Industrial Activities[54]

The Bihar state government has decided to promote industry in the state, and use it as a tool for creation of employment opportunities, rural development, and as a revenue generating mechanism.

- *Petroleum and Natural Gas.* Petroleum and natural gas are subjects of study in BR period of contract for exploration has been awarded to Cairn Energy, Ltd. under a New Exploration Licensing Policy of the Government of India. There is an existing petroleum refinery in the state at Barauni.[55]

- *Mines and Minerals.* Before Jharkhand was split off from the former Bihar, the state possessed nearly 25% of the total mineral deposits in India. Currently, however, it has only 1% of the total deposits, but two minerals – limestone and pyrite – have notable potential within the state. Mina minerals, namely sand, bricks and stoned contributed around 85 to 90% of state revenues collected from the mines and minerals sector.[56]

- *Makhana* . Makhana is one of the species of *Euryale ferox* (Family Nymphaeaceae) and is produced in Northern Bihar. It is a flowering plant in the water lily family, and grows in water, producing large floating leaves with a quilted texture, purple flowers, and starchy white seeds. The popped seeds of makhana are used to prepare sweets and other foods. The state has established a program to expand its cultivation.[57]

- *Textiles.* Bihar has strong weaving traditions, and is the home of over 90,000 weavers today. Cities like Bhagalpur and Gaya are centers of this textile industry. In conjunction with the sericulture industry, the state government is looking to give a strong boost to this industry by strengthening training, and providing better infrastructure and financial services to those involved. Modernization of looms and expansion of work sheds have also been identified as requiring state attention.

- *Tourism.* Bihar's *2006-07 Economic Plan* singles out terrorism as an industry

[53] "Industrial wastewater management", Sven Erik Jorgensen, p 340
[54] Some of the items below are as singled out in in the Chief Minister's presentation to the Indian Institute of Management made on 26 Nov 2006, Ahmedabad. http://industries.bih.nic.in/Ppts/Presentation%20at%20IIM.pdf, 5 May 2007.
[55] Government of Bihar, 2007, *2006-07 Economic Plan*, Department of Finance, p.53-4.
[56] Government of Bihar, 2007, *2006-07 Economic Plan*, Department of Finance, p.54.
[57] Government of Bihar, 2007, *2006-07 Economic Plan*, Department of Finance, p.52-3.

> that, while still in its nascent stage in Bihar, has enormous potential. The planned singles out important sites in pilgrimage center us for Hindus, Jane's, Buddhists, and sheiks, and makes note of monuments of Hindu and Mughal architecture. Notwithstanding the potential, the total influx of tourists has been very low. This is attributed to inadequate amenities, bad roads and accessibility problems, inadequate publicity, and a "poor image building exercise."[58] The heirloom/ power loom sector has the potential for growth in Behar, but it would require proper finance, training, designing and marketing facilities.[59]

The Bihar Industrial Area Development Authority has an overall industrial policy that highlights encouragement of export oriented units based on agricultural products, medicinal plants and outputs from the food processing industries.[60] The policy contains special incentives for the following industries: sugar, tea and jute. Incentives are also provided for information technology and other "knowledge-based industries." The Authority are is all creating five and industrial growth centers and they are located in Bhaglapur (Khalgaon/Bhaglapur district); Chapra (Saran Chapra Sitalpur); Muzaffarpur (Muzaffarpur district); Darbhanga (Darbhanga, Sadar); and Begusari (Begsari/ Begusari district).

[58] Government of Bihar, 2007, *2006-07 Economic Survey*, Department of Finance, p. 55.
[59] *Ibid.*, p.54.
[60] Information in this paragraph is from the Bihar Industrial Area Development Authority website, http://biada.org.in/ip.htm and http://biadaand.org.in/igc.htm , accessed June 1, 2007.

Annex C
Caste, Class and Politics

Although the reputation of Bihar as a backward and lawless state has persisted for many years, an examination of the period since 1990 is especially instructive since that period has been dominated by Lalu Prasad Yadav (commonly referred to simply as “Lalu” or “ Laloo”), a political figure whose actions have further enhanced the reputation of Bihar as an unsafe state characterized by a lack of development. Lalu’s success in Biahr’s politics is due to what is often referred to in India as "caste-based politics," and thus it is necessary to begin with a basic introduction to the caste system.

Over 3000 years ago, the concept of caste became well entrenched among the Hindus in South Asia. According to ancient Hindu scriptures, the castes derived from various body parts of Brahma, the ancient god of creation. For example, *brahmans*, which derived from Brahma’s mouth, are associated with priests reciting holy verses.[61] In contemporary usage, there are thousands of subcastes that derive from a combination of kinship ties (“endogamous group related by ‘birth’ [*jati*]”)[62] and the following four traditional classes (*varna*):

Brahmans -- priests and the learned class.

Kashatriyas -- rulers and warriors.

Vaishyas -- traders and other members of the merchant class.

Sudras -- manual laborers and artisans.

Within traditional Hindu society, these four categories did not constitute a complete set. Those engaged in activities that caused them to be viewed as polluted or unclean, were not assigned to a caste. These "outcastes" were traditionally referred to as "untouchables" and are now referred to commonly as "*Dalits*." In modern India, these five basic groupings have been subdivided into an enormous number of subcastes, which were catalogued by the British and subsequent governments. Notwithstanding that the caste system is of Hindu origin, it is also a part of the everyday life of Muslims and Christians within modern India.

Bhimaro Ambedkar, one of India's most well known and highly educated *Dalits*, campaigned for decades against the oppression of *Dalits* and advocated for special provisions of various types to elevate their status. Eventually, arguments of Ambedkar and other reformers led the British to introduce to a system in which groups the British once referred to as the "the depressed classes" were defined in a list, or "schedule," of

[61] Kamdar, M., ,2007, *Planet India*, Scribner, NY, pp. 232 – 3.
[62] Wolport, S., 1993, A *New History of India*, 4th edition, Oxford University Press, Oxford, UK, p.41.

castes, and groups on the schedule had positions set aside for them within the government.

This "reservation system," as it is commonly called, is codified in the Constitution of India, which includes provisions that make it possible to set aside positions in various governments and universities for members of so-called "Scheduled Castes" and "Scheduled Tribes."[63] The latter refers to groups of indigenous peoples, who were outside the Hindu caste system. Subsequent refinements of the reservation system included groups referred to as "other backward castes" (OBCs), and thus the reservation system extended beyond the traditional untouchables to include many subcastes of the *Sudra* caste who were considered disadvantaged; a schedule is used to define these other backward castes.

The *Yadavs*, the traditional cowherd caste of northern India, is among the OBCs, and this caste has played a major role in the politics of contemporary Bihar. This is the caste of Lalu Prasad Yadav, who dominated politics in Bihar for the past few decades. Lalu's early political affiliation was with the Janata Dal party, which used an electoral strategy known as "MY" or Muslim-*Yadav*, to build a powerful political alliance between Bihar's Muslims and *Yadavs*.[64]

The caste composition in Bihar, as of 2005, was reported as follows: " A total of 16.5% of Bihar's people are Muslims and another 12.7% belong to the *Yadav* caste - one of the designated "other backward castes" that make up 35% of the population. Lower still are the scheduled castes that comprise 14% of the people. Other castes include the *Kayasthas* (12%), *Kurmis* and *Koeris* (7.7%) and *Brahmins* (4.7%)."[65]

The 1990 elections for the Bihar *Vidhan Sabha* (the legislative assemble or lower house of state governments in India) were a sweeping victory for the Janata Dal party and its leader, Lalu Prasad Yadav, who became the state's chief minister. Although Lalu's parties' majorities in the *Vidhan Sabha*, did not remain at the high levels of the early 1990s, they were sufficient to keep his party in power for the 15 year period beginning in 1990.[66] As reported by BBC News, from 1990 to 2004 the party led by Chief Minister Lalu (who was later replaced in 1996 as chief minister by his wife, Rabri Devi), lacked "the moral authority to govern" …. Moreover, it "appeared that no one really believes that other parties would make a difference."[67] In fact, up to the time of the election, Lalu "continued to insist that caste, not governance - or the lack of it - would continue to determine the way people voted in Bihar."[68]

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[63] Constitution of India, http://indiacode.nic.in/coiweb/coifiles/part.htm, accessed June 4, 2007.
[64] Luce, E. 2007, In Spite of the Gods: the Strange Rise of Modern India, Doubleday, NY, p. 116.
[65] Tewary, S., 2005, "Bihar's loyalties cast in stone," BBC News Patna, February 19,2005, available at http://news.bbc.co.uk/2/hi/south_asia/4276379.stm, accessed June 4, 2007.
[66] The Janata Dal party was renamed Rashitriya Janata Dal.
[67] Robin, C. , 2004, , "2005 Bihar elections: Laloo against Who?", ***Economic and Political Weekly***, Mumbai, December 18, 2004.
[68] Biswas, S.,2005, "Analysis: Turning point for Bihar?" BBC News, Delhi, November 22, 2005, http://news.bbc.co.uk/2/hi/south_asia/4458976.stm accessed June 4, 2007

However, things did change with the 2005 election, and Nitish Kumar led the National Democratic Alliance to victory in the Bihar Assembly elections.[69] His party, the National Democratic Alliance in Bihar, consists of an alliance of the Janata Dal United party and the Bharatiya Janata Party (BJP) . Nitish Kumar became Chief Minister in November of 2005, thereby ending 15 years of rule by and Lalu and the alleged proxy government headed by Rabri Devi after Lalu resigned in the midst of a corruption scandal.[70]

How has Bihar's political history under Lalu influenced the state's economic development and poverty alleviation? Writing for the BBC News, Tewary observed:

> Analysts agree that Mr Yadav's rise to power ended years of political dominance by upper-caste leaders and parties.
>
> But this has happened at the expense of development - Bihar is backward in roads, schools and hospitals and there has been a breakdown in law and order.
>
> Voting along caste lines has given rise to a violent political culture where most political parties field candidates with criminal records, and mercenary private caste gangs intimidate and kill rivals.
>
> More than 1,000 political workers and leaders have been killed in the state since 1990, according to police records.[71]

It is not as if Lalu's supporters are not aware of the lack of economic progress that has characterized the Lalu and Rabri Devi period as the state's chief ministers. According to some, the key to Lalu's success was the restoration of dignity to his supporters and the relatively low level of Hindu-Muslim fighting within the state during a period in which religious violence has been widespread elsewhere in India. Here is how one of Lalu's supporters characterized reasons for his allegiance to him:

> "For thousands of years the poor and the downtrodden had no voice here," says one man.
>
> "We were beaten, abused and harassed by the people higher to us in the social ladder. Laloo has given us dignity." [72]

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[69] Lalu was defeated in 2005 "by a rainbow coalition of the lowest castes, or extremely backward castes (EBCs), upper castes and breakaway Muslim and Dalit voters, many of whom had voted faithfully for Mr Yadav over the past 15 years." Biswas, S.,2005, "Delhi Analysis: Turning point for Bihar?" BBC News, Delhi, November 22, 2005, http://news.bbc.co.uk/2/hi/south_asia/4458976.stm accessed June 4, 2007.
[70] Lalu resigned as chief minister in 1996 but ensured his wife, Rabri Devi, would take over.
[71] Tewary, S., 2005, "Bihar's loyalties cast in stone," BBC News Patna, February 19,2005, available at http://news.bbc.co.uk/2/hi/south_asia/4276379.stm, accessed June 4, 2007.
[72] Srivastava, S. " The Lord of Bihar," BBC News, April 30, 2004, available at http://news.bbc.co.uk/2/hi/south_asia/3669543.stm accessed June 4, 2007

One of the impediments to economic development that carries over from the period in which Lalu's party was in power is lack of progress in developing basic infrastructure. In addition, the state failed to shake off a reputation as being "in the throes of economic chaos and unprecedented social tension."[73] Clearly, potential investors see notable risks in investing in a state characterized widely in the press as lawless and anarchic. Indeed, a 2005 World Bank report, "Bihar, towards a development strategy," calls for strengthening the investment climate as a "pillar" in the strategy to improve Bihar's economic growth. And not surprisingly, the report cites "inferior infrastructure" and "poor law and order" as among the several factors contributing to the weak investment climate.[74]

The *2006-07 Economic Survey* developed by the Government of Bihar reinforces the point regarding the adverse influence of poor infrastructure on development. It observes that the "highest sickness [referring to large and medium industries officially classified as 'sick' from an economic perspective] in Bihar is due to inadequate infrastructure facilities."[75]

And what of the prospects for change under Nitish Kumar? He and his coalition face huge challenges in rebuilding Bihar. According to:

> He has to meet the aspirations of the caste groups who voted for him, rein in a possible backlash by the upwardly mobile backward castes and private upper caste armies which may be looking to settle scores, and keep winners with criminal records out of the state government.
>
> He also has to deal urgently with the rising and violent ultra-left movement of Maoist rebels fighting for more rights and a more equitable society.
>
> "But the biggest change is that development will finally get its place in Bihar. The middle class will again start taking interest in Bihar," says Shaibal Gupta [an analyst at the Bihar-based Asian Development Research Institute].[76]

The Kumar government has put much emphasis on removing the image of Bihar as a lawless state. Although the government has suffered setbacks , there were signs of progress. As reported in a May 2007 edition of *The Indian Express*[77]

> Immediately after Nitish took over the reins of Bihar, he was fairly successful in generating a feel good factor. Gradually development agenda was seen to be taking over politics and crime for

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[73] Das, A., "Bihar's lawless ways," *UNESCO Courier*, February 1999, http://www.unesco.org/courier/1999_02/uk/dici/txt1.htm accessed June 5, 2007. Arvind N. Das, was a well known Indian sociologist, a native of Bihar, and author of several studies on Bihar State.
[74] World Bank, 2005, *Bihar, towards a development strategy*, World Bank, Washingtion, DC.
[75] Government of Bihar. 2006, *2006-07 Economic Survey*, Department of Finance, Patna, p.50.
[76] Biswas, S.,2005, "Analysis: Turning point for Bihar?" BBC News, Delhi, November 22, 2005, http://news.bbc.co.uk/2/hi/south_asia/4458976.stm accessed June 4, 2007

[77] Prakash Yadav, J., 2007, "Nitish losing law & order advantage," *The Indian Express,* Monday, May 14, 2007, **http://www.indianexpress.com/story/30876.html**, accessed June 5, 2007.

which the state had been known. Several events were organised to build Brand Bihar. Industry leaders and academicians dared to venture where few had earlier and saw a vision of Bihar blossoming. Proposals for investments in industry, education and tourism came from far and wide.

It was not only a responsive police that created a sense of security among the people, but also a move to expedite pending cases against known criminals and even politicians. This sent home the message that the new government meant business. The recent conviction of Shahabuddin, the don-cum-politician of Siwan, is a case in point.

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Annex D

Water Resource Related Issues

This annex is organized as follows. It begins with a treatment of two sets of related subjects: administration of water resources within Bihar and trans-boundary issues. The presentation then proceeds by giving an introduction to the nature of water resources in India, followed by sections on the following topics:

Floods and Droughts
Water and Sanitation
Hydroelectric Power Projects

Bihar's Minor Irrigation Department

Overview of Institutional Arrangements

Bihar has a rich endowment of groundwater and surface water resources. The state is not dependent on direct rainfall for its water supply because it has considerable water supply from the Ganges and its tributaries. The Ganges enters Bihar from Uttar Pradesh (UP) in the west and exits into West Bengal. Within Bihar, the Ganges is fed by tributaries from Nepal in the north: two snow-fed tributaries, Gandak and the Kosi, and a number of non-snow fed rivers (e.g., the Bagmati and the Kamala). The Ganges bisects Bihar into the flood prone but agriculturally rich north and the drought prone south.

State governments have primary responsibility for use and control of water resources. In Bihar, major and medium irrigation is handled by the State Water Resources Department, whereas small scale irrigation is looked after by the State Minot Irrigation Department. Urban water supply is generally the responsibility of public health departments and *panchayats* take care of rural water supply. Hydro-power is the responsibility of the State Electricity Boards.

At the *central* level, the Union Ministry of Water Resources is responsible for the general policy on water resources development and for technical assistance to the states on irrigation, multipurpose projects, ground water exploration and exploitation, and so forth. It also oversees the regulation and development of inter-State rivers. Urban water supply and wastewater disposal is handled by the Ministry of Urban Development; and the Department of Drinking Water under Ministry of Rural Development Rural Water oversees rural water supply issues; the Ministry of Power is responsible for hydro-electric power and the Ministry of

Environment and Forests is responsible for pollution control.[78]

The Ministry of Water Resources formulates policy guidelines and programs for the development and regulation of India's water resources. Its functions include the following (among several others)[79]**:**

- Technical guidance, clearance and monitoring of "major" and "medium" irrigation, flood control and multi-purpose projects.
- Central financial assistance for projects and assistance in obtaining external finance (e.g., from the World Bank).
- Overall policy formulation, planning and guidance in respect of minor irrigation and command area development, administration and monitoring of the Centrally sponsored schemes, and promotion of participatory irrigation management.
- Planning for the development of ground water resources.
- Coordination and mediation of disputes relating to inter-state rivers and, in some instances, overseeing implementation of inter-state projects.
- Operation of the central network for flood forecasting and warning on inter-state rivers, and preparation of flood control master plans for the Ganges.

Allocation and management of water resources requires a collaborative effort between the central and the state government. The state boards are organized in a manner that the minister of water resources (of the state) heads the team of officials comprising the water board.

Trans-Boundary Issues

According to Gyawali,

Bihar today feels itself marginalized both by its upstream and downstream riparian neighbours in India. A dispute over a barrage proposed across the Ganga at Kanpur in UP exists since 1993, which involves Bihar, U P and the Union Government in Delhi. The signing of the Farakka Treaty between Delhi and Dhaka in December 1996 has added to Bihar's fears of losing its rights over the waters of the Ganga.[80]

The benefit provided to both India and Nepal by the Kosi and Gandak Projects have been result of the spirit of goodwill and cooperation between people of the two countries who have very close historical and cultural ties.

[78] Website of the Ministry of Water Resources, http://wrmin.nic.in/index2.asp?sublinkid=410&langid=1&slid=305 accessed on June 8, 2007

[79] Website of the Ministry of Water Resources, http://wrmin.nic.in/index1.asp?linkid=189&langid=1 accessed on June 8, 2007

[80] Gyawali, D. 1999, "Institutional forces behind water conflict in the Ganga plains," *GeoJournal,* 47, p. 443.

Bihar's inter-state water resources projects are described as follows by the Water Resources Department (formerly called the Irrigation Department):[81]

Bansagar Project

This is an Inter-State Project between M.P., U.P. and Bihar. An agreement was reached between the Government of these three states on 16/09/1973 for sharing the Sone River Water by constructing Bansagar Dam on cost sharing basis. The cost of construction of the dam is to be shared between the three states in 2:1:1 ratio. For Bihar, the project envisages to stabilize about 0.94 Lakh Ha. of area in Sone Canal System. The latest (1998) estimated cost of the project is 1151.41 Crores. Out of its total share of 227.30 crores, Bihar has already released Rs. 219.562 Crores till March, 2004. The scheme is likely to be completed by 2004. The scheme is included in AIBP and the state gets loan assistance from centre to pay its share.

Jamania Pump Canal Scheme

Jamania Pump Canal Scheme has been framed to avail 2.50 Lakh Acre ft. of water from River Ganga under Bansagar agreement. This will provide an annual irrigation of 30.07 Th. Ha. in Kaimur district of Bihar. The latest (1992) estimated cost of the scheme is 94.87 Crore for which administrative approval is obtained. The modality of canal crossing with river Karmnasa is the main issue to be resolved between U.P. and Bihar.

Tilaiya Dhadhar Diversion & Upper Mahananda Irr. Scheme

This scheme was originally proposed to provide irrigation to 31.70 th. ha of drought prone districts like Gaya, Nawada and Hazaribagh. After the bifurcation of the state, it has been decided to construct the Sohjana Barrage and Left Main Canal upto RD 10.23 with its distributaries to utilise the available water in Dhadhar River flowing in Bihar portion. It is anticipated to provide irrigation to 5868 ha land against the estimated expenditure of Rs. 20.61 crore. Civil works of Sohjana Barrage has already been completed. Mechanical work at Barrage and the distributary system will be constructed with the loan assistance of NABARD.

Indrapuri Reservoir Scheme

The project envisages construction of a dam on river Sone near village Kadwan, about 80 KM upstream of Indrapuri Barrage. The creation of this reservoir will help to ensure the water required for irrigation in the Sone Canal System, besides generating 450MW of hydroelectricity. Water Resources Department has accepted the proposal of Energy Department for the execution of this project through National Hydro Electric Power Corporation (NHPC).

[81] Website of Bihar's Water Resources Department http://wrd.bih.nic.in/ accessed on June 12, 2007

North Koel Project

North Koel Project, being constructed on river North Koel (a tributary of river Sone) benefits Aurangabad and Gaya districts of Bihar and Palamu district of Jharkhand. The head works (dam as well as barrage) falls in Jharkhand and the distribution system fall both in Bihar and Jharkhand. As per the Government of India, Ministry of Water Resources, Gazette Notification dated 14th November 2000, the project shall continue to be looked after as per the existing arrangement by the successor state of Bihar. The works of the project are being executed by the Chief Engineer, Aurangabad, Government of Bihar.

Batane Reservoir Project

Batane Reservoir Project being constructed on river Punpun benefits Aurangabad district of Bihar (10.466 Th. Ha.) and Palamu district of Jharkhand (1.660 Th.Ha.). The head works falls in Jharkhand but the distribution system lies both in Bihar and Jharkhand. As per Government of India, Ministry of Water Resources Gazette Notification dated 14th November 2000, the project shall continue to be looked after as per existing arrangement by the successor state of Bihar. The works of the project are being executed by Chief Engineer, Aurangabad, Government of Bihar under AIBP.

In addition to the projects above, there are also a number of inter-basin transfer projects that involve Bihar. These types of projects, referred to as "river inter-linking projects" in India, have
been proposed to balance water supplies and demands within the country. Parts of India receive abundant rainfall all through the year and others are often drought stricken.

The national program would link 37[82] rivers, through 30 links, and numerous dams and canals. These projects have been proposed by the National Water Development Agency (NWDA). [83] The following summary of a portion of the national plan is from the Bihar Water Resources Department:

Six river-link canals are directly related to Bihar. They are Kosi-Mechi, Kosi-Ghaghara, Chunar-Sone Barrage, Sone Dam- Southern tributaries of Ganga and the Braahmaputra-Ganga (MSTG) Link Canal. The sixth Gandak-Ganga link canal, is partly related of Bihar.

Although the *Gandak Ganga link canal* will not pass through Bihar, it will have an impact on the State's flood situation and hydrology.

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[82] The facts are taken from the 'Rivers for Life' website, http://studentorgs.utexas.edu/aidaustin/water/interlinking-rivers.pdf, Accessed on 05/04/07

[83] Material here is taken verbatim from the Government of Bihar Water Resources Department website (emphasis not in original) http://wrd.bih.nic.in/, accessed on June 12, 2007

As part of the project, a *Multi-Purpose High Dam across river Kosi* will be constructed near village, Barahkshetra in Nepal. The total storage capacity of the proposed dam is 9370 million cubic meters (MCM) while is will generate 3000 MW of hydro-electricity.

Besides the High Dam, a *barrage across Kosi river will also be constructed near village Chatra* 10-12 Kms below the Dam, to transfer water to Mechi river through the Kosi-Mechi link canal.

Two more dams will be constructed across Gandak and Sone rivers as part of the project. While the Dam across Gandak will be constructed in Nepal, the Sone Dam will be near Kadwan village in Garhwa district of Jharkhand. [84]

The Nature of Water Resources of Bihar: an Introduction

Key physiographic and climatic features of the state are given in Table D.1.

Latitude	21°-58'-10" ~ 27°-31'-15" N
Longitude	82°-19'-50" ~ 88°-17'-40" E
Rural Area	92,257.51 sq. kms
Urban Area	1,095.49 sq. kms
Total Area	94,163.00 sq. kms
Height Above sea level	173 Feet
Normal Rainfall	1,205 mm
Average Number of rainy days	52.5 Days in a Year
Net Sown Area	42% of total geographical area
Area under forests	17% of total geographical area
Fallow land	18% of total geographical area
Net irrigated area	3.4 million hectares
Gross irrigated area	4.5 million hectares

Table D.1: Some key features of Bihar http://cgwbbihar.nic.in/profile.html, accessed June 8, 2007)

From a physiographical perspective, Bihar can be divided into three units[85]:

North Bihar Plain covers about 30% of the state's area, the entire portion of Bihar north of the of Ganges.

[84] Material here is taken verbatim from the Government of Bihar Water Resources Department website (emphasis not in original) http://wrd.bih.nic.in/, accessed on June 12, 2007

[85] Website of Central Ground Water Board, Mid Eastern Region, Patna, http://cgwbbihar.nic.in/profile.html , accessed June 8, 2007.

South Bihar Plain covers about 22% of the state and stretches between the Ganges and hard rock areas in the of south Bihar.

Chotanagpur Plateau covers the entire hard rock areas of south Bihar.

Tributaries of the Ganges on the North Bihar Plain are shown in Figure D.1.

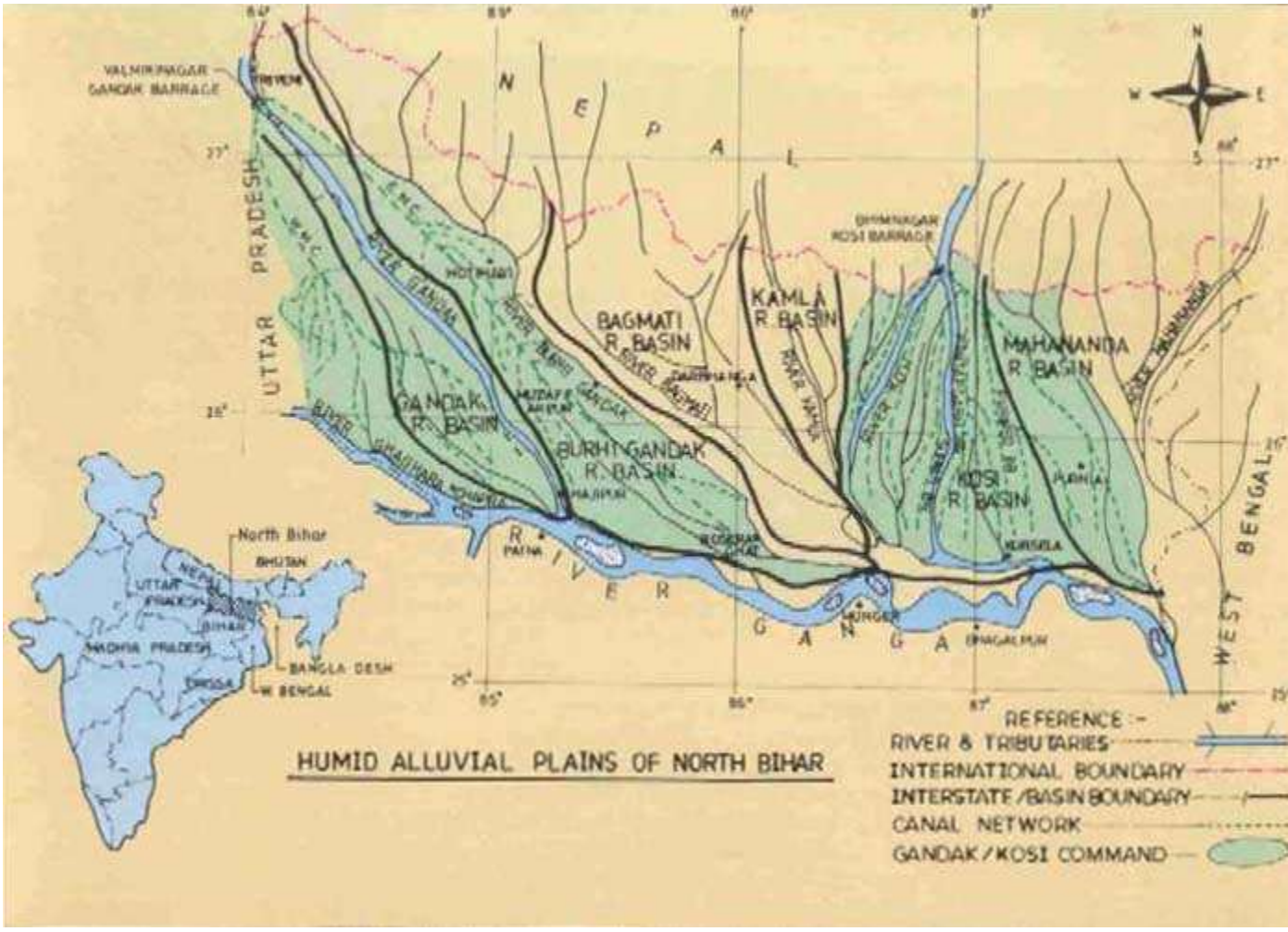


Figure D.1 Tributaries of Ganges on North Bihar Plain

Surface Water

The Ganges is joined by its tributaries with their sources in the Himalayas, including the Saryu (Ghaghra), Gandak, Budhi Gandak, Bagmati, Kamla-Balan and Mahananda. Some

other tributaries start from the plateau area and flow north to meet the Ganges: Sone, Uttari Koyal, Punpun, Panchane and Karmnasha. Figure D.2 depicts the Ganges and its main tributaries in Bihar.

Source: http://presidentofindia.nic.in/scripts/sllatest1.jsp?id=750, Accessed on 5/15/07

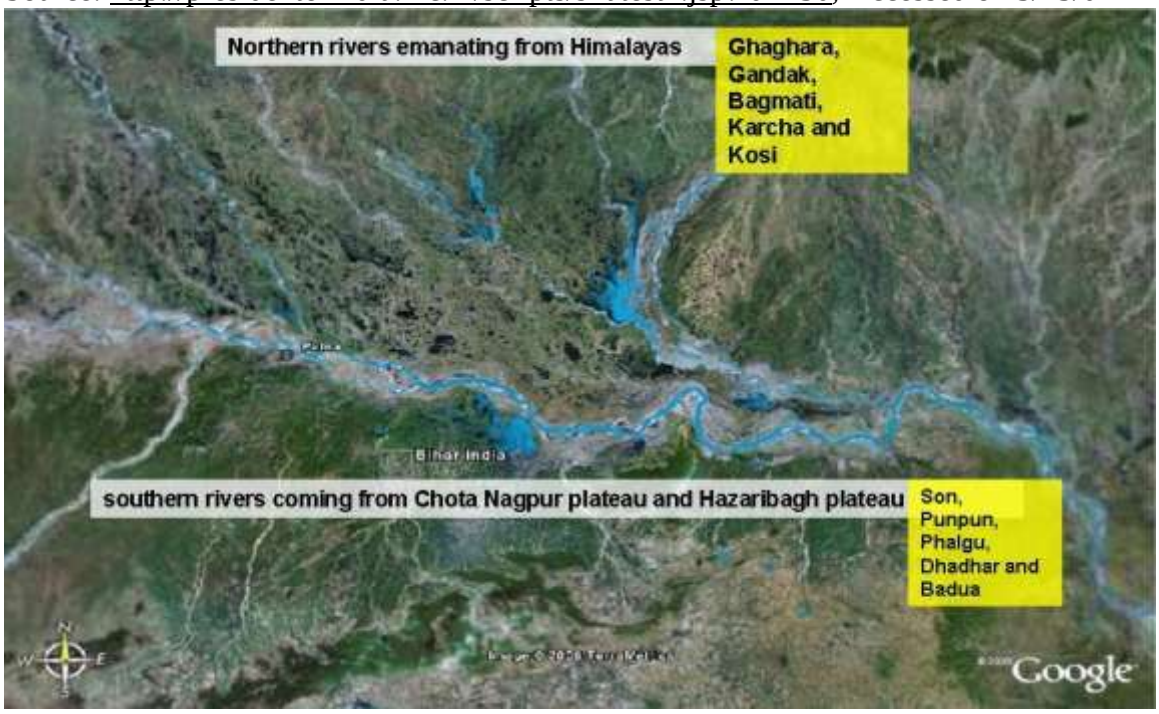


Figure D.2. Ganges and its tributaries in Bihar

Rivers outside the Ganges basin include the Subarnarekha and the Brahmni. More than 93% of the available surface water resources are contributed by the Ganges and its tributaries.[86]

[86] Website of Central Ground Water Board, Mid Eastern Region, Patna, Source: http://cgwbbihar.nic.in/ Accessed on June 9, 2007

Ground water

The Bihar plain is rich in groundwater supplies, which can be used for drinking, irrigation and industries. Groundwater level in the state varies considerably (see Figure D.3). Groundwater is available at shallow depths ranging between 2 and 5 meters in the Northern plain, whereas towards the central and Southern part of the state groundwater is available at depths more than 5 meters. In a few sections, the water table is below 10 meters. The state has groundwater potential that remains untapped.

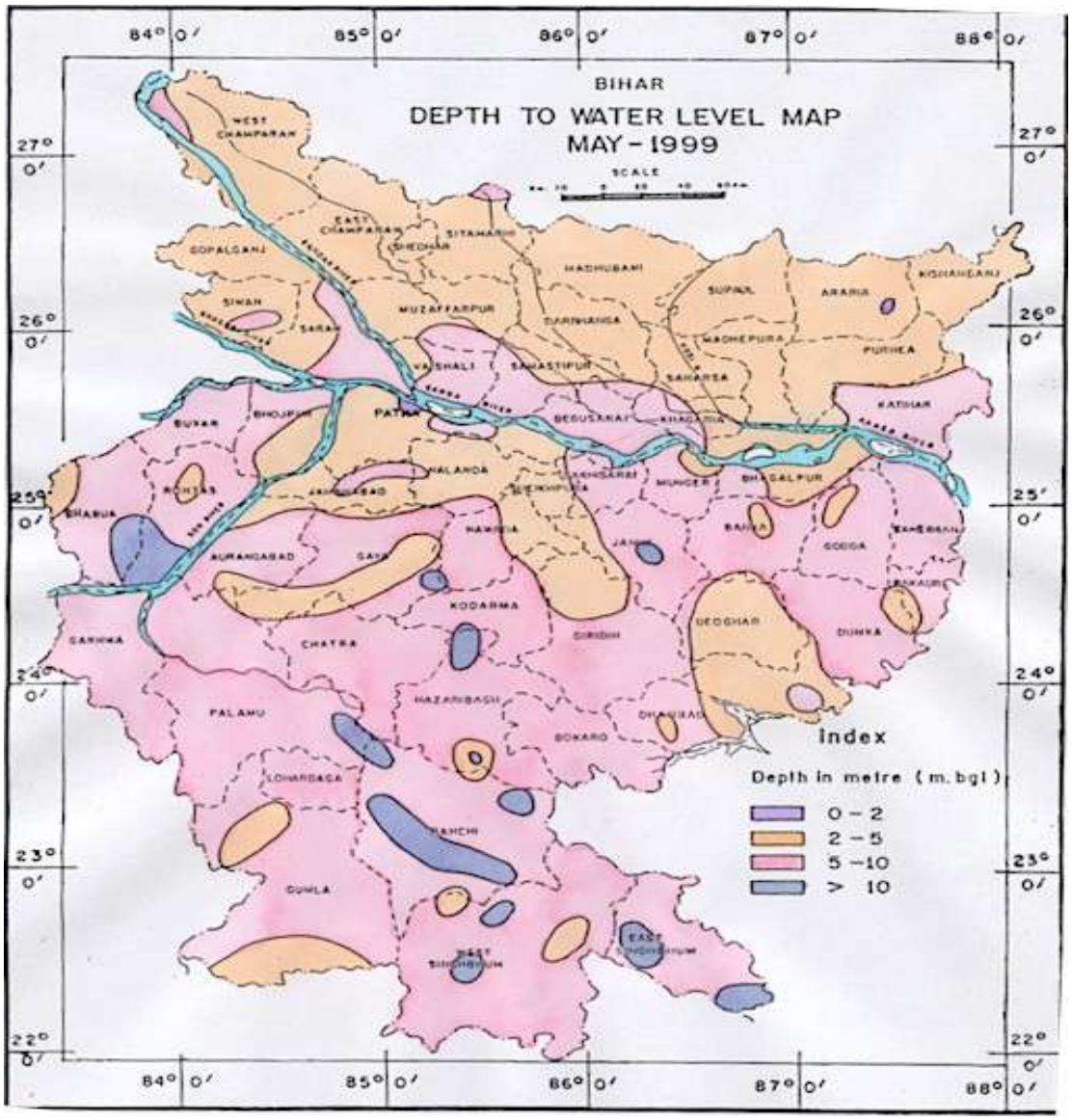


Figure D.3 Depth to Water Level – May 1999

(*S*ource: http://cgwbbihar.nic.in/images/wlav1.jpg, Accessed on June 9, 2007.)

Ground water quality of the state is monitored based on water samples from selected Hydrograph Network Stations. For the most part, Bihar's groundwater is suitable for irrigation and industrial purposes, but there are potential problems linked to use for drinking because of high levels of chloride, nitrate and iron. [87] These are reported as follows:

- Chloride ranges from 11 ppm to 580 ppm, values more than 200 ppm in patches in North Bihar Plain.
- Nitrate concentration ranges from traces to 194 ppm, with high nitrate concentrations reported in isolated patches in the following districts: East and West Singhbhum, Ranchi, and Gumla.
- In parts of Bihar Iron content is more than maximum permissible limit. It ranges from traces to 7.6 ppm . Areas with high iron content has been delineated.
- Iron content ranges from traces to 7.6 ppm; the maximum permissible limit of 0.3ppm.

Floods and Droughts

About 40 million hectares or nearly 1/8th of India's geographical area is flood-prone. The plains of north Bihar are some of the most susceptible areas in India, prone to flooding. A review by Kale (1997) indicated that the plains of north Bihar have recorded the highest number of floods during the last 30 years. The total area affected by floods has also increased during these years. [88] the plains of north Bihar have experienced extensive and frequent loss of life and property over the last several decades (Sinha and Jain, 1998).

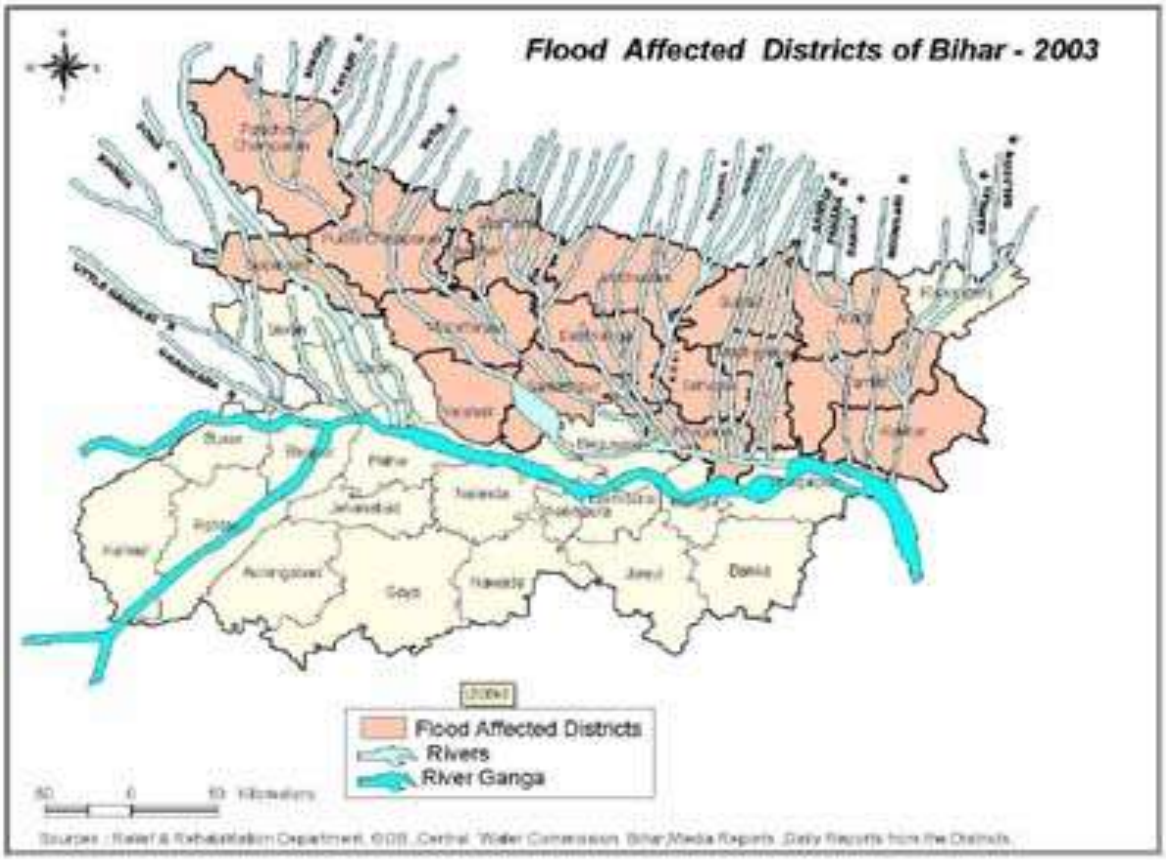
Bihar[89] is the most flood affected state of the country, accounting around 17% of the flood prone area of the country.

About 73% of the total areas of the state are flood-prone. Presently 30 out of 37 districts of Bihar belong to this category. Most of these districts fall in the northern plains of Bihar, and have recorded the highest number of floods during the last 30 years. Figure D.4 below indicates the districts in the Northern plain which are the most flood-prone. The total area affected by floods has also increased during these years.

[87] BIS values were obtained for comparison from the JUSCO Water Manual, published in 1997

[88]

[89] The facts in this section of the annex are taken from Bapalu, G.V. and R. Sinha, "GIS in Flood Hazard Mapping: a Case study of the Kosi River Basin, India available from the GIS development website, http://www.gisdevelopment.net/application/natural_hazards/floods/floods001pf.htm , Accessed on June 14, 2007.



Source: WHO website http://www.who.int/disasters/repo/10500.jpg, Accesses on June 17, 2007

Figure D.4: Flood affected districts of Bihar

As a result of flooding of two major rivers, the Kosi and Gandak, and several smaller systems such as Burhi Gandak, Baghmati and Kamla-Balan, the people of the plains of north Bihar have experienced extensive and frequent loss of life and property over the last several decades.[90] The Kosi River is well-known in India for rapid and frequent shifts in its course and the extensive flood damages it causes almost every year. The Kosi is one of the major tributaries of the Ganga River, and flows for about 320 km through the state. The river has caused extensive destruction by both lateral movement and extensive flooding.

[90] This paragraph summarizes material in Bapalu, G.V. and R. Sinha, "GIS in Flood Hazard Mapping: a Case study of the Kosi River Basin, India available from the GIS development website, http://www.gisdevelopment.net/application/natural_hazards/floods/floods001pf.htm , Accessed on June 14, 2007.

Table D.2[91] shows the recurrence interval of floods in two rivers of Bihar, along with their flow data.

Table D.2: Recurrence interval data for floods for two rivers of Bihar

River	Discharge (cubic feet per second)	Recurrence interval (in years)
Burhi Gandak river	24,000	2.05
Bagmati river	146,000	2.2

As the data in the table suggest, flooding is a frequent occurrence. Indeed, a more recent assessment refers to flooding in Bihar as an annual event, one that occurs often from mid-June through September.[92] It can affect many as 20 districts in north Bihar, and flooding in some twenty districts can occur even with relatively low rain.

In an unpublished paper, Chatterjee and Day of the Institute of Management Studies in Dehradun described the flooding situation as follows:[93]

> It is said that 'Only dark clouds are sufficient to bring floods in the districts of Saharsa, Madhepura, Supaul and Bhagalpur (Naugachhia)' as the lower areas in these districts start getting filled as the snowmelt starts in the Himalayas. Kosi that actually comprises of seven rivers of Himalayan origin coming through Nepal, ravage these districts and then the flood waters inches towards Katihar through Kursela where it joins the mainstream of the Ganga eroding its banks in Begusarai. Mahananda on the other hand, along with its tributaries, devastates the districts of Katihar, Araria, Purnea and Kishanganj to complete the picture. This annual story is repeated every year. According to the reports [on devastating sequence of floods in 2004] available from the relief and rehabilitation department till 28th September 2004, 18.83 million people were hit by floods that spread over 25 out of 37 districts, 205 blocks, 2268 Gram Panchayats, and 8208 villages of which 5788 remained marooned for over a fortnight and 679 are still engulfed. Over 1376 persons and 3592 cattle had perished in this year's flood besides destruction of 4,78,589 houses.

Elsewhere in the paper, Chatterjee and Day say:

[91] This table has been reconstructed from the Geological Survey Professional Paper website http://eps.berkeley.edu/people/lunaleopold/(055)%20River%20Flood%20Plains%20-%20Some%20Observations%20on%20their%20Formation.pdf, Accessed on 05/15/7

[92] This paragraph is based on material presented by Action Aid India, an NGO, http://www.actionaidindia.org/emr_bih_floods.htm , accessed on June 17, 2007.

[93] Chatterjee , A. and D. Day, undated, Water Woes in South East Asia: Geo-Ecology of Trans-Border River System and Dams between India and Nepal, Institute of Management Studies, Dehradun, India available at http://balwois.mpl.ird.fr/balwois/administration/full_paper/ffp-763.pdf accessed June 16, 2007.

This plain remains submerged under floodwaters for around 100-120 days a year between July and October. Major rivers of Nepal that contribute over 40 % of the total flow of the Ganges and over 70 % of its dry-season flow are Mahakali, Karnali, Gandak and Kosi of which the last two are looked up as the "sorrow of Bihar". The total amount of water though enough to meet the social, economical and environmental requirements of this part of the basin, land man ratio and per capita food grain availability is steadily declining. The integrated development and utilization approach of the basin's huge natural resources have never been sought by the regional countries due to past differences in perception, legacy of mistrust, lack of political vision, and lack of goodwill [citing Ahmed et al.[94]].

Current flood management strategy

Flood management works so far implemented comprise of construction and maintenance of embankments, revetment in selected portions of river banks, land spurs and other necessary flood protection works.

As the waters of the Kosi river carry heavy silt load and the river has a steep gradient, it has a tendency to move sideways. To check the lateral movement as well as for flood control, embankments on both sides of the river were constructed, five to sixteen km apart. Although this has confined the lateral shift of the river within the embankments, the problem of river flooding is getting more and more acute due to human intervention in the flood plain at an ever increasing scale.

A large amount of expenditure has been made for flood control and management, the problem of flooding still remains a challenge in this area.

In commenting on flood control works in the northern Bihar plains, Chatterjee and Day offer the following:

To prevent shift of the rivers and to save a vast population from annual flooding, most of these rivers were embanked in the five-year plan periods undermining the debate of over hundred years against embanking of the rivers.

Some 3465 kilometer long embankments were built along these rivers during the plan period to protect 29.28 lakh hectares (LH) of land at a cost of Rs. 1827 Crores (till March 2003). At the same time, the flood prone area of the state has raised from 25 LH (1954) to 108.81 LH (2002-when last assessed) in the said period. The balance of about 80 lakh hectares of the flood affected area is yet to be tackled forwhich, apparently, no money is available as all the money that is allocated for flood control is consumed

in maintaining the already constructed embankments. There has been, virtually, no addition in the embankment length of the rivers in Bihar for the past 17 years.

[94] Ahmed, Q.K., Biswas, A.K., Rangachari, R. & Sainju, M.M. (Eds.) (2001) *Ganges-Brahmaputra-Meghna Region: A Framework for Sustainable Development* (University Press Limited, Dhaka).

As mentioned in the section above on "Activists' Concerns over Water Projects in Bihar," NGOs have alleged the embankments and other flood control projects have led to a variety of ills including river bed silting of the river beds, preventing flood waters from draining, and water logging.[95]

Droughts

The agriculture based economy of Bihar has gone through periods in which it has been completely devastated as a result of droughts. The drought of 1966-67 is particularly well known because of the famine it caused, but there have been many droughts since then.[96] For example, in 2004, 20 out of the 37 districts of Bihar were declared drought – hit. [97]

A recent illustration of the devastation caused by droughts in Bihar concerns the drought of 2006. News accounts in March 2006 reported that fields went dry and thousands of people fled their villages in search of water and food. Hand pumps and well s went dry and women walked as far as 10 kilometers for water.[98]

According to one news account, this was a "common plight for over 20,000 villages and lakhs of people living there [Bihar]….And the water these villagers are forced to drink is not even fit for bathing." Although Jehanabad, Arwal, Gaya, Nawada and Aurangabad districts were declared as drought-hit in February 2006, many villages in other districts were also affected.

In 2004, 20 districts out of the 37 districts of Bihar were declared drought – hit. Moreover, during 2006 there was a report on monsoon failure resulting in drought-like situation in parts of the State.

Water and Sanitation

The Bihar State Water and Sanitation Mission (BSWSM), a unit within the Bihar department of Public Health and Engineering, is the state government's "nodal agency" for providing improved water supply and sanitation facilities. Among other things, BSWSM aims to provide policy guidance and coordinate activities implemented by water

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[95] Website of Action Aid India, http://www.actionaidindia.org/emr_bih_floods.htm , accessed June 17, 2007.

[96] Brass, P.R., 1986, "The Political Uses of Crisis: The Bihar Famine of 1966-1967," The *Journal of Asian Studies* 45(2) 245-267

[97] Department of Agriculture and Cooperation, Ministry of Agriculture http://agricoop.nic.in/AnnualReport06-07/DROUGHT%20MANAGEMENT.pdf, accessed on June 9, 2007.

[98] Kumar, P. 2006, "Drought, gov't.leaves bihar parched, march 23, IBN Live **http://www.ibnlive.com/article.php?id=7157&section_id=3India** accessed June 19, 2007.

and sanitation missions within Bihar's districts; and to improve access to safe drinking water and sanitary facilities (e.g., mechanisms for disposal of excreta, garbage and bio-medical waste.) [99] It is implementing India's "Total Sanitation Campaign" and "Swajaldhara" in Bihar. The Total Sanitation Campaign is a comprehensive program to ensure sanitation facilities in rural areas, with a broader goal to eradicate the practice of open defecation. The Mission is also implementing the Accelerated Rural Water Supply Program (ARWSP), which India established to achieve universal coverage of all rural villages with drinking water supply.

Information on water and sanitation in rural Bihar is not easily available and thus only information from particular experiences is reported here. A key issue highlighted in studies noted below is the central importance of open defecation as a dimension of many observed problems linking health and water. According to Jah, "[i]n India, the majority of the people use unsanitary bucket privies or resort to open air defecation," with 66% of the population relying on open defecation, an unhygienic practice leading to infections and high mortality and morbidity.[100] In Bihar, the World Bank reported that in Bihar in1999, only 16.8% of the population had access to latrine/toilet facilities, a figure that had barely progressed from the 16.5% figure reported in 1993, and one that was far below the Millennium Development Goal (MGD) goal of 25% of the population with access to the latrine/toilet facilities by 2015.[101]

The situation is better for water supply. The World Bank reported that Bihar had achieved two of its eight MDG targets, and one of those was for improvement in access to drinking water. According to World Bank, Bihar moved from its position in 1993 with 63.6% of the population having access to improve water resources to a level of 75.4% in 1999. The goal for 2015 is about 80%.[102]

Water and sanitation in the village of Barasher in Bihar's Saharsa District was the subject of a study by deSilva. The village has about 4000 people in 450 households and about 65% of the population consists of tribals and lower castes. Per capita income is on the order of $140, which, although poor by absolute standards, makes Barasher "a well-to-do village on the rural India --Bihar scale."[103] During the last few decades, residents of Barasher have moved from obtaining water supply from primarily open wells to a reliance on bamboo tubes for private hand pumps. Da Silva found that about 375 of the

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[99] Bihar State Water and Sanitation Mission website http://bswsm.org/vision-mission.htm, accessed on June 9, 2007.

[100] Jah, P.K. 2003, "Health and social benefits from improving community hygiene and sanitation: an Indian experience," *International Journal of Environmental Health Research*, 13, Supplement 1/June. Pp. S133-4.

[101] World Bank, 2005, Bihar, Toward a Development Strategy, Washington, DC, pp.10-11.
[102] Idem.
[103] DeSilva, R. N., 2002, *Environment and appropriate technologies for investment decision making in rural sanitation projects in developing countries*, Ph.D. dissertation, Division of Engineering and Applied Sciences, Harvard University, Cambridge, Massachusetts, p. 114.

450 households rely on open defecation in fields and most of the remaining households have pit or borehole toilets.

The existence of conveniently located hand pumps in Barasher has led to a notable increase in domestic water use during the past 20 years, with a corresponding increase in wastewater generation. However, in deSilva's words, "[t]here are no proper wastewater disposal pits. Water used for bathing, washing clothes and cooking utensils collect near the sources, and is left to infiltrate into the ground. Sometimes there are natural wastewater pit formations near hand pumps."[104] According to deSilva, a combination of increased wastewater disposal without proper disposal facilities, combined with the relatively high population density in Barasher, are such that "the village may be on the brink of a massive groundwater pollution disaster from the lack of sanitation."[105]

DeSilva' analysis also emphasizes linkages between literacy and sanitation. After making the general observation that many girls in poor schooling districts drop out of school after puberty because of the lack of toilet facilities in schools, she notes that this fact "keeps an important segment of society from learning and contributing to society later. More importantly these women later become responsible for health and hygiene of their families -- when they themselves have not had the opportunity to learn about the links between hygiene and health."[106] In Barasher, student absenteeism is high and villagers do not relate water and sanitation to epidemiology. Da Silva attributes this inability to link between water and sanitation disease to high illiteracy rates, especially among women.

A study of a two municipalities and four municipal corporations in Bihar and West Bengal by Pandev and Kaul found that domestic wastewater in municipal areas is collected and discharged through earth, cement-concrete, and natural drains and released into water courses or disposed of on land. Open defecation by the inhabitants in some municipalities was observed. In addition, use of scavengers for cleaning dry toilets and carrying night soil for disposal were observed in several places.[107]

Sheede reports on water and sanitation work of the Family Planning Association of India (FPAI) project in the former Bihar's, Ranchi District (now in Jahrkand), a project which includes a population of 81,000 in 160 villages. The Association's campaign, which focuses on work with Munda tribals, is intended to improve health in numerous ways, includes a water and sanitation project. According to Sheede, "[s]ince FPAI started its water and sanitation project in 1997, the incidence of diarrhea in the district has fallen

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[104] *Ibid.*, p. 124.
[105] *Ibid.*, p. 121.
[106] Idem, p. 118.
[107] Pandey R.A. and S.N. Kaul, 2000, "Status of domestic wastewater management in relation to drinking-water supply in two states of India," Schriftenreihe des Vereins für Wasser-, Boden- und Lufthygien (German)105:405-11. Abstract available in English at <http://www.ncbi.nlm.nih.gov/sites/entrez?cmd=Retrieve&db=PubMed&list_uids=10842846&dopt=Abstract accessed June 9, 2007.

dramatically from 293 cases (in 1996) to 93 in just two years, and diarrheal deaths have been completely eliminated."[108]

Hydroelectric Power Projects

Bihar State Hydroelectric Power Corporation (BHPC) is the nodal agency for development of hydroelectric potential in Bihar. The completed hydroelectric power projects in the state have a total installed capacity of 46.1 MW and are given in Table D.3.

SI No.	Project	District	Installed Capacity (MW)
1	Valmikinagar	West Champaran	15.0
2	Dehri	Rohtas	6.6
3	Barun	Aurangabad	3.3
4	Kataiya	Supaul	19.2
5.	Agnoor SHP	Arwal	1.00
6.	Dhelabagh SHP	Rohtas	1.00
		Total	**46.1 MW**

Table D.3: Completed hydroelectric power projects
(Source: Bihar State Hydroelectric Power Corporation website http://www.bshpcltd.com/, Accessed on June 11, 2007.)

There are 16 hydroelectric power projects under construction, as well as future small-scale and large-scale projects which have been proposed. Some of the important future large-scale hydro-power schemes, along with their installed capacities are listed in Table D.4.

SI No.	Project	Installed capacity (MW)
1	Sinafdar Pumped Storage Scheme	345
2	Telharkund Pumped Storage Scheme	400
3	Panchgotia Pumped Storage Scheme	225
4.	Hathiadah-Durgawati Pumped Storage Scheme	8 x 200 = 1600

[108] Shedde, M., 1999, Radical health alternatives in Bihar, Real Lives, Issue 4 (December), available at website of International Planned Parenthood Federation (IPPF), http://oldwww.ippf.org/regions/sar/rl/issue4/bihar.htm, accessed June 16, 2007

5.	Kohira Dam HEP.	400
6.	Dagmara HEP	3 x 42 = 126
7.	Indrapuri (Old name Kadhawan)	5 x 90 = 450

Table D.4. Future large-scale hydro-power schemes
(Source: Bihar State Hydroelectric Power Corporation website http://www.bshpcltd.com/, Accessed on June 11, 2007.)

The entire Eleventh Plan Document 2007-2012 for hydroelectric power is available at the website of the Bihar State Hydro-Electric Power Corp. Ltd. (http://www.bshpcltd.com/)

Bihar's Minor Irrigation Department

The main objective of the Bihar Government's Minor Irrigation Department (MID) is to create irrigation potential in a relatively short time frame using modest investment funds. In general any irrigation scheme whose cultivable command area is viewed as below 2000 hectares comes under MID's purview. According to the MID , these small projects have become poplar among farmers in Bihar, and this favorable impression is due to the following:

- Provides irrigation in comparatively shorter gestation period and at smaller investment
- Suitable in exploiting abundantly available catchment areas with their network of natural drains
- M.I. [Minor Irrigation] Projects do not pose rehabilitation and environmental conservation problems n the state
- Projects require small area and therefore land acquisition becomes easier for the State Govt.
- High patches of land which, though ,physically lie in the command of a major irrigation project, does not get irrigated. Such patches of land are provided with suitable minor irrigation scheme. In such cases minor irrigation plays a supplemental role .
- "Conjunctive Irrigation", which is nothing but exploitation of ground water in the command of Irrigation Project, does not allow the the ground water to rise.This keeps at bay the problem of water logging and salination

- Projects require small area and therefore land acquisition becomes easier for the State Govt.[109]

[109] This material is verbatim from MID's website: http://biharirrigation.nic.in/intro.htm, accessed June 1, 2007.

Annex E
Environmental Management in India

This annex contains only a brief introduction to key elements of India's environmental management framework; however, a number of extensive summaries have recently been prepared and some of them contain detailed assessments of environmental enforcement and compliance with environmental regulations. These sources include:

Government of India, 2007, Planning Commission, "Report of Steering Committee on the Environment and Forests Sector for the Eleventh Five Year Plan (2007-2012)," New Delhi (March)[110]

World Bank, 2006, India: Strengthening Institutions for Sustainable Growth, Country Environmental Analysis, Washington, DC (October).[111]

Office of Economic Cooperation and Development (OECD), 2006, Environmental Compliance and Enforcement in India: Rapid Assessment, presented at the AECEN (Asian Environmental Compliance and Enforcement Network) annual forum in Hanoi, Vietnam, 4-5 December 2006.[112]

US Environmental Protection Agency, 2005, Report on Environmental Compliance and Enforcement in India (December).[113]

Governmental Organizations Engaged in Environmental Management

The legal framework for environmental management is upheld and supported by the following institutions:

Ministry of Environment and Forests (MOEF established in 1985)

MOEF is the central government agency responsible for the planning, promotion, and co-ordination of all activities related to the environment, including but not restricted to the

[110] This Planning Commission report is available at http://planningcommission.nic.in/aboutus/committee/strgrp11/str11_E&F.pdf
[111] The World Bank report is available at http://72.14.253.104/search?q=cache:jz-Eaii1hJkJ:siteresources.worldbank.org/INDIAEXTN/Resources/295583-1176163782791/ch1.pdf+World+Bank+India:+Strengthening+Institutions+for&hl=en&ct=clnk&cd=1&gl=us&client=firefox-a
[112] The OECD report is available at http://72.14.253.104/search?q=cache:QJbvXf9Dkz8J:www.oecd.org/dataoecd/39/27/37838061.pdf+OECD+enforcement+in+India&hl=en&ct=clnk&cd=1&gl=us&client=firefox-a
[113] This report could not be obtained on the Internet; it was cited in the OECD study noted above.

formulation of national policies, standards, and regulations. The Ministry is also the "nodal agency" in India for the United Nations Environment Program (UNEP)[114].
The principal activities undertaken by the Ministry consist of conservation (and surveys) of flora, fauna, forests and wildlife, prevention and control of pollution, aforestation and regeneration of degraded areas and protection of environment, in the framework of legislation.

Central Pollution Control Board (CPCB)[115]

Established by the Water Act of 1974, the CPCB has a wide range of powers to regulate water and air pollution. It provides technical services to MOEF on any issues relating to the environment, and plans nationwide programs for the prevention and control of water and air pollution, and improvement of air quality. CPCB has the authority to bring legal action against those not in compliance with the Water Act. It also carries out, and sponsors research related to pollution control. Towards this endeavor, it collects, compiles, and publishes air and water data for the country; and it prepares manual, codes, and guidelines for industrial effluents and emissions. In addition, CPCB organizes educational programs for the public to increase awareness of environmental issues. T

The central office of CPCB is in New Delhi, and it has additional offices in Vadodara, Bhopal, Bangalore, Lucknow, Kolkata, and Shillong.

State Pollution Control Boards (SPCBs)

The SPCBs are attached to departments at the state level, typically the Environment Department, or the Forests and Wildlife Department. The role SPCBs includes the following: advise the state government on issues related to the environment; plan a comprehensive state level pollution abatement program; implement and enforce national standards (making them more stringent if local conditions demand it); and implement industrial licenses to establish, operate, and collect water cess for the use of water.

National Environmental Appellate Authority (NEAA)

The Government of India in 1997 established NEAA under the National Environmental Appellate Authority Act to allow the public to challenge environmental clearances issued by regulating agencies.[116] In spite of the huge number of clearances issued since 1997, by

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[114] Ministry of Environment and Forests, Government of India. http://envfor.nic.in/, 10 June, 2007

[115] Central Pollution Control Board, Ministry of Environment and Forests, Government of India http://www.cpcb.nic.in/, 10 June, 2007

[116] NEAA was established under appointed under Section 3 (3) of the Environment (Protection) Act, 1986. For basic facts about NEAA and an assessment of the NEAA, see Menon, M., 2005, "National Environment Appellate Authority: Puppet of the MoEF?" available at **http://infochangeindia.org/analysis96.jsp**, accessed July 11, 2007. This assessment of both NEAA and MOEF is quite negative.

2005, only 15 cases had been directed to the authority. Most cases were either not admitted owing to a delay in approaching the authority or were ruled in favor of the project proponent. One reason for rejection of cases is the authority's strict enforcement of the time limit for filing appeals. Appeals before the NEAA need to be filed within thirty days of a grant of an environment clearance, and cases submitted within the 30-90 day time frame are accepted based on the discretion of the NEAA Chairperson.

Role of the Judiciary

The Constitution of India gives each citizen the right to a healthful environment. In recent years, Public Interest Litigations (PILs) have become common.[117] Notable cases[118] of change caused by PILs include: prohibition of certain mining operations in Uttar Pradesh; the conversion of all public transport in New Delhi to motors run on compressed natural gas (instead of the previously used diesel or petroleum); and the closure of many tanneries in Vellore around the river Palar.

Environmental Laws and Regulations

The Constitution of India lists both environmental protection "rights" and "duties." Thus it confers on the states a responsibility to protect India's natural resources, as well as bestowing upon its citizens a healthful environment. Listed among the "fundamental duties" of every citizen of India is the duty to protect the environment, worded as follows: *To protect and improve the natural environment including forests, lakes, rivers and wild life, and to have compassion for living creatures.*

In addition to this constitutional mandate, India has over 200 laws related to environment protection.[119] Some of the key laws are summarized below.

Water (Prevention and Control of Pollution) Act of 1974, Amended in 1988

This Act entrusts the states with regulatory powers through the State Pollution Control Boards (SPCB); those boards are to enforce effluent standards on industries discharging effluent into water bodies. Union territories are regulated by the Central Pollution Control Board (CPCB). The CPCB also co-ordinates activities among states. The state boards advise their respective state governments on environmentally appropriate location of industrial projects.

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[117] See, e.g., Peiris G.L., 1991, "Public Interest Litigation in the Indian Subcontinent: Current Dimensions," *The International and Comparative Law Quarterly*, 40(1), 66-90.

[118] Role of PIL in Environment Protection in India, Vijay Oak http://www.legalserviceindia.com/articles/peiln.htm, 10 June, 2007

[119] Organization for Economic Co-operation and Development (OECD) report on Environmental Compliance and Enforcement in India, presented at the Asian Environmental Compliance and Enforcement Network (AECEN) annual forum in Hanoi, Vietnam on 4-5 December, 2006.

The boards use "licenses" as their main instrument of regulation. Any industry requires Consent to Establish (CTE) and then a Consent to Operate (CTO), and these are supposed to be given only after inspections are conducted to ensure satisfactory compliance with environmental regulations.

Water (Prevention and Control of Pollution) Cess Act of 1977, Amended in 1991[120]

This Act stipulates the use of water fees for water withdrawal. The fees are levied as a tax (or "cess") calculated at rates specified by the government. Two rates have been applied, a lower one for industries that complied with the Water Act of 1974 and (later) the Environment Protection Act of 1986, and a higher one for the others.
This Act also required the installation and maintenance of stipulated water meters to measure quantities of water use; such measurements are necessary to calculate water fees.

Air (Prevention and Control of Pollution) Act of 1981, Amended in 1987

With a framework similar to the Water Act, this act gives state and central authorities power to issue consents required by industries to operate their facilities. It also allows the prescription of emission standards for moving and stationary sources.

Environment Protection Act (EPA) of 1986

Spurred by the Bhopal disaster of 1984, the Government of India decided it needed a broad overarching national environmental law that provides protection of air, water, and land, and created a framework for the co-ordination of activities of authorities established by the Water Act and Air Act. The Environment Protection Act (EPA) of 1986 required the central government to set national ambient and emission standards, establish procedures for managing hazardous substances, regulate industrial locations, investigate pollution, and establish laboratories to collect, process, and disseminate information.

The Indian Forest Act of 1927

This Act came into force long before the country of India, as it is known today, was established. It bestows on the state governments the rights to create "reserve forests," and to transfer to village communities the state's rights to a forest. The Act also lists all the activities that are prohibited in forests, such as quarrying stone, and clearing land for cultivation.

Wildlife Protection Act of 1972

This Act provides protection to wildlife in India; among other things, it unequivocally bans the hunting of wild animals (except in some exceptional cases); the uprooting or destruction of plants from land specified by the central government (the only exception to

[120] As described by the Delhi Pollution Control Committee http://dpcc.delhigovt.nic.in/actcess.htm, 10 June, 2007

this rule are Scheduled Tribes who are allowed to collect and use plants for their personal use); and the sale of wild animals, their body parts.

Public Liability Insurance Act (PLIA) of 1991

The PLIA requires business owners dealing with hazardous substances to take out insurance policies covering potential liabilities from an accident, and it also requires the same owners to establish Environmental Relief Funds to provide for aid in the eventuality of an accident occurring involving hazardous substances.

National Environmental Appellate Authority Act of 1997

This Act allows for the establishment of an authority to hear appeals with respect to restriction of areas in which any industries may be allowed, or not, to carry out operations, with safeguard measures.

Environmental Impact Assessment (EIA) notifications, 1994 and 2006

According to the Environmental Impact Assessment (EIA) notification, 1994, all new projects, the expansion or modernization of existing projects and projects involving a change in product mix in an existing unit will be subjected to certain restrictions and prohibitions, unless they obtain prior Environmental Clearance (EC) from the Central Government. Clearance is sanctioned by the Central Government based on an Environmental Impact Assessment Report, an Environmental Management Plan[121] and results of public consultation. The Central Government consults a Committee of Experts constituted by the Impact Assessment Agency (IAA)[122]. In addition, site clearance from the MOEF is required for specified projects like construction, operation or mining. IAA is also responsible for monitoring the implementation of the recommendations made during the issuance of the EC.

The scheme established in 1994 was modified by the Environmental Impact Assessment (EIA) notification, 2006, which included a list of projects that require EC.[123] The schedule delineates projects as being in category A or category B depending on the project scale.
All projects falling under Category A in the schedule must obtain EC from the Central Government before beginning any kind of construction. In contrast, projects falling under Category B must obtain EC from the State Environmental Impact Assessment Agency (SEIAA).

Environmental Policies

[121] An Environmental Management Plan is a monitoring plan developed by the project proponent to mitigate the adverse impacts of the project.
[122] IAA is formed by MOEF.
[123] The EIA Notification of 2006 is available at the MOEF website; see http://envfor.nic.in/.

In addition to the laws noted above, MOEF has created several national policies to help attain its environmental protection goals. They include the following: [124]

National Environmental Policy – 2006
National Conservation Strategy and Policy Statement on Environment and Development
Wildlife Conservation Policy—2002
National Forest Policy -- 1998
National Zoo Policy
Policy Statement on Abatement of Pollution—1992

In addition, some sector policies, such as those listed below, have also contributed to environmental Management in India.

National Population Policy – 2000
National Agricultural Policy – 2000
National Water Policy -- 2002

These policies serve as guiding principles for central and state governments as they formulate their environmental laws; however, the policies themselves are not enforceable in court. Additional information on some of these policies is summarized below policies are noted below[125]:

National Environmental Policy of 2006

The main goals of this policy are:

- conservation of critical environmental resources,
- inter and intra generational equity,
- efficiency of environmental resource use, and
- improvement of environmental governance and conservation.

The policy describes in detail the environmental resources available to the country (such as deserts, forests, wildlife, water, wetlands etc.) as well as key issued that need to be considered such as pollution, climate change, environmental standards and regulations, and awareness and education.

National Policy on Abatement of Pollution (NPPA, 1992)

Realizing that national policy had (until the 1990s) focused narrowly on end-of-the-pipe-treatment, the Ministry of Environment and Forests issued a comprehensive policy statement aimed at integrating environmental considerations into decision making at all levels. The policy advises the following:

[124] These policies are available at a section of the MOEF website, namely, http://envfor.nic.in/
[125] These two policies are as described by the National Productivity Council of India http://wmc.nic.in/chapter1-policyinstruments.asp#4.2, 10 June, 2007

- Prevention of pollution at the source
- Striving towards use of "best available technology"
- Ensuring the polluter pays for damage and control (i.e., polluter pays principle)
- Focusing first on heavily polluted areas, and protection of river stretches
- Encouraging public participation in decision making

National Conservation Strategy and Policy Statement on Environment and Development (NCS/PSED, 1992)

This policy provides a framework for environmental management. Key instruments for positive environmental change have been identified as environmental impact assessment reports, educational campaigns, and public participation. Priority areas have been identified as the following:

- Conservation of natural resources such as land and water
- Prevention and control of atmospheric pollution including noise pollution
- Industrial development using both incentives and regulations

The Eleventh Five Year Plan (2007-2012)

The previously mentioned "Report of Steering Committee on the Environment and Forests Sector for the Eleventh Five Year Plan (2007-2012)" includes numerous recommendations for consent of the Eleventh Plan, including the following:

- The Eleventh Plan needs to work on integrating development planning and environmental concerns, providing for the use of economic instruments based on principles such as the "polluter pays", supplemented by command-and-control policies where these are more appropriate.
- In order to strengthen the framework of governance and integrate environmental concerns into all planning and decision-making processes across all sectors and development activities of the Central Government an independent, statutory Commission on Sustainable Development (CSD) and District Paryvayan Vahinis have been proposed. Setting up of a National Environment Clearance Authority (NECA) and State Environment Clearance Authority (SECA) will also help in improving the quality, independence, and transparency of the Environmental Impact Assessment (EIA) process.
- The NRCP [National River Conservation Plan] should graduate from being a 'sewage treatment plan' to a programme with a more broad-based approach. The integration of NRCP and NL CP [National Lake Conservation Plan] with the investment being made under the JNNURM [Jawaharlal Nehru National Urban Renewal Mission] will need to be pursued for affective impact on pollution abatement of water bodies.[126]

[126] From the Planning Commission report, http://planningcommission.nic.in/aboutus/committee/strgrp11/str11_E&F.pdf. accessed on June 11, 2007.

Annex F
NGOs in Bihar

This annex consists of an unedited compilation of data sources on NGOs in Bihar. The reason for compiling this information is that information on NGOs in Biahr is not easy to find. This it appears worthwhile to compile the data sources that have been found in one place fro use in the future.

NGOs India—The Web Portal for NGOs in India

From: http://www.ngosindia.com/

"NGOsIndia.com is a online web directory and resource centre of Indian NGOs. The portal is containing information about grassroot level Non-Governmental Organizations (NGOs) , POs, GOs in India, Funding Agencies, social activists and concerned stakeholders, Funding Agencies, issues, projects, job opportunities in social sector, success stories of individuals as well as organizations, and other relevant links."

From: http://www.bihar.ngosindia.com/

Bihar NGOs (Non Governmental Organizations)

Adarsh Gramin Vikas Samiti
Adithi
Agrotech Consultants
Asian Development Research Institute
Assert Institute of Management Studies
Aulia Adhyatmik Anusandhan Kendra Aulia Darbar
Bal Sakha
Bashirul Hoda Islahul Muslemin Welfare Society
Bihar Gram Vikas Parisad
Bihar Gramin Vikas Parishad
Bureau of Rural Economical and Agriculture Development
Calcutta Social Project
Centre for Action Research and Development Initiative
Centre for Communication Resources Development
Centre for Documentation, Information, Research, Education, Communication and Training
Centre for Planning Development and Science
Centre for Urban and Rural Development, Nalanda
Centre for Youth Development
Daudnagar Organisation for Rural Development

Deepa Devi Manav Kalyan Sansthan
Deepayatan
Deptt. of Institutional Finance and Programme Implementation
Development Network
Discipleship Centre, Bihar
Environment Conservation Outreach Task Force
Family Planning Association of India, Patna Branch
ICON Communications
Integrated Development Foundation
Jan Jagran Sansthan
Jan Sewa Parishad
Korea Bihar Institute
L.N. Mishra Institute of Economic Development and Social Change
Lok Parivartan Kendra
Lok Prerna
Magadh Shikshan Shansthan
Magadh Shilp Kala Kendra
Mahila Mukti Wahini
Mobile Theatre
National Development and Social Welfare Council
NDCC
Nidan
Pallav Samajik Sewa Sanstha
Panna Devi Mahila Shilp Prashikhan Kendra
Rights Collective Nalanda
Rohtas
Rural Development Environment Protection Forestation and Research Organisation
Samadhan
Seeta Gramodyog Vikas Sansthan
Seventh Day Adventists Hospital
Shaheed Bachchan Smarak Pustakalaya

Shakti Vardhini
Shramajivi Unnayan
Sitaram Singh Foundation of Social Welfare and Rural Development
Society for Population and Development Studies
Society for Rural Industrialisation
St. Lukes Hospital
Swablamban Siksha Kendra
The Voluntary Organisation in Interest of Consumer Education Social Change and National Development
Vaishali Samaj Kalyan Sansthan
Vidyapati Samajik Evam Shikshan Vikas Sansthan
Young Men's Christian Association, Ranchi

Indianngos.com – Social and Development Canvas of India

IndianNGOs.com Pvt Ltd
6 C, Devendra Apartments
Next to Sahayog Mandir
Ghantali, Naupada
Thane 400 602
Maharashtra
India
Ph : 022 6553 5698
e mail : Info@IndianNGOs.com

Website: http://www.indianngos.com/

From: http://www.indianngos.com/districts/index.htm

Can we help you identify credible NGOs districtwise ?
Sure
IndianNGOs.com consulting has been identifying credible NGOs to partner with for corporate and funding agency clients
This is a paid and customer driven service
Contact Sanjay

Also, for a district by district breakdown of NGOs in Bihar, see
http://www.indianngos.com/districts/index.htm

Indianngos.com is a paid subscriber organization

Directory of Environmental NGO's in India

Information on NGO profiles is published in the Directory of Environmental NGO's in India. It is available as computerized database. See http://envfor.nic.in/

The ENVIS Centre 07 at World Wide Fund for Nature-India (WWF-India)

From: **http://www.wwfenvis.org/**

"The ENVIS Centre 07 at World Wide Fund for Nature-India (WWF-India) was established on October 27, 1984 under the Environmental Information System (ENVIS) Programme of the Ministry of Environment & Forests, Government of India. The Centre was assigned the responsibility for being the focal point for information on:

- **NGO's and the Environment**

- **Parliament and the Environment**
- **Media and the Environment**"

The following information about ENVIS is from the website of India's Ministry of Environment and Forests

Non-Governmental Organizations (NGO) Directory
[List of the leading Non-governmental organizations that are operating within the country]

ENVIS Centre at World Wide Fund for Nature-India, New Delhi has published an NGO Directory working in the field of Environment.

For more details please contact:-

Mr. Ravi Singh - Secretary General and CEO

Mr. G. Areendran - Head ENVIS Centre

Address: World Wide Fund for Nature-India
172-B, Lodi Estate, New Delhi - 110 003.

E-mail:igcmc@wwfindia.net, rkumar@wwfindia.net
Website : http://www.wwfenvis.org/

Telephone : +91-011-51504791/51504794
Fax : +91-011-51504779/4795

Bihar Times

A website of the Bihar Times contains a listing of contact information fro NGOs working in Bihar. It is available at http://www.bihartimes.com/ngos/ngos.html

[1] The World Bank, 2004, *OP 8.60 Development Policy Lending.*
[2] Government of Bihar, 2007, *Economic Survey 2006-07*, Department of Finance, Patna, p. i. For a more complete introduction to Bihar, see Annex A.
[3] Bihar State Pollution Control Board, Patna and Department of Environment and Forests, Government of Bihar, 2007. "State of Environment Report, Bihar," Bihar State Pollution Control Board, Patna. pp.100-101.
[4] *Ibid.*, p.101.
[5] *Ibid.*
[6] *Ibid.*
[7] Government of India, 2007, *2006-07 Economic Plan*, p. 3.
[8] World Bank, 2005, *Bihar, Towards a Development Strategy*, Washington, DC, table 1.2, p.11.
[9] *Ibid.*, p.10. In 2005, Bihar's per capita income was reported as $94 a year against India's average of $255. Biswas, S., "Analysis: Turning point for Bihar?" *BBC News*, Delhi, 22 November 2005, http://news.bbc.co.uk/2/hi/south_asia/4458976.stm accessed June 8, 2007.
[10] For a more complete introduction to Bihar's economy, see Annex B.
[11] Information in this paragraph is from Government of Bihar, *Economic Survey 2006-07*, *op. cit*., p. 9.
[12] This paragraph is based on Government of Bihar, *Economic Survey 2006-07*, *op. cit.*, pp. 4-5.
[13] Government of Bihar, *Economic Survey 2006-07*, *op. cit.*, p. 13.
[14] *Ibid.*, p.43.
[15] *Ibid.*, p.37.
[16] *Ibid.*, p.33-4.
[17] *Ibid.*, p.30-1.
[18] *Ibid.*, p.40
[19] *Ibid.*, p.41.
[20] *Ibid.*, p.42.
[21] *Ibid.*, p.46.
[22]Factories in these two basic industrial groups contributed to more than 85% of total industrial output in 2002 – 03.[22] Of Bihar's 259 large and medium units, 32% are in the food/beverages/tobacco group, and more than half of these units are in two divisions: Patna and Tirhut. Government of Bihar, *Economic Survey 2006-07*, *op. cit.*, p. 48. As of December 2006, Bihar had over 161000 industrial units officially registered as small, tiny, or artisan-based, and they employed over 530,000 persons. Government of Bihar, *Economic Survey 2006-07*, *op. cit.*, p.64. In contrast to the medium and large units, which are concentrated in a few divisions, the small, tiny, and artisan-based are spread throughout the state.
[23] Government of Bihar, *Economic Survey 2006-07*, *op. cit.*, p..50.
[24] *Ibid.*, p.51.
[25] Presentation by Chief Minister of Bihar, Mr. Nitish Kumar on 26 Nov 2006, at Indian Institute of Management, Ahmadabad, sourced from the Govt. of Bihar website on Industries. http://industries.bih.nic.in/Ppts/Presentation%20at%20IIM.pdf, 1 May 2007.
[26] Vision of His Excellency the President of India on Sugar Industry in Bihar. http://gov.bih.nic.in/depts/sugarcane/visionofpresident.htm, 1 May 2007.
[27] "Bihar amends sugar act to boost ethanol output", 6 April 2007, Business Standard. http://www.business-standard.com/common/storypage_c.php?leftnm=10&autono=280131
[28] "Bihar provides a sweet cure for sugar sector- offers attractive incentive, plans PSU units privatization", The Hindu Business Line. http://www.thehindubusinessline.com/2006/02/24/stories/2006022401131200.htm, 1 May 2007.
[29] Government of Bihar website http://gov.bih.nic.in/depts/sugarcane/, 1 May 2007.
[30] Some of the items below are also singled out in the Chief Minister's presentation to the Indian Institute of Management made on 26 Nov 2006, Ahmadabad. http://industries.bih.nic.in/Ppts/Presentation%20at%20IIM.pdf, 5 May 2007.
[31] Information in this paragraph is from the Bihar Industrial Area Development Authority website, http://biada.org.in/ip.htm and http://biadaand.org.in/igc.htm , accessed June 1, 2007.
[32] An introduction to caste-based politics in Bihar is given in Annex C.

[33]According to a definition at Answers.Com, "*yadav* is an Indian caste which is referred to in ancient Dharmic scriptures. They are among the few surviving ancient Aryan *kshatriya* [ruler and warrior] clans …. *Yadavs*, though being *kshatriya* in certain parts of *Aryavart* [the ancient name for northern and central India] are classified by the respective governments as Other Backward Classes, or OBCs. This classification stems from their prevailing general economic and educational condition." From http://www.answers.com/topic/yadav , accessed June 26, 2007.
[34] Luce, E., 2007, *In Spite of the Gods: the Strange Rise of Modern India*, Doubleday, NY, p. 116.
[35] Lalu was defeated in 2005 "by a rainbow coalition of the lowest castes, or extremely backward castes (EBCs), upper castes and breakaway Muslim and Dalit voters, many of whom had voted faithfully for Mr. Yadav over the past 15 years." Biswas, S., 2005, "Delhi Analysis: Turning point for Bihar?" BBC News, Delhi, November 22, 2005, http://news.bbc.co.uk/2/hi/south_asia/4458976.stm accessed June 4, 2007.
[36] Tewary, S., 2005, "Bihar's loyalties cast in stone," BBC News Patna, February 19, 2005, available at http://news.bbc.co.uk/2/hi/south_asia/4276379.stm, accessed June 4, 2007.
[37] *Ibid.*
[38] Das, A., "Bihar's lawless ways," *UNESCO Courier*, February 1999, http://www.unesco.org/courier/1999_02/uk/dici/txt1.htm accessed June 5, 2007. Arvind N. Das, was a well known Indian sociologist, a native of Bihar, and author of several studies on Bihar.
[39] World Bank, 2005, *Bihar, Towards a Development Strategy*, World Bank, Washington, DC.
[40] Government of Bihar, 2007, *2006-07 Economic Survey, Department of Finance, Patna.*
[41] . The Government of Bihar, undated, "White Paper on State Finances and Development," Department of Finance, Patna, p. 5. Available at http://finance.bih.nic.in/FWP-English.pdf, accessed June 27, 2007.
[42] Biswas, S.,2005, "Analysis: Turning point for Bihar?" BBC News, Delhi, November 22, 2005, http://news.bbc.co.uk/2/hi/south_asia/4458976.stm accessed June 4, 2007

[43] Prakash Yadav, J., 2007, "Nitish losing law & order advantage," *The Indian Express*, Monday, May 14, 2007, **http://www.indianexpress.com/story/30876.html**, accessed June 5, 2007.
[44] Das, A., "Bihar's lawless ways," *UNESCO Courier*, February 1999, http://www.unesco.org/courier/1999_02/uk/dici/txt1.htm accessed June 5, 2007.
[45] *Dalits*, formerly called "untouchables" or "outcastes," are literally outside of classification scheme made up of the traditional four part caste system: *brahmans* -- priests and the learned class; *kashatriyas* -- rulers and warriors; *vaishyas* -- traders and other members of the merchant class; and *sudras* -- manual laborers and artisans.
[46] Iype, G, "The Naxal's: Bihars Bane," The Rediff Special, November 14, 2005, http://in.rediff.com/news/2005/nov/14nax21.htm accessed June 18 , 2007
[47] Chaudhuri, K., "End of a terror trail," Frontline, India's National Magazine, Volume 19, Issue 19, September 14 - 27, 2002, Frontline, India's National Magazine http://www.hinduonnet.com/fline/fl1919/19190330.htm, June 18, 2007.

[48] Website of the Southeast Asia Terrorism Portal **http://www.satp.org/satporgtp/countries/india/terroristoutfits/Ranvir_Sena.htm**, accessed June 18, 2007.

[49] For a more complete discussion of water resources issues in Bihar, see Annex D.
[50] Gyawali, D. 1999, "Institutional forces behind water conflict in the Ganga plains," *GeoJournal*, 47, p. 446.
[51] *Ibid.*
[52] Website of Action Aid India
[53] This is according to Gyawali, op. cit.
[54] Website of Rivers for Life, http://studentorgs.utexas.edu/aidaustin/water/interlinking-rivers.pdf, accessed on June 11, 2007.
[55] In making its case, Rivers for Life cites the report **"**Dying Wisdom," which argues for a revival of local water harvesting systems in India. For more on Dying Wisdom, see the website of the Centre for Science and Environment, http://www.cseindia.org/html/extra/twhs.htm, accessed June 11, 2007.

[56] Anon., 2006, "Inter-linking of rivers must to solve floods and drought: Nitish," The Hindu, Thursday, May 25, 2006, http://www.hindu.com/2006/05/25/stories/2006052515980300.htm, accessed June 26, 2007.
[57] For an introduction to environmental management in India, see Annex E.
[58] Annex F contains information on NGOs in Bihar.
[59] For an example of monetization that has already been carried out, in this case for flood damages, see [59] Bihar State Pollution Control Board, 2007,"State of Environment Report, Bihar," *op.cit*., pp.98-99.
[60] For example, poor farmers are likely to be hit particularly hard by changes in climate because they are unlikely to have the resources needed to adapt to such changes.
[61] DeSilva, R. N., 2002, *Environment and appropriate technologies for investment decision making in rural sanitation projects in developing countries*, Ph.D. dissertation, Division of Engineering and Applied Sciences, Harvard University, Cambridge, Massachusetts, p. 118.
[62] Durning (1992, as cited by Sawehney, 2004, p. 61) "analyzed the world by three consumption classes: high income consumers, middle income consumers, and under consumers. The consumption pattern of high income consumers (1.1 billion in number) constituting 20% of the global population, is characterized by a diet of meat, packaged food and soft drinks, are transported by private cars and use throwaway materials. The middle-income consumers (numbering 3.3 billion), 60% of the global population, have a diet of grain and clean water, are transported by bicycles and buses, use durable materials, and have virtually no 'luxury' items. The remaining 20% of the population are the under consumers (numbering 1.1 billion) with insufficient grain, unsafe water, no vehicular transport, and dependent on local biomass. In particular, the US accounting for barely 5% of the global population, accounts for 22% of fossil fuel consumption, 24% of carbon dioxide emissions, and 33% of paper and plastic used [Sawehney, 2004, p. 61, citing Durning]." From Sawhney, A., 2004. *The New Face of Environmental Management in India.* Ashgate Pub., Hants, UK, p.61. As Sawhney later observes: "While the [trade] liberalization has brought in newer and better car models in the [Indian] domestic market at bargain prices, mass transit systems in the cities remains poor. This has encouraged increased ownership of cars and two wheelers in India increasing both road congestion and air pollution."
[63] Sawhney, A., 2004. *The New Face of Environmental Management in India.* Ashgate Pub., Hants, UK, p.64.
[64] Bihar State Pollution Control Board, Patna and Department of Environment and Forests, Government of Bihar, 2007. "State of Environment Report, Bihar," Bihar State Pollution Control Board, Patna. p.60.
[65] A key issue in Bihar and other rural parts of India open defecation, an unhygienic practice leading to infections and high mortality and morbidity.[65] The World Bank's 2005 report, Bihar, Towards a Development Strategy, noted that in Bihar in1999, only 16.8% of the population had access to latrine/toilet facilities, a figure that had barely progressed from the 16.5% figure reported in 1993, and one that is far below the Millennium Development Goal (MGD) goal of 25% of the population with access to the latrine/toilet facilities by 2015.[65] The situation is better for water supply. The World Bank reported that Bihar had achieved two of its eight MDG targets, and one of those was for improvement in access to drinking water. According to World Bank, Bihar moved from its position in 1993 with 63.6% of the population having access to improve water resources to a level of 75.4% in 1999. The goal for 2015 is about 80%. See, also, the annex on Water- Resources Related Issues.
[66] According to Agarwal, during the monsoon and continuing for a month or two thereafter, runoff from agricultural fields is a notable source of silt loads, dissolved salts, nutrients, bacteria, and heavy metals in India's rivers. See Agarwal, G.D., "Diffuse agricultural water pollution in India," *Water Science and Technology*, 39 (39): 33 -- 47. Available at <http://www.ingentaconnect.com/content/els/02731223/1999/00000039/00000003/art00030> accessed on July 16, 2007.
[67] See, e.g., Chakraborti , D. et al., 2003, "Arsenic Groundwater Contamination in Middle Ganga Plain, Bihar, India: A Future Danger?", *Environmental Health Perspectives,* 111(9):1194.
[68] Bihar State Pollution Control Board, Patna and Department of Environment and Forests, Government of Bihar, 2007. "State of Environment Report, Bihar," Bihar State Pollution Control Board, Patna. p. 26. Note that *Rabi* (winter) cultivation in Bihar often begins in October or November and the rabi crop is harvested in March or April. (*Ibid*. p.120.) The *kharif* (rainy) season often starts in June in Bihar. From Chaudhary, V. K. and V. K. Shahi, "Origin of Rabi (winter) maize in India,"

undated, available at http://www.agron.missouri.edu/mnl/64/153chaudhary.html accessed June 27, 2007.

[69] Bihar State Pollution Control Board, 2007, "State of Environment Report, Bihar," *op. cit.* p. 27. "[W]ater logged area mainly falls in the Gandak and Kosi basins." *Ibid.* p.92.

[70] *Ibid.*

[71] *Ibid.* p. 93.

[72] *Ibid.* p.26.

[73] *Ibid.* p. 96.

[74] Droughts have been a continuing problem, especially in south Bihar; see annex on Water Resources.

[75] See Annex G on Global Climate Change and Agriculture.

[76] Bihar State Pollution Control Board, 2007, "State of Environment Report, Bihar," *op. cit.* p. 96..

[77] During the most recent five year period, domestic sales of all types of motor vehicles in India, rose by 70% from nearly 6 million vehicles in 2002-03 to slightly over 10 million in 2006-07. Domestic market share in 2006-07 was: 77%, two wheelers (e.g., scooters and motorcycles); 14% passenger vehicles; 5% commercial vehicles; and 4% three wheelers. Website of Society of Indian Automobile Manufacturers, http://www.siamindia.com/scripts/industrystatistics.aspx accessed June 14, 2007.

[78] *Patliputra* is an ancient name for Patna.

[79] Bihar State Pollution Control Board, 2007, "State of Environment Report, Bihar," *op. cit.* p. 69.

[80] *Ibid.* pp. 44-46.

[81] *Ibid.* pp.83-4.

[82] *Ibid.* p.87.

[83] See Annex E -- Environmental Management in India.

[84] Government of India, Planning Commission, 2007, "Report of Steering Committee on the Environment and Forests Sector for the Eleventh Five Year Plan (2007-2012)," New Delhi (March), available at http://planningcommission.nic.in/aboutus/committee/strgrp11/str11_E&F.pdf accessed June 11, 2007.

[85] The Environmental Management annex was prepared using published literature and web-based materials. While much information is available from these types of sources on environmental management in India, little comparable information is available for Bihar.

[86] See, e.g., Sawhney, A. 2004, "The New Face of Environmental Management in India," Ashgate Publishing, Hants, U.K.

[87] World Bank, 2005, "Bihar, Towards a Development Strategy," Washington, DC, p. 5

[88] See Annex B: "Bihar's Economy – Agriculture and Industry."

[89] World Bank, *Bihar, Towards a Development Strategy*, *op cit.*, p.3

[90] *Ibid.*, p.2.

[91] *Ibid.*, pp. 4-6.