Government of Bihar

Bihar Kosi Basin Development Project
Under The World Bank Assistance

'Converting Adversity into Opportunity'

Environmental and Social Management Framework

FINAL REPORT

April 2015

Bihar Aapada Punarwas Evam Punarnirman Society
Patna

PREFACE

This Environmental and Social Management Framework (ESMF) is prepared by Bihar Aapada Punaravas Evam Punarnirman Society (BAPEPS) for the World Bank assisted Bihar Kosi Basin Development Project (BKBDP).

The ESMF preparation team in BAPEPS was headed by Dr. Deepak Prasad, IAS, Project Director, BAPEPS and Mr. N. P. Mandal, Additional Project Director, BAPEPS. The team members included Dr. Ravi Kumar Gupta, Environmental Specialist, Md. Azam Khan, Social Mobilization Officer and Mr. Ravi Prakash Singh, Grievance Redressal Officer. The BAPEPS team was assisted by support teams, from time to time, drawn from the participating line departments, such as Water Resources Department, Minor Water Resources Department, Roads Construction Department, Bihar Rajya Pul Nirman Nigam, Rural Works Department, Agriculture Department and Animal Husbandry Department.

This ESMF along with a translation of the executive summary in Hindi has been placed at BAPEPS web site and hard copies were kept at the District Information Centers in the project districts. BAPEPS is committed to this ESMF implementation in letter and spirit. This ESMF will be updated from time to time as the BKBDP is implemented duly taking into account the sub-projects experiences.

April 2015

Project Director
BAPEPS

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List of Acronyms

AESA	Agro Ecosystem Analysis
Ag. D	Agriculture Department
AME	Agri Man Ecology
APO	Accident Prevention Officer
ARAP	Abbreviated Resettlement Action Plan
ASA	Action for Social Advancement
BAPEPS	Bihar Apada Punarwas Evam Punarnirmanm Society
BCM	Billion Cubic Meters
BDO	Block Development Officer
BKBDP	Bihar Kosi Basin Development Project
BLARRP	BiharLand Acquisition Resettlement and Rehabilitation Policy
BPNNL	Bihar Pul Nirman Nigam Limited
BRRDA	Bihar Rural Road Development Agency
BSPCB	Bihar State Polluction Control Board
Bt	Bacillus Thuringensis
CIPMCs	Central Integrated Pest Management Centers
CO	Carbon Monoxide
CUMECS	Cubic Meter per Second
DG	Diesel Generating
DMD	Disaster Management Department
DPR	Detailed Project Report
EA	Environmental Assessment
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
ERR	Economic Rate of Return
ESA	Ecologically Sensitive Area
ESMF	Environmental and Social Management Framework
ESC	Environmental and Social Checklist
ETL	Economic Threshold Level
FES	Foundation for Ecological Security
FFSs	Farmers Field Schools
FMIS	Flood Management Information System
FSL	Full Supply Level
GDP	Gross Domestic Product
GFCC	Ganga Flood Control Commission
GIS	Geo Information Systems
GoB	Government of Bihar
GoI	Government of India
GP	Gram Panchayat
GRC	Grievance Redressal Committee
GT	Grand Trunk
GWMS	Ground Water Monitoring System
HFL	Highest Flood Level
HIV / AIDS	Human Immunodeficiency Virus/ Acquired Immunodeficiency Syndrome
IEC	Information Education and Communication
IPM	Integrated Pest Management

IRC	Indian Road Congress
LA	Land Acquisition
LPG	Liquid Petroleum Gas
MoEF&CC	Ministry of Environment, Forests and Climate Change
MSL	Mean Seal Level
MWRD	Minor Water Resources Department
NGOs	Non Government Organization
NOx	Nitrogen Oxide
NPM	Non Pest Management
NWDA	National Water Development Agency
O&M	Operation and Maintenance
OP	Operation Policies
PAF	Project Affected Families
PAP	Project Affected Persons
PD	Project Director
PDO	Project Development objective
PEC	Project Empowered Committee
PFR	Pre Feasibility Report
PIA	Project Implementation Agency
PMP	Pesticides Management Plans
PMU	Project Monitoring Unit
PPE	Personal Protective Equipment
PRADAN	Professional Assistance for Development Action
R&R	Rehabilitation & Resettlement
RAPs	Resettlement Action Plan
RCD	Road Construction Department
RoW	Right of Way
RWD	Rural Works Department
SA	Social Assessment
SCs	Schedule Castes
SES	Socio Economic Survey
SMP	Social Management Plan
SMS	Short Message Service
SPCB	State Pollution Control Board
STD	Sexually Transmitted Diseases
STs	Schedule Tribes
STW	Shallow Tube Wells
ToR	Terms of Reference
VECs	Valued Environmental Components
WB	The World Bank
WHO	World Health Organization
WRD	Water Resource Development

Executive Summary

The Project

The Government of Bihar (GoB) has received assistance from the World Bank, effective from January 2011, to address the emergency needs arising out of Kosi floods through Bihar Kosi Flood Recovery Project-I (BKFRP-I). As a sequel to this and to address long term challenges of flood management, GoB has sought further assistance for the Bihar Kosi Basin Development Project (BKBDP) with an objective to enhance resilience to floods and to increase agriculture production in the flood affected districts in the Kosi River Basin. This project is developed under a multi-sector framework, with investment activities aimed at reducing the volatility of agricultural outputs and increasing overall economic productivity in the Kosi River Basin. The project will comprise the following five components:

- Component 1: Improving Flood Risk Management, US$ 100 million
- Component 2: Enhancing agricultural productivity & Competitiveness, US$ 75 million
- Component 3: Augmenting connectivity, US$ 177.5 million
- Component 4: Contingent Emergency Response, US$ 0 million
- Component 5: Implementation Support, US$ 22.50 million

Environmental and Social Management Framework

As part of BKFRP-I, has developed an ESMF considering the environmental and social safeguards issues of the project. This has further been updated incorporating the issues associated with project components of BKBDP. The ESMF has been prepared based available secondary information, field visits, discussions with project officials and other stakeholders.

Environmental and Social Baseline

The ESMF analyzed the baseline historical, locational, geographic and physiographic profile of the project districts and the state of Bihar along with environmental and social features. In addition, flood related disaster risk profile of the project area was also analyzed. The analysis identifies the following;

- Rural roads in poor condition
- Damaged Bridges
- Poor Transportation Facilities
- Sand casting
- Soil erosion
- Damage to plantations
- Increasing salinity due to poor drainage
- Change in land-use due to sand casting

Laws and Regulations Related to Environmental and Social

Various laws, regulations and policies, of Government of India, Government of Bihar and the World Bank, related to environmental and social issues were reviewed and the laws, regulations and policies relevant to the project were discussed. The relevant safe guard policies of the World Bank applicable to the project are;

- OP/ BP 4.01 Environmental Assessment
- OP 4.09 Pest Management
- OP/ BP 4.12 Involuntary Resettlement
- OP/BP 4.11 Physical Cultural Resources
- OP/ BP 7.50 Projects on International Waterways
- BP 17.50 Policy on Disclosure of Information

The various policies, acts, rules and regulations promulgated by the central and state governments related to environment and social and relevant to present project are;

Environment

- The Environment (Protection) Act No.29 of 1986
- Water and Air (Prevention and Control of Pollution) Act, 1974 & 1981 (Central Act 6 of 1974) as amended in1988
- Forest (Conservation) Act No. 69 of 1980 and amended in 1988
- National Forest Policy, 1988
- Joint Forest Management, 1993
- The Wildlife (Protection) Act I972, Amendment 1991
- EIA Notification of MoEF 2006
- The Ancient Monuments, Archaeological sites and Remains Act, 1958
- Biological Diversity Act 2002
- Biological Diversity Rules 2004

This policy and regulatory analysis suggests that the proposed sub-projects does not fall under any of the project categories listed in Schedule-I of the Environmental Impact Assessment Notification and hence does not require environmental clearance of the Ministry of Environment and Forests, GOI. The project area has also not been notified as ecologically sensitive or fragile under the Environment Protection Act, 1986.

Social

- The Land Acquisition (LA) Act of 1894
- National Resettlement and Rehabilitation Policy, 2007
- Bihar Land Acquisition Resettlement and Rehabilitation Policy, 2007
- Minimum Wages Act, 1948
- Contract Labour Act, 1970
- The Bonded Labour System (Abolition) Act, 1976
- Child Labour (Prohibition and Regulation) Act 1996 along with Rules, 1988
- Children (Pledging of Labour) Act, 1933 (as amended in 2002)
- The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995
- The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Rules, 1996
- Untouchability Offences Act, 1955
- The Scheduled Castes and the Scheduled Tribes (Prevention of Atrocities) Act, 1989
- The Scheduled Castes and the Scheduled Tribes (Prevention of Atrocities) Rules, 1995

- Bihar Privileged Persons Homestead Tenancy, 1947, 1949
- Bihar Public Land Encroachment Act, 1956
- Kosi Calamity Rehabilitation and Reconstruction Policy, 2008
- Bihar Irrigation Act, 1997
- Irrigation, Flood Management and Water Drainage Rules, 2003

The project activities however would require certain permissions, clearances and authorizations from competent authorities during the design, planning and implementation of the sub-projects. These are given below:

- Environment Clearance/NOC from state authorities (For sub-projects which requires such clearance, such as embankment works if their location and size requires)
- Transfer of Forest land
- Tree Cutting Permission
- Hot mix plants, Wet Mix Macadam plants, Crushers, Batching Plants
- Storage, handling and transport of hazardous materials
- Location/ layout of workers camp, equipment and storage yards
- Liquid and solid waste Discharges from Labour Camp
- Permission for sand mining from river bed

Environmental and Social Impacts

The BKBDP and the concomitant sub-projects are yielding many positive and beneficial impacts on the target population and certain adverse impacts. Due to the likely small size of the sub-projects, adverse impacts, if any, would be at its minimum and localized. The impacts could occur during the construction phase and/or operation phase. In addition, the project is expected to contribute to the following positive impacts.

- Improved public safety
- Security during floods
- Less suffering during monsoons and adverse climatic conditions
- Better infrastructure and transportation facilities
- Improved access to services
- Productive use of time
- Improvements in income patterns
- Health and Environmental improvements
- Improvements in quality of life and human dignity
- Opportunities for social interaction
- Improved community participation and sense of ownership

The adverse environmental and social impacts due to sub-projects aresummarized below:

Project Type	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1. Improving Flood Risk Management																		
1.1. Reinforcements of Flood control Infrastructure																		
1.1.a. Eastern Embankments (75 km), associated embankments (25 km), closing gaps in embankments*	**L**	**S**	**L**	**M**	**L**	**L**	**L**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
1.1.b. Procurement of 12 No. Dredgers	**L**	**L**	**M**	**M**	**L**	**L**	**L**	**M**	**L**	**L**	**L**	**S**	**L**	**S**	**L**	**L**	**L**	**L**

1.2. Support to Strengthen Institutional Capacity to Manage Floods	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
1.3. Flood Mitigation Works (to be identified)																		
2. Strengthening Irrigation Capacity																		
2.1. Private Tube Well Development	**L**	**L**	**L**	**L**	**M**	**M**	**M**	**L**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
2.2. Solar Electrification of Government Tube Wells	**L**	**L**	**L**	**L**	**M**	**M**	**M**	**L**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
2.3. Support to Irrigation Schemes in Kosi (investments to be identified)																		
2.4. Water Table Monitoring and Technical Assistance to MWRD	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
3. Augmenting Connectivity																		
3.a. Upgrading of rural roads	**S**	**S**	**L**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**M**
3.b. Construction of small and medium bridges	**M**	**M**	**L**	**M**	**M**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
4. Financing Agricultural Production																		
4.a. Multiple Cropping Cycles	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**L**	**M**	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
4.b.Reviving Heavily Sedimented Areas	**L**	**L**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
4.c. Alternate Livelihoods Promotion	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**L**	**L**	**L**	**L**	**M**	**M**	**M**	**L**	**L**
5. Contingency Emergency Response	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
6. Implementation Support	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**

Code	Impact	Code	Impact	Code	Impact
A	Land acquisition	G	Ground Water Quality	M	Bio-diversity
B	Involuntary Resettlement	H	Destruction of Habitat/Flora Fauna	N	Noise
C	Land Use	I	Insect and Pest Menace	O	Smell
D	Hydrology and drainage Pattern	J	Increased chemical pesticide/fertilizer use	P	Smoke
E	Water logging	K	Public Health	Q	Disturbance to Services
F	Surface Water Quality	L	Safety	R	Air Quality

Impacts: S – Significant M – Medium L - Low

Environmental and Social Management Framework (ESMF)

The ESMF provides the following due diligence process to ensure compliance with Bank safeguard policies and the environmental regulations of Government of India.

Screening

The sub-project screening process comprises analyzing theenvironmental and social profile of the sub-project influence area through an Environmental and Social Checklist (ESC) and impacts associated with the sub-project. The sub-project Implementing Agency carries out the screening of respective sub-projects with the facilitation support of the BAPEPS field office duly identifying the environmental and social issues of concern. The ESC and the screening recommendations are attached to the sub-project proposal/ concept note. These includes, categorization of sub-projects with potentially significant environmental/ social issues for detailed environmental/ social assessment. Based on the environmental and social information provided in the ESC, the proposed sub-projects are categorized as Ea/Eb and Sa/ Sb. This screening and categorization of sub-projects will be shared with the Bank team for its concurrence, before initiating EA/SA studies or the safeguard due-diligence process for the sub-projects.

Categorization

Based on the scale and size of environmental and social impacts, the ESMF categorize the sub- as under:

Environmental

Based on environmental impacts the sub-projects are categorized into two categories;
1) Ea, where there are significant adverse environmental impacts
2) Eb, where there are moderate to minimal adverse environmental impacts

The Ea category sub-projects require conducting a comprehensive Environmental Assessment (EA) and preparation of an Environment Management Plan (EMP) by Independent Consultants other than the DPR consultants for appraisal by BAPEPS and The World Bank. This EIA and EMP need to be disclosed in compliance with the disclosure policies of the Bank, before the commencement of the respective sub-project procurement process.

The Eb category sub-projects would require an environmental analysis and development of but require an EMP, which is to be prepared by Design Consultants following the guidelines given in this ESMF. This EMP becomes a part of the DPR, which will be appraised by BAPEPS. If, under special circumstances, BAPEPS identifies a need for a limited environmental assessment, then it needs to be conducted.

Environment Impact Mitigation - Guidance

An environmental impact mitigation guidance has been included listing mitigation measures for the possible impacts caused by the sub-projects. This also includes the project phase, where each of the mitigation measures needs to be considered and also indicates the implementation responsibility. This guidance covers all impacts listed and gives the mitigation measures by phase of sub-project.

Social

Based on social impacts the sub-projects are categorized into two categories;
1) Sa, where there are more than 20 Project Affected Families (PAFs),
2) Sb, where there are less than 20 PAFs

The Sa category sub-projects require conducting a comprehensive Social Assessment (SA) and preparation of a Resettlement Action Plan (RAP) by Independent Consultants prior to preparation of Detailed Project Report (DPR) for appraisal by BAPEPS. This SIA and RAP need to be finalized and disclosed before the start of procurement for that sub-project.

The Sb category sub-projects need not conduct SA but prepare Abbreviated Resettlement Action Plan (ARAP), but need to include the Social Management Plan (SMP) which is to be prepared by Design Consultants following the guidelines given in this ESMF. This SMP becomes a part of the DPR, which will be appraised by BAPEPS. If, under special circumstances, BAPEPS identifies a need for a limited social assessment, then it needs to be conducted.

Resettlement Policy Framework

This Resettlement Policy Framework for BKBDP is drawn in accordance with the World Bank's Safeguard Policy on Involuntary resettlement (OP 4.12). The framework has been developed based on the following policies/ legislations:

- Bihar Land Acquisition and Resettlement and Rehabilitation Policy 2007
- The Land Acquisition Act 1894
- The Asian Development Bank funded Bihar State Highways-II Project – Additional Financing, November 2011

This framework will act as guide for mitigating the social impacts that would be triggered by the sub-projects under BKBDP. The entitlement matrix applicable for the project is given below:

Impact Type	Entitled Entity	Entitlement as per BLARRP 2007
1. Loss of Land (Titleholders)		
1A. Loss of Agricultural Land	Affected Family (Titleholder)	• Cash compensation at replacement cost as determined according to BLARRP 2007 or replacement of land if available. • If the residual plot is not viable and PAP becomes a marginal farmer, then any of the following three options are to be given to the PAP, subject to PAP's acceptance: o Acquire the required land and pay compensation and assistance for the same. o If PAP so wishes acquire the remaining portion of the plot and pay compensation and assistance for the entire plot including residual part. o If PAP is from vulnerable group, compensation for the entire land by means of land for-land will be provided, if PAP wants so, provided that land of equal productive value is available. • All fees, stamp duties, taxes and other charges, as applicable under the relevant laws, incurred in the relocation and rehabilitation process, are to be borne by the IA.
1B. Loss of Residential/ Commercial land	Affected Family (Titleholder)	• Cash compensation at replacement cost as determined according to BLARRP 2007 or replacement of land if available, only if the land acquired is a maximum of 5 Decimal. • All fees, stamp duties, taxes and other charges, as applicable under the relevant laws, incurred in the relocation and rehabilitation process, are to be borne by the IA.
2. Loss of Structures (Titleholders)		
2A. Loss of Residential Structures	Affected Family (Titleholder)	• Compensation of structure will be paid at the replacement cost to be calculated as per latest prevailing Basic Schedule of Rates (BSR) without depreciation. • Assistance of Rs. 10,000/- towards temporary accommodation • Transportation assistance of Rs. 5000/- • Right to salvage material from demolished structure and frontage etc. • Rental assistance as per the prevalent rate in the form of grant to cover maximum three month rentals
2B. Loss of Rental Accommodation (Residential/ Commercial	Tenants	• Rental assistance for both residential & commercial tenants as per the prevalent rate in the form of grant to cover maximum three month rentals. • Additional structures erected by tenants will also be compensated and deducted from owner's compensation amount. • Shifting assistance based on type of house and household assets. • Any advance deposited by the tenants will be refunded from owners total compensation package to the tenant on submission of documentary evidence. • Right to salvage material from demolished structure and frontage etc. erected by tenants.
3. Loss of Structures Residential/ Commercial (Non-Titleholders)		

Impact Type	Entitled Entity	Entitlement as per BLARRP 2007
3A. Loss of Immovable and Pucca Structures (Residential/ Commercial)	Squatters/ Encroachers	• Squatters and Encroachers will be notified and given one month time to remove their assets or harvest their crops. • Compensation for loss of structure at replacement cost for Squatters • Compensation for loss of structure at replacement cost for only the vulnerable households among Encroachers • Shifting assistance of Rs. 10,000/- for Squatters. • For Squatters and Encroachers right to salvage material from the demolished structure.
4. Loss of Crops and Trees	Titleholders Share Croppers Lease Holders	• Advance notice to all to harvest crops, fruits and remove trees. • In case of standing crops, cash compensation at current market prices for mature crops based on average production. • For fruit bearing trees compensation at average fruit production for next 15 years to be computed at current market value. • For timber trees compensation at market price based on kind of trees.
5. Loss of Livelihood		
5A. Loss of Primary Source of Income	Titleholders Non-Titleholders Agricultural Labourers Share Croppers	• Employment opportunity for PAPS in the sub-project construction work, if available and if so desired by them. • National/State level job card under National Rural Employment Guarantee Program. • Income generation skill upgrading vocational training of their choice at a rate of Rs. 5,000/- • For Agricultural Labourers and Share Croppers an assistance of 200 days of wages at minimum wage rate
6. Common Property Resources		
6A. Loss of Common Property Resources	Community	• Reconstruction, Commissioning and handing over to concerned departments/ community of all affected community property resources with community consultation and participation.
7. Other Unforeseen/ Unanticipated Impacts		
7A. Unforeseen/ Unanticipated Impacts		• Any unforeseen/ unanticipated impacts due to the sub-projects will be documented and mitigated based on the spirit of the principle agreed upon in this framework.

The ESMF is prepared using the NRRP 2007 and The Bihar Land Acquisition Resettlement and Rehabilitation Policy 2007. Whenever there is a new LA and R&R Policy, the ESMF will be revised in light of that Policy.

Grievance Redressal

In order to address grievances related to land acquisition and resettlement and rehabilitation implementation, two bodies are to be established; R&R Committee at the state level and Grievance Redressal Committee at the district level. The former will be established under the chairmanship of Principal Secretary, Planning, to monitor and review the progress of implementation of resettlement, in his capacity as Chairman. Project Director, BAPEPS will be convener of this committee. This committee should meet every quarter to review the progress made in the implementation of the RAPs and to solve any grievances of the PAPs. This committee will also provide policy related direction to the Grievance Redressal Cell and the participating departments with regard to Land Acquisition and Resettlement and Rehabilitation.

The Grievance Redressal Committee will be established at each district under the chairmanship of District Collector for redressal of grievances of the PAPs. The

Superintending Engineer, WRD shall be the convener of these committees. At the district level, the NGO contracted by the project will provide support to these committees. District level head of all participating departments will be members along with a PAPs representative, NGO Chairperson and a prominent Social Worker of the district.

The PAP will have the option of seeking redress under the general legal environment consisting of court of law.

Pest Management Plan

In addition to the above a Pest Management Plan has been prepared as a part of this ESMF. The concerned line departments, i.e. Agriculture Department need to ensure that this plan is implemented at the field level. The NGO partner will have a major role in mobilizing the farmers to implement the provisions of this plan. Pest management is an ecological matter andhasmuchrelevance inthecontext of flood ridden project area. A Pest and Pesticide Management Screening Tool is included for enabling Pest and Pesticide Management.

Monitoring and Evaluation

The ESMF requires detailed supervision, monitoring and evaluation of the impact of the project on the environment and social aspects. In order to carry out this, BAPEPS will have specific arrangements made at state and division/ district level. This includes appointment of an Environmental Specialist and Social Specialist for the project period. Further the BAPEPS will guidethe District and Field level implementing agencies on how to implement the provisions of this ESMF. At the field level the staff of the implementing agencies (viz. RCD, RWD, WRD, BRPNNL and Agriculture Dept. etc.) has the experience of implementing projects concerning their departments and do land acquisition for their project. Implementation of the provisions of ESMF will be new to these staff and hence several orientations and trainings are proposed as a part of this ESMF to build their capacity. In order to achieve the objectives of this ESMF and to ensure the safeguards are implemented in a proper manner, the following provisions are made in this ESMF:

- Independent Consultants for Quarterly Monitoring of ESMF and sub-project EMP implementation

Further the BAPEPS will incorporate the provisions of this ESMF as actionable points in the Project Operations Manual or other similar document for the project. These will be non-negotiable and will have to be followed by all the field units of the implementing agencies. The Environmental and Social Specialists will oversee the application of these provisions and guide the process and implementation of ESMF at field level, while at the same time building the capacity of the field units.

The following provisions include the arrangements made for the effective implementation of the ESMF:

Implementation of Sub-Project EMPs: The sub-project EMP implementation will be done by the respective project implementing agencies with the help of environmental and social specialists. In the event of sub-projects spread over a larger geo-graphic area, the project implementing agencies will designate suitable officers /engineers to implement the EMPs.

Implementation of ESMF andSafeguards Supervision: This is basically the responsibility of BAPEPS. While the compliance to ESMF will be ensured through review / appraisal of sub-project proposals and progress reports on implementation, all the sub-projects in implementation will be visited at regular intervals at least once every month by BAPEPS to check if all safeguard requirements are met and to identify any issues that need to be addressed. BAPEPS would submit quarterly progress reports to The World Bank on safeguards implementation.

Quarterly Monitoring: The concurrent internal environmental social monitoring will be done as part of the regular monitoring by the design and supervision consultants and implementing agencies. However, independent consultants appointed by BAPEPS, will do the quarterly environmental and social monitoring of selected sub-projects for safeguards compliance.

Stakeholder Involvement and Consultation

BAPEPS would engage Design consultants to prepare sub-project DPRs. These consultants would to carry out public/ stakeholder consultations through specified mechanisms to ensure the upfront public/ stakeholder inputs in preparation of sub-projects. During sub-project implementation GPs, NGOs, Community Based Organisations (CBOs) will be involved. The stakeholder meetings would discuss the sub-project progress reports and make recommendations for sub-project control and modifications. These recommendations would be made use for future sub-project design.

Disclosure

BAPEPS have disclosed the draft ESMF on June 29, 2012 and the updated ESMF has been re-disclosed on January 4, 2015. The summary of the ESMF has also been translated into local language (Hindi) and placed on the website. A copy of the ESMF and Resettlement Policy Framework and Entitlement Matrix is also availablein all the District Collectors Offices of the project area.

The World Bank as per its disclosure policies has disclosed the draft ESMF at its infoshop on August 22, 2012 and the same will be replaced with the final ESMF. In addition all the EA/ SA along with EMP/ RAP of sub-projects will also be disclosed locally by BAPEPS.

Institutional and Implementing Arrangements

The BKBDP will be implemented in 8 flood prone districts of Kosi basin. At the state level the Planning Department is the implementing agency and there are several participating departments implementing the project components. In order to coordinate the efforts of several participation departments, the Bihar Aapada Punarwas Evam Punarnirman Society (BAPEPS) has been established. The Project Implementing Agency (PIA) will be the BAPEPS. The Project Director BAPEPS will be the responsible for overall project implementation.

The Project Empowered Committee (PEC) will govern the overall project, and guide the PIA. The PEC will be constituted by the main implementing agencies, and chaired by the Development Commissioner GOB.

Field Level Management

The Field Office of BAPEPS will ensure coordination among the participating departments, monitoring and reporting functions. This field office will have deputed or contracted experts sector and functional management area. BAPEPS will have one Environmental Specialist and one Social Specialist. The Environment and Social Specialists of the BAPEPS shall provide regular feedback to the respective implementing agencies and to the Project Director on the implementation of ESMF and other safeguard management plans. The Participating departments will be responsible for the execution of sub-projects. These departmentsthrough designated / appointed environmental and social specialist will ensure ESMF, including the EMPs and the RAPs are implemented on their sub-projects.

Capacity Building and Training

A capacity building strategy has been outlined in order to build environmental and social awareness and environmental and social management capacity in the project administration structure as well as in the intended target communities. This training program uses cascade approach. Various training Programs such as Orientation/ Learning Training Programs, Training on the ESMF, Training on Environmental and Social Management are planned. The total estimated cost of training is estimated to be about Rs.20 million

Total ESMF Budget

The total budget for environmental and social management activities such as Training and Workshops, Quarterly Environmental Social Safeguards Monitoring by Independent Consultants, Preparation of specific environment and social related community awarenessmaterials, etc. under the proposed BKBDP has been worked out as Rs. 77 million.

1 Proposed Project

1.1 Background

Following major floods in the Kosi Basin in 2008, the Government of Bihar (GoB) requested assistance from the World Bank to address the emergency needs of the population, as well as the longer term challenges of flood management, vulnerability reduction, connectivity, and agriculture productivity. A first project, the Bihar Kosi Flood Recovery Project (BKFRP, US$220 million) became effective in January 2011 and focuses on emergency needs through the reconstruction of damaged houses, rehabilitation of road infrastructure, and the strengthening of the flood control structures in the Kosi Basin. Two smaller project components are aimed at enhancing livelihood opportunities of the affected population and improving the emergency response capacity for future disasters. During the preparatory stage of the BKFRP, and after considering various possibilities, the Government of India (GoI), GoB and the Bank agreed on a phased approach to recovery and reconstruction. The first phase would provide timely and focused support for reconstruction efforts, and later phases would focus on a long-term program to support Bihar's need for flood management, increased agriculture productivity and improved connectivity.This proposed Phase II project will address longer term challenges as described above, and is prepared in the broader context of the State's five year plan for 2011-2016 and the preliminary results of the GoB's Agriculture Roadmap for 2012 to 2022. This Roadmap, which set ambitious targets for the holistic development of agriculture in the state, recognizes the need for coordinated action from multiple departments and proposes a multi-sector approach to increase agriculture productivity.

1.2 Project Description

The project is developed under a multi-sector framework, with investment activities aimed at reducing the volatility of agricultural outputs and increasing overall economic productivity in the Kosi River Basin. At the base level, the investments in flood control decrease volatility and better protect the Kosi Basin from flooding that damages livelihoods and agriculture. To augment the benefits of a more stable environment, the project also makes a series of investments to unlock the agricultural potential of the area. Investments in irrigation will improve farmer access to water necessary to grow crops year round, and an improved road network will allow transport of harvests to a wider market. In addition, significant institutional strengthening and capacity building efforts will complement investments in physical infrastructure.

The project will serve as the convening mechanism between line departments to ensure synergies between these investments. Coordinating activities will ensure that irrigation reaches flood protection enhanced lands, agricultural support is provided to areas with new access to water, and transport network improvements are put in place where there is demand to transport greater harvests.

1.2.1 Project Development Objective

The project development objective is to enhance resilience to floods and to increase the production of agriculture in the greater Kosi River Basin.

1.3 Project Components

The project will comprise the following five components:

1.3.1 Component 1 – Improving Flood Risk Management, US$100 million (with US $ 66.7 million IDA financing)

The objective of this component is to increase the capacity of the Water Resources Department (WRD) to manage flood risk and to decrease vulnerability to floods in the Kosi River Basin. This objective will be achieved by investing in flood management infrastructure to reduce vulnerability and by strengthening institutional capacity to better understand how the Kosi River system functions. Activities will build on technical studies and flood modeling already underway in BKFRP and FMIS II, in addition to pilot embankment strengthening works underway in BKFRP. The component is broken into three subcomponents.

1.3.1.1 Sub-component1.1-Reinforcement of flood control infrastructure (US$65 million)

The objective of this subcomponent is to strengthen and reinforce existing weak flood control infrastructure in the Kosi River Basin. Investments will primarily include: (i) restoration/strengthening of Eastern and Western Kosi embankments, approximately 70 km; (ii) restoration of selected stretches of the Ex-Zamindari embankments, approximately 25 km; (iii) strengthening existing spurs that are severely damaged and protecting critical erosion prone river banks; and (iv) procurement of 12 dredgers for management of silt deposits in the river system. Alternative designs and construction materials including stone-filled machine-made gabions, reno-mattresses, geo-tubes, and geo-bags will be used for the infrastructure works to improve performance at competitive costs.

1.3.1.2 Subcomponent 1.2 - Support to strengthen institutional capacity to manage flood risk (US $ 10 million)

The objective of this subcomponent is to strengthen State level capacity to understand, manage, and communicate flood risk. The project will fund training and capacity building activities for WRD staff to familiarize themselves with modern methods in flood risk management and maintenance of investments. Additionally, the project will finance an institutional analysis study for improving the daily functioning of WRD, and leverage the expertise that has been enhanced through the FMIS investments. Activities will be financed to further integrate FMIS into WRD and to scale the technical capacity of FMIS throughout the Department. Ongoing activities under BKFRP and FMIS II, along with activities financed in this

subcomponent, will account for the potential future impact of climate change and will guide further investments in structural and non-structural measures in Subcomponent 1.3.

A Flood Management Master Plan will be completed to enhance flood and sedimentation management systems. Inputs into the Master Plan are currently ongoing under BKFRP and the project will finance the additional required activities. The Master Plan will also produce recommendations for structural investments to minimize river bank erosion and shifts in the course of the river. The scaling up of embankment asset management system, flood forecasting, and early warning modeling activities will be financed to increase the planning and response capacity of the GoB. These models will monitor precipitation events and utilize the data to project the potential impacts of climate change on the hydrological dynamics of the Kosi River Basin.

1.3.1.3 Subcomponent 1.3 – Flood mitigation works (US $ 75 million)

This subcomponent will finance investments identified and/or mentioned under Subcomponent 1.2. The Flood Management Master Plan will be developed within the first two years of the project cycle and implemented in the following years. It is expected that these works will include a series of investments to strengthen system weaknesses and/or to push or channel the river flow away from the banks.

1.3.2 Component2 – Enhancing agricultural production, US$75 million (with US $ 50 million IDA Financing)

This component would work with organized farmers to increase agricultural production (including livestock) and productivity by expanding their access to and adoption of innovative farm technologies and practices (including irrigation) and extending their linkages to market infrastructure. Active farmer participation in planning, implementing, and evaluating project interventions will enhance the relevance of crops/varieties selected for cultivation, increase technology adoption, and contribute to the sustainability of both technical interventions and the local institutions supporting farmers. All activities are complementary to the GoB's Agricultural Road Map (2012-2017, 2017-2022). In addition, a groundwater monitoring system will be implemented to effectively manage the resource. The component has three sub-components.

1.3.2.1 Subcomponent 2.1 – Intensification and Diversification of Production Systems (Agriculture / Horticulture Crops – US $ 35 million with US 23.4 million IDA Financing)

This component would promote agricultural intensification through: (a) technology demonstration and diffusion; (b) increased water availability and efficiency via irrigation; and (c) improved agricultural inputs and practices packages. Business plans, financed through Matching Grants and prepared by farmer interest groups

(FIGs) with support from service providers contracted under the project, would identify market potential and link it to investments needed to increase productivity and competitiveness. Business plans would consist of, *inter alia*: (a) fixed capital (e.g., plant and equipment, irrigation infrastructure); (b) input and other technology packages; and (c) capacity-building and technical assistance expenditures.

1.3.2.2 Subcomponent 2.2 – Strengthening of Agricultural Value Chains (US$12.5 million, with US$8.3 million IDA Financing)

This component would facilitate produce aggregation and value-added activity through Agricultural Business centres (ABCs) proposed, owned and operated by producer organizations with support from Service Providers. ABCs would vary in terms of scope and content based on needs expressed by the proposing producer organization. It is expected that some 200 ABCs will be financed, about one-half of which will promote food grains, oilseeds and pulses, with the remaining one-half would facilitate marketing of horticulture crops, livestock and dairy. Business plans would be developed for each ABC by eligible producer organizations and evaluated on technical criteria set forth in the Project Implementation Plan. Approved ABC business plans would be financed via Matching Grants, with cost-sharing on the part of producer organizations.

1.3.2.3 Subcomponent 2.3 – Institutional Development for Market-led Extension (US$27.5 million, with US$18.3 IDA Financing)

This component would promote and strengthen the Agriculture Technology Management Agency (ATMA) in each of the five targeted districts. The Government of Bihar has already initiated actions to implement ATMA model of agricultural extension in all the 38 districts of the state. The ATMAs would promote: (a) convergence among state- and centrally-sponsored schemes in the agricultural sector; (b) inter-departmental coordination at the district, block and village levels; and (c) transformation of the production-entered extension system toward market-led agricultural development. Marketing extension employs the same best practices as in production extension, in that it would focus on enabling farmers to learn for themselves (i.e., experiential learning) and empowering them to engage directly with the market. The subcomponent would also leverage the experience and lessons learned from the Bank-financed National Agricultural Technology Project (NATP) and the agriculture competitiveness projects in Assam and Maharashtra.

1.3.3 <u>Component 3 – Augmenting connectivity, US$177.5 million (with 118 million IDA Financing</u>

The objective of this component is to improve farmers' access to markets through the expansion of the local transport network that connects rural roads to the main road network. To achieve this objective, the component will be structured in two subcomponents. These activities will be a continuation of the initiatives started

under BKFRP, and will include the same specifications, implementation arrangements, and bidding plans already in place.

1.3.3.1 Subcomponent 3.1 – Construction of roads and strengthening institutional capacity (US$50 million).

This subcomponent will finance the construction of linking roads to major roads and the upgrading of rural roads to provide small villages (population less than 500) greater access to local markets. The sub-component will be implemented in the five flood-affected districts of the Kosi River Basin: Araria, Madhepura, Purnea, Saharsa, and Supaul. An estimated 600 km of rural roads will be constructed at a cost of US$80 million, of which 383 km of roads have already been identified across 94 sites. All paved and unpaved rural roads will be constructed as black top roads and will be built to the latest rural road standards followed under the GoI and Bank financed PMGSY Rural Roads Program. In addition to the large scale investments, pilot projects will be conducted to demonstrate new technologies that promote cost effective, modern, climate resilient, and environmentally friendly road reconstruction.

The institutional strengthening activities will amount to US$15 million and will focus on the development of an asset management and maintenance system, as well as a road maintenance strategy. Activities will also be financed to support training in technical skills and management information systems for the staff of the Road Construction Department.

1.3.3.2 Subcomponent 3.2 – Construction of bridges (US$25 million).

This subcomponent will finance the construction of small and medium bridges to provide greater access to local markets. An estimated 75 bridges will be constructed at a cost of US$80 million. Approximately 56 bridges have been identified, with the average length of each bridge measuring 75 meters and an average cost per bridge of US$1 million. New cross drainage structures will be provided where new streams have formed and where these were missing earlier. Bridges and culverts will be designed to withstand earthquake forces (per the guidelines of the Bureau of Indian Standards) and with regard to topography and hydrology (per the guidelines of the Indian Roads Congress, the Ministry of Road Transport and Highways, and projected demographic changes).

1.3.4 Component 4 – Contingent Emergency Response, US$0 million

Following an adverse natural event that causes a major natural disaster, the GoB may request the Bank to re-allocate project funds to support response and reconstruction. This component would draw resources from the unallocated expenditure category and/or allow the GoB to request the Bank to re-categorize and reallocate financing from other project components to partially cover emergency

response and recovery costs. This component could also be used to channel additional funds should they become available as a result of the emergency.

1.3.5 Component 5 – Implementation Support, US$22.50 million (with US $ 15 million IDA Financing)

This component would finance activities required for project implementation. These would include incremental operating costs, including those related to operating BAPEPS and the IAs. These funds are also available to BAPEPS to employ subject matter experts, fiduciary agents, and support staff to be housed within each IA and assist with the preparation, implementation, and supervision of project activities. In addition, training, exposure visits, documentation, and monitoring and evaluation will be financed out of this component.

1.4 Objectives of This ESMF

The BKFRP-I has an ESMF prepared taking the environmental and social safeguards issues of the project into account. Presently the BKBDP, is a logical extension of phase I; the investments and components of phase II are more multi-sectoral and diverse. For this reason it is felt that the ESMF of phase I needs to be revised appropriately for phase II. The present ESMF phase II is prepared to achieve this central objective. The activities taken up to revise the ESMF are as below:

- Determining key social and environmental issues associated with flood management in Greater Kosi Basin and possible activities that could be initiated by BAPEPS, both at the overall basin level as well as part of specific sub-projects;
- Identifing potential environmental and social impacts associated with such investments and recommending measures to enhance positive impacts and mitigate adverse impacts;
- Carrying out an analysis of various stake holders (including in particular the disadvantaged and voiceless)associated with the project, identifying their concerns with regard to environmental and social aspects, and recommending measures to mainstream these aspects into the project;
- Developing an Environmental and Social Management Framework (ESMF) for the project, for ensuring that environmental and social issues are effectively addressed in project design and implementation.
- Identifying additional detailed environmental and social studies that need to be conducted in the project.

1.5 Methodology

The methodology used for preparation of this ESMF is both participative and consultative. The data used for this ESMF has been mostly secondary; though some primary data is generated it is mostly qualitative using discussions during field visits. The same is described here:

- Compilation of Secondary information from Government of Bihar's various departments and several other sources like reports, publications, web sites, etc. This included the various environmental and social indicators ofBihar, therelevant legalandregulatory provisions, status reports, etc. This data greatly helped in identifyingthe keyissues.
- Field Visits to sample sub-project areas giving an understanding of the usual practices and process in use.
- Discussions with BAPEPS and participating departments at State and district level have helped in understanding the project requirements, existing environmental and social capacity, strategies for ESMF implementation, etc.
- Discussions with Communities gave an indication of need for the project, their readiness to participate in the project implementation, etc.
- Presentation in a stakeholder consultation workshop feedback and finalization gave indication of various gaps in the ESMF and need for detailing and fine-tuning.
- Disclosure of draft ESMF through the project website for comments and inputs from general public.

1.6 Organization of the Report

This report is organized into eleven sections apart from an executive summary and annexures.

First chapter gives introduction to this report which includes background, objectives, scope of the physical activities, need for environmental and social assessment and approach and methodology adopted for this study. Chapter two provides the geographic, physiographic, socio-economic and environmental profile of the Bihar It also presents flood situation in Bihar, floods caused by Kosi River and issues for the project. Third chapter deals laws and regulation related to the project environmental and social context and the World Bank safeguards.

Fourth chapter details the environmental and social impacts caused by the sub-projects to be taken up under BKBDP. Fifth chapter describes the environmental and social management framework proposed for the project which include sub-project categorization, summary of impacts, environmental and social impacts mitigation, sub-project cycle with respect to environment and social impact mitigation, monitoring and evaluation, stakeholder consultation, disclosure and updation of ESMF. Sixth chapter deals with institutional and implementation arrangements at state level and field level arrangements.

Seventh chapter deals with capacity building of stakeholder organizations and description of various training programs proposed including a budget. Eighth chapter provides an estimate of cost for implementing the ESMF and associated

measures. The ninth chapter provides guidance on environmental impacts mitigation duly giving mitigation measures for all possible impacts during various stages of sub-project cycle. Chapter 10 provides for the pest management plan to ensure that the requirements of OP 4.09 on Bank are incorporated. Chapter eleven provides social impacts mitigation guidance through a resettlement policy framework detailing various methods of land procurement, entitlement matrix,etc.

2 Environmental and Social Baseline

2.1 Introduction

This chapter provides the historical, locational, geographic and physiographic profile of Bihar along with environmental and social baseline. Along with these this chapter presents the state's flood related disaster risk profile.

2.2 Bihar – Geographic and Physiographic Profile

Bihar state is 12thlargest in terms of geographical size (94,163 sq. km) and 3rdlargest by population, 10.38 crores as per Census 2011, in the country. It is also known for its abundant natural resources, perennial rivers, fertile lands and a long glorious history. In spite of all these conditions, the state remained one of the poorest states in the country since independence. The poverty condition further deteriorated after the state's division in 2000. After the division the state retained almost 75 percent of the population, while it is left with only 54 percent of the land, thus inducing a lot of strain on the available resources.

Figure 1: Bihar Map

Bihar is located between24°20'10"and27°31'15"N latitudeand82°19'50"and88°17'40"Elongitude in the eastern part of the country and situated at about 52.73 m height above sea level . It is an entirely landlocked state and is surrounded by West Bengal in the east, Uttar Pradesh in the West and the State of Jharkhand in the South. In the North, Bihar shares its boundary with Nepal. Humid West Bengal in the east and the sub humid Uttar Pradesh in the West provides it with a transitional position in respect of climate, economy and culture. The Bihar plain is divided into two unequal halves by the River Ganga which flows through the middle from West to East. Close to 88% of the population lives in villages.

Table 1: Administrative Divisions		
Details	**2001**	**2011**
No. of Divisions	9	9

No. of Districts	37	38
No. of Sub-Districts	101	101
No. of Towns	130	199
No. of Villages	45,098	44,875
Percentage of urban population	10.46	11.30

Bihar lies in the tropical to sub tropical region. Rainfall here is the most significant factor in determining the nature of vegetation. Bihar has a monsoon climate with an average annual rainfall of 1200 mm.The sub Himalayan foothills of Someshwar and Dun ranges in Champaran constitute another belt of moist deciduous forests. Thesealso consist of scrub, grass and reeds. Here the rainfall is above 1,600 mm and thus promotes luxuriant Sal forests in the favoured areas. The hot and dry summer gives the deciduous forests. The most important trees are Shorea Robusta (Sal), Shisham, Cedrela Toona, Khair, and Semal. This type of forests also occurs in Saharasa and Purnia districts.

The topography of Bihar can be easily described as a fertile alluvial plain occupying the Gangetic Valley. The plain extends from the foothills of the Himalayas in the north to a few miles south of the river Ganges as it flows through the State from the west to the east. Rich farmland and lush orchards extend throughout the state. The major crops are paddy, wheat, lentils, sugarcane, jute (hemp, related to the marijuana plant, but a source of tough fibers for gunny bags). Also, cane grows wild in the marshes of West Champaran. The principal fruits are mangoes, banana, jack fruit and litchi. This is one of the very few areas outside China which produces litchi.

2.3 Socio-Economic Baseline of Bihar

The BKBDPwill make investments in 5 flood affected districts of Kosi basin. These investments will be made in the districts of Araria, Madhepura, Purnia, Saharsa, and Supaul. The socio-economic information of these project districts is presented here. Wherever the information about all the Bihar districts is presented, then the project districts are highlighted in bold.

2.3.1 Demographic

Some of the important demographic indicators of Bihar and project districts are compared in the table below:

Table 2: Population Details

Item	Bihar	Araria	Madhepura	Purnia	Saharsa	Supaul
Area, Sq. Km	94,163	2830	1788	3229	1696	2420
Total population, Census 2011 (in millions)	103.80	2.83	1.99	3.26	1.89	2.22
Decadal growth rate (Census 2011) (%)	25.10	31.84	30.65	28.33	25.79	28.62
Crude Birth Rate (AHS 2010-11*)	28.90	30.90	30.10	27.60	32.1	28.50
Crude Death Rate (AHS 2010-11)	7.30	7.80	7.50	7.20	7.80	6.50
Natural Growth Rate (AHS 2010-11)	19.50	23.10	22.70	20.40	24.2	22.00
Infant Mortality Rate (AHS 2010-11)	52	61	64	71	62	64

Item	Bihar	Araria	Madhepura	Purnia	Saharsa	Supaul
Female Sex Ratio,Census 2011	916	921	925	914	906	929
Schedule Caste population ('000) (2001 Census)	13049		207	192	175	
Schedule Tribe population (2001 census)	758000		3,962	8,321	3,397	
Literacy rate (Census 2011) (%)	63.82		28.62	30.65	25.79	

According to the 2011 census, the population of the state of Bihar is 103,804,637 persons, consisting of 52.2% males and 47.8% females. The average population of a district of the state is 2,731,701. The population of the state is predominantly rural, with 89% of the population residing in rural areas. Patna (5772804) and Sheikpura (634927) are most populated and least populated districts of the state.

According to Census 2011 Bihar has recorded 25.07 percent decadal population growth. The district with highest decadal growth is Madhepura (30.65) and the district with lowest decadal growth is Gopalganj (18.83).

The urban decadel growth rate (35.11) is higher when compared to rural growth rate (23.9). From the data, it could be seen that decadal growth rate of urban females (37.07) is more than urban males (33.4), whereas the decadal growth rate of rural females (23.43) is lower than rural males (24.33). This could be a pointer towards increased acceptance of girl child (reduced female foeticide/ infanticide) and women empowerment in urban areas.

2.3.2 Households

Table 3: Bihar Household Details

S.No	Total	Number
1	No of occupied Residential houses	1,27,40,000
2	No. of House holds	1,37,44,000
3	Total Population	8,29,99,000
4	No. of persons per Household	6.04
RURAL		
5	No of occupied Residential houses	1,24,07,000
7	Total Population	7,43,17,000
8	No. of persons per Household	5.99

The household size in the state of Bihar roughly stands at 6 members per household. The number of members per household in rural areas is about 6, whereas in urban areas it is about 6.5.

2.3.3 Population by Religion

The population of Hindus in Bihar is about 83%, whereas the Muslim population is to 17%. The rest comprise 0.06% Christians, 0.02% Sikhs, 0.02% Buddhists, 0.02% Jains, while 0.05% belong to other religions about 0.06% did not state their religion.

Table 4: Percentage Population by Religion

S No.	Community	Bihar	India

		Population ('000)	Percentage	Population ('000)	Percentage
1	Hindus	69077	83.23	827579	80.46
2	Muslims	13722	16.53	138188	13.43
3	Christians	53	0.06	24080	2.34
4	Sikhs	21	0.02	19216	1.87
5	Budhists	19	0.02	7955	0.77
6	Jains	16	0.02	4225	0.41
7	Other Religious persons	53	0.06	6640	0.65
8	Religion not stated	38	0.05	728	0.07
10	**Bihar Total**	82999	100	1028611	100
Source: Bihar at Glance 2009					

2.3.4 Birth and Death Rates

The crude birth rate per 1000 population for Bihar is 26.7, whereas the same is 21.2 for urban and 27.5 rural. The crude death rate per 1000 population is 7.2, whereas the same is 5.7 for urban and 7.4 for rural. The infant mortality rate per 1000 live births is 55, whereas the same is 56 for urban and 53 for rural. This data shows that there is significant difference in among rural and urban areas in terms of birth and death rates, as the urban data is more promising.

Table 5: Birth and Death Rates

S. No.	Particulars	Rural	Urban	Combined
1	Crude Birth Rate per 1000 population	27.5	21.2	26.7
2	Crude Dearth Rate per 1000 population	7.4	5.7	7.2
3	Infant mortality Rate per 1,000 Live births	53	56	55
Source: Data on Sample Registration System, Registrar General of India, Min. of Home Affairs, Govt. of India, New Delhi and Annual Health Survey 2010-11				

2.3.5 Scheduled Castes and Scheduled Tribes

The Scheduled Caste population of Bihar was 15.7% in 2001, as compared to 16.2% for India. The corresponding figures for 1991 were 15.5% and 16.5%. The Scheduled Tribe population was 0.9% in 2001, as compared to 8.2% for India in 2001. The state ranked 16th in the Scheduled Caste population and 27th in the Scheduled Tribe population in 2001.

Table 6: Scheduled Caste and Scheduled Tribe

	Total Population			Rural			Urban		
	Total	Male	Female	Total	Male	Female	Total	Male	Female
Schedule Caste	13048608	6784676	6263932	12178555	6321221	5857334	870053	463455	406598
% age	15.7%	52%	48%	16.4%	51.9%	48.1%	10.0%	53.3%	46.7%
Schedule Tribe	758351	393114	365237	717702	371009	346693	40649	22105	18544
% age	0.9%	51.8%	48.2%	1.0%	51.7%	48.3%	0.5%	54.4%	45.6%
Source: Census 2001									

The notified Scheduled Castes in Bihar are Bantar, Bauri, Bhangi,Bhogta, Bhuiya, Bhumji, Chamar, Mochi, Chaupal, Dabgar, Dasadh, Dhangad, Dharhi, Dhobi, Dom, Ghasi, Halalkhor, Hari, Kanjar, Kurariar, Lalbegi, Mehtar, Musahar, Nat, Pan, Pasi, Rajwar, Sawasi and Turi.

The notified Scheduled Tribes in Bihar are Assure, Baiga, Banjara, Bathudi, Bedia, Bhumij, Binjhia, Birhor, Birjia, Chero, Chik Baraik, Gond, Gorait, Ho, Karmali, Kharia, Kharwar, Khond, Kisan, Kora, Korwa, Lohara, Mahli, Mal Paharia, Munda, Oraon, Pahariya, Santal, Sauria Paharia and Savar. It needs to be noted that some of these groups now belong to the state of Jharkhand.

2.3.6 SC, ST and Minority Details in Project Area/ Districts

In terms of the proportion of SCs, Kaimur has the highest proportion (29.6%) followed by Banka (24.1%) and Samastipur (22.2%). Of the 38 districts, Patna has the least proportion of SCs (6.6%) followed by Munger (8.7). The maximum proportion of STs are in Katihar (5.9%) followed by Muzaffarppur (4.8) and Sheikpura (4.7%) and Purnia (4.4%).As far as minority community proportion is concerned, the state average is 16.6, whereas Siwan has the maximum (67.6%) followed by Madhubani (42.5%) and Purnea (41.1). of the 38 districts Kishanganj has the least population of minority community (4.4) followed by Nalanda (6.2).

Table 7: Project District wise SC, ST and Minority

Districts	Rural Population	SC (%)	ST (%)	Minority (%)
Bihar	89.5	13	0.1	22.7
Araria				
Purnia				
Supaul	94.9	18.9	0	11.8
Madhepura	95.5	20	0.1	9.5
Saharsa	91.7	14.8	0.7	10.1
Source: Census 2001				

2.3.7 Mahadalits in Project Districts

The Government of Bihar has formed the State Mahadalit Mission for the development of the most deprived amongst the Scheduled castes. The Commission observed that out of the 22 scheduled castes in Bihar, 20 are acutely deprived in terms of educational, economic, socio-cultural and political status. The Commission identified these 20 castes primarily on the basis of their literacy rate. The literacy rate of Mahadalits is 16.7% against 28.5% of scheduled castes in Bihar. The table below gives the district wise proportion of Mahadalits. Bihar has 15.69% of Mahadalits. The top three districts in terms of Mahadalit proportion, are Gaya (29.62%), Nawada (24.04%) and Aurangabad (23.46%).

2.3.8 Literacy

As per 2011 Census, the number of literates in Bihar is 54,390,254 taking the state's literacy rate to 63.82%.Out of these male literates are 73.4% and female literates are 53.3%. the urban literacy rate stands at 78.75% (Male 84.42% and Female72.36%) compared to rural literacy rate of 61.83% (Male71.9% and Female 50.82%).

Table 8: Literacy Details in Project Districts

	Absolute Literates			Literacy Rate		
Item/District	Persons	Males	Females	Persons	Males	Females
Bihar	**54,390,254**	**32,711,975**	**21,678,279**	**63.82**	**73.39**	**53.33**
Araria						
Purnia						
Supaul	10,76,133	6,72,945	4,03,188	59.65	71.65	46.63
Madhepu ra	8,58,886	5,33,342	3,25,544	53.78	63.82	42.75
Saharsa	8,29,206	5,21,560	3,07,646	54.57	65.22	42.73
Source: Census of India 2011						

2.3.9 Economy

Bihar, once restricted to the lowest levels of development in the country, has not only grown consistently but also outperformed even the most developed states.It has clocked an annual growthrate of 14.15 per cent for the fiscal 2010-11, surpassing the GDP figures of some of the most developed states such as Gujarat, Maharashtra and Punjab. The state has witnessed a GDP growth rate of over 14 per cent thrice in the past five years.It has also made global headlines by getting into the World Bank Development Report 2009 as the fastest growing Indian state, followed by Chhattisgarh which saw its GDP grow at 11.57 per cent.Closely following the two are Tamil Nadu and Maharashtra with growth rates at 11.74 per cent and 10.47 per cent respectively.

The economy of Bihar is largely service oriented, but it has a significant agricultural base. The state also has a small industrial sector. As of 2008, agriculture accounted for 35%, industry 9% and service 55% of the economy of the state. Among all the sectors, the manufacturing sector performed very poorly in the state between 2002–2006, with an average growth rate of 0.38% compared to India's 7.8%. Bihar was the lowest GDP per capita in India, although there are pockets of higher than average per capita income. Between 1999 and 2008, GDP grew by 5.1% a year, which was below the Indian average of 7.3%. More recently, Bihar's state GDP recorded a growth of 18% between 2006–2007, and stood at 94,251 Crore Rupees ($21 billion nominal GDP). In the five-year period of 2004–2009, Bihar's GDP grew at a stunning rate of 11.03%. This makes Bihar the fastest growing major state. In actual terms, Bihar state GDP was ranked second out of 28 states, next only to Gujarat.

2.3.10 Total workers

There were total 22.69 lakh workers working in 12.25 lakh Establishments of the State. The number of total workers grew by 1.62% during 1998-2005. Out of total workers, 14.05 lakh workers (61.90%) were in rural area while 8.65 lakh workers (38.10%) were in urban areas. The growth of workers in rural area for whole of the state was 15.06 percent as against decline of 17.07% in the urban areas.

Table 9: Total Number of Workers in Project Districts						
	Rural		Urban		Total	
District/Year	1998	2005	1998	2005	1998	2005
Bihar	**1220972**	**1404857**	**1012363**	**864699**	**2233335**	**2269556**
Supaul	22763	25066	10151	8571	32914	33637
Madhepura	23047	19177	9622	7491	32669	26668
Saharsa	17714	23382	12152	14105	29866	37487
Araria						
Purnia						
Source: Fifth Economic Census 2005, DES, Govt. of Bihar						

2.3.11 Agricultural/ Non-agricultural Distribution of Total Workers

The number of workers in the Agricultural Establishments in the State decreased from 64,010 in 1998 to 63,021 in 2005, a decline of 1.57%. The number of workers in the Non-Agricultural Establishments increased from 2169322 in 1998 to 2206535 in 2005 recording a growth of 1.72%. This is shown in the table below:

Table 10:Distribution of Workers (Agriculture and Non-Agricultural)					
Agricultural		Non-Agricultural		Total	
1998	2005	1998	2005	1998	2005
64010	63021(-.57%)	2169322	2206535 (1.72%)	2233332	2269556 (1.62%)
Source: Fifth Economic Census 2005, DES, Govt. of Bihar					

Table 11: Project Districtwise DistributionofWorkers by Agricultural/Non-Agricultural Establishments						
	Agricultural		Non-Agricultural		Total	
District/Year	1998	2005	1998	2005	1998	2005
Bihar	**64010**	**63021**	**2169322**	**2206535**	**2233332**	**2269556**
Supaul	637	229	32277	33408	32914	33637
Madhepura	265	852	32404	25816	32669	26668
Saharsa	1755	909	28111	36578	29866	37487
Araria						
Purnia						
Source: Fifth Economic Census 2005, DES, Govt. of Bihar						

2.3.12 Income

There is a substantial gap in the per capita income of India (25661) and Bihar (9586). During period 2006-07 and 2008-09, the Per Capita Income of Bihar has grown by 17.37%, whereas during the same period that of India has grown by 13.64%.

Table 12: Income Details

Per Capita Income	At Constant Price in Rs. (Base Year 1999-2000)			At Current Price in Rs.		
	2006-07	2007-08 (Provisional)	2008-09 (quick)	2006-07	2007-08 (Provisional)	2008-09 (quick)
Per Capita Income, Bihar	8167	8703	9586	9817	11135	12643
Per Capita Income, India	22580	24295	25661	29524	33283	38084
Source: Bihar at Glance 2009						

2.4 Environmental Baseline of Bihar

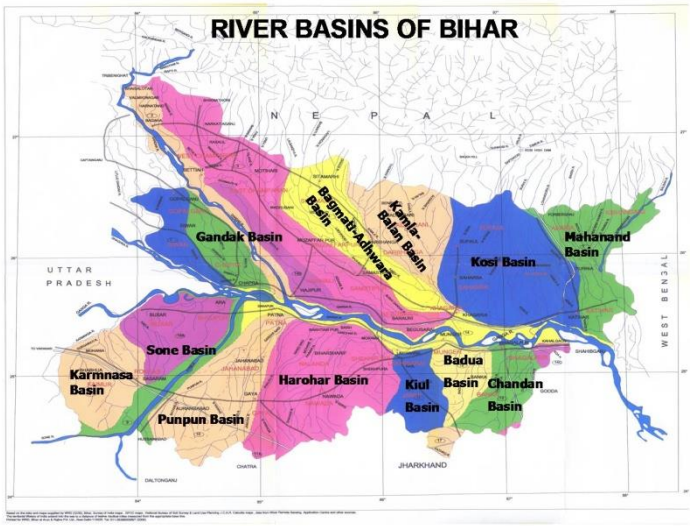
2.4.1 Water Resources

Bihar is richly endowed with water resources, both the ground water resource and the surface water resources. Not only by rainfall but it has considerable water supply from the rivers which flow within the territory of the State. Ganga is the main river which is joined by tributaries with their sources in the Himalayas. Some of them are Saryu (Ghaghra), Gandak, Burhi Gandak, Bagmati, Kamla-Balan and Mahananda. There are some other rivers that start from the platue area and meet in Ganges or its associate rivers after flowing towards north. Some of them are Sone, Uttari Koyal, Punpun, Panchane and Karmnasha.These rivers make the water available for irrigation purpose and also help in generating the hydro-thermal energy for the state. Apart from this they provide a medium for water transport, provide fishes for fishery industry and enrich the natural resources of state in many other ways. All the above rivers have their impact on the Bihar plain. State also has non-exhaustible source of ground water which is in use for drinking purposes, irrigation and industries. The details of the rivers flowing in Bihar are given below:

Table 13: Rivers flowing in Bihar

Name of the Basin	Catchment Area (Sq. Km)	Length of River in Bihar (Km)	Embankment Constructed (Km)	Flood Prone Area (Sq.Km)	Protected Area (Sq. Km)
Ganga	19322	445	596.92	12920	4300
Kosi	**11410**	**260**	**387.51**	**10150**	**9300**
Burhi Gandak	9601	320	704.26	8210	4010
Kiul Harohar	17225		14	6340	NIL
Punpun	9026	235	37.62	6130	260
Mahananda	6150	376	225.33	5150	1210
Sone	15820	202	59.54	3700	210
Bagmati	6500	394	400.79	4440	3170
Kamla Balan	4488	120	184.9	3700	2810
Gandak	4188	260	511.66	3350	3350
Ghaghra	2995	83	132.9	2530	790
Chandan	4093	118	83.18	1130	80

Badua	2215	130	NIL	1050	NIL
Lalbakeya			54.35		
Adhwara			181.5		
Bhuthi			54.7		
Total			**3629.16**	**68800**	**29490**



Surfacewater: The surface water resource in the state includes 69000ha of ponds and tanks, 9000 ha of oxbow lakes, 7200 ha of reservoirs, 3200 km of rivers and 1lakh ha of riverine and other flood plains.

Groundwater: The annual replenishable ground water resource in the state is estimated to be 29.19 BCM. The net annual ground wateravailability is27.42BCM.The annual ground water draftis estimated to be 10.77 BCM making the stage of ground water development 39%. None of the administrative divisions (calledblocks) in the state are classified as Over Exploited, Critical or Semi-critical with respect to the ground water status. Thestage of ground water development exceeds 50% in Nalanda, Jehanabad, Begusarai, Siwan, Saran andPatna.

Water quality: Groundwater quality in parts of the state is affected by high Fluoride (4157habitations), Iron (18673habitations)andArsenic(1590habitations). The details of groundwater contamination are given below:

Table 14: Ground water quality	
Contaminant	**Districts affected**
Fluoride (>1.5 mg/l)	Aurangabad, Banka, Buxar, Bhabua(Kaimur), Jamui, Munger, Nawada, Rohtas, **Supaul**
Iron (>1.0 mg/l)	Aurangabad, Begusarai, Bhojpur, Buxar, Bhabua (Kaimur), East Champaran, Gopalganj, **Katihar, Khagaria**, Kishanganj, Lakhiserai, **Madhepura**, Muzafferpur, Nawada, Rohtas, **Saharsa, Samastipur**, Siwan, **Supaul**, West Champaran
Nitrate (>45 mg/l)	Aurangabad, Banka, Bhagalpur, Bhojpur, Bhabua, Patna, Rohtas, Saran, Siwan
Arsenic (>0.05 mg/l)	Begusarai, Bhagalpur, Bhojpur, Buxar, **Darbhanga, Katihar, Khagaria**, Kishanganj, Lakhiserai, Munger, Patna, Purnea, **Samastipur**, Saran, Vaishali

Among the Kosi Basin Project Districts, some parts of Supaul District are having Fluoride in excess of 1.5 mg/l. Iron is present in more than permissible limits, i.e., above 1.0mg/l in some parts of Kosi Basin Districts, viz., Katihar, Khagaria,

Madhepura, Saharsa, Samastipur and Supaul. Arsenic is found in excess (more than 0.05mg/l) in some parts of Kosi Basin Districts, viz., Darbhanga, Katihar, Khagaria and Samiastipur. Flooding could be one the many reasons for presence of contaminants in the groundwater in Kosi basin. District wise groundwater quality maps are available at www.cgwb.gov.in.

2.4.1.1 Rainfall

The average annual rainfall of Bihar is 1271.9 mm and the average number of rainy days are 52.5. The Zone-II North East Alluvial Plains has the highest rainfall ranging between 1200-1700 mm, the Zone-INorth West Alluvial Plains has rainfall between 1040-1450 mm, and the Zone-III, South Bihar Alluvial Plains has the lowest rainfall ranging between 990-1240 mm. The districts of Kishanganj, Araria, West Champaran and Purnia receive over 1400 mm rainfall. Patna and Nalanda receive less than 1000 mm of rainfall annually. The districts of Saran, Darbhanga, Patna and Muzaffarpur have a higher probability of drought (15%ormore). The below table gives the season wise rainfall data and number of rainy days during the years 2004-05, 2005-06 and 2006-07.

Table 15: Season wise Average Rainfall (in m.m) & Rainy Days in Bihar, During the Year, 2004-05, 2005-06, 2006-07.

June 2004 to September 2004	907.71
October 2004 to December 2004	60.07
January 2005 to February 2005	22.31
March 2005 to May 2005	38.58
Total Rainfall 2004-05	1002.5
Normal Rainfall 2004-05	1176.4
Average Rainy Days 2004-05	43.14
June 2005 to September 2005	768.3
October 2005 to December 2005	30.22
January 2006 to February 2006	0.1
March 2006 to May 2006	88.96
Total Rainfall 2005-06	887.59
Normal Rainfall 2005-06	1176.4
Average Rainy Days 2005-06	39.83
June 2006 to September 2006	903.02
October 2006 to December 2006	23.57
January 2007 to February 2007	30.17
March 2007 to May 2007	80.83
Total Rainfall 2006-07	1037.61
Normal Rainfall 2006-07	1176.4
Average Rainy Days 2006-07	44.8
Source: Directorate of Economics & Statistics, Bihar, Patna	

The monthly average rainfall and potential evapo-transpiration in re-organized Bihar is given in the following graph:

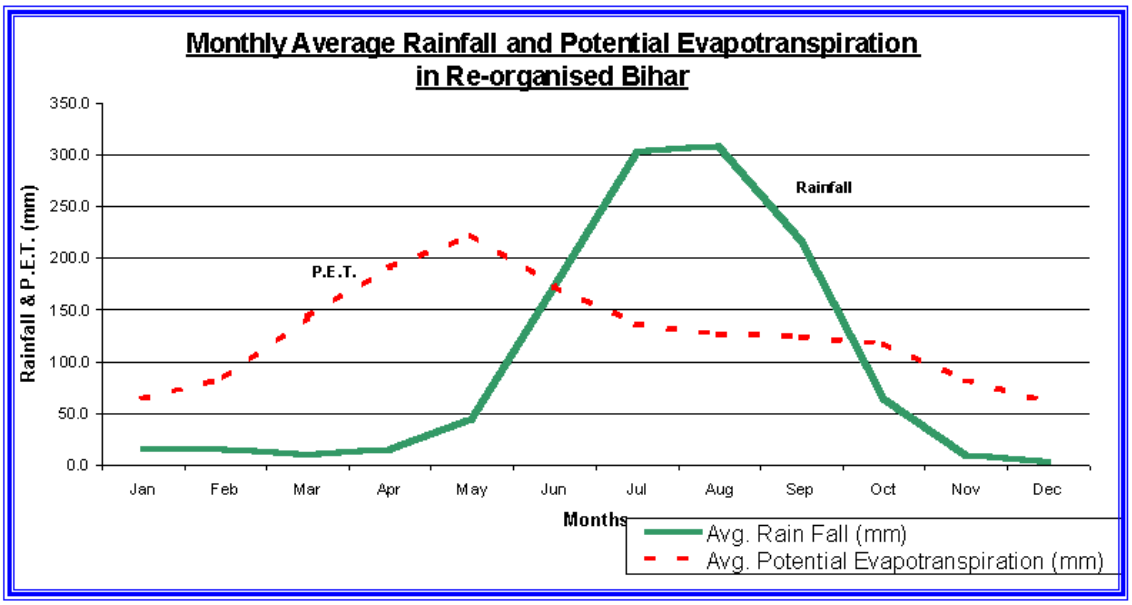


Figure 2: Monthly Avg. Rainfall and Potential Evopotranspiration in Re-organised Bihar

2.4.1.2 Project District wise Rainfall

Among the 38 districts, Kishangunj (2141.7) has the highest normal rainfall, while Patna (973.1) has the lowest normal rainfall. During 2007, among the 38 districts, Muzaffarpur (2271.9) had the highest actual rainfall and Buxar (934.0) had the lowest rainfall The district wise normal and actual rainfall for the year 2007 is given in below table:

Table 16: Project District wise normal and actual rainfall for the year 2007

S.No.	District	NormalRainfall	ActualRainfall2007
1	**Bihar**	**1176.4**	**1196.0**
2	Darbhanga	1114.6	1610.6
3	Samastipur	1142.0	1695.4
4	Madhubani	1285.8	1804.6
5	Khagaria	1170.2	1472.4
6	Saharsa	1259.8	1270.7
7	Supaul	1344.0	1450.1
8	Madhepura	1230.5	1358.3
9	Katihar	1297.9	1223.6

2.4.2 Agro-Climatic Condition

Bihar with a geographical area of about 94,200sq.Km. is divided by river Ganges into two parts, the north Bihar with an area of 53,300sq.km. and the south Bihar having an area of 40,900sq.km. Based on soil characterization, rainfall, temperature and terrain, four main agro-climatic zones in Bihar have been identified each with its own unique prospects. These are:

1. Zone-I, NorthAlluvialPlain
2. Zone- II,NorthEastAlluvialPlain

3 . Zone-III ASouthEastAlluvialPlain
4. Zone-IIIB, SouthWest AlluvialPlain

Table 17: Agro-climatic Zones

S No	Agro-climatic Zone	District
1.	Agro- climatic zone I (Northern West)	West Champaran, East Champaran, Siwan, Saran, Sitamarhi, Sheohar, Muzaffarpur, Vaishali, **Madhubani, Darbhanga, Samastipur**, Gopalganj, Begusarai
2.	Agro-climatic Zone II (Northern East)	Purnea, **Katihar, Saharsa, Supaul, Madhepura, Khagaria**, Araria, Kishanganj.
3.	Agro-climatic zone IIIA (Southern East)	Sheikhpura, Munger, Jamui, Lakhisarai, Bhagalpur & Banka.
4.	Agro-climatic zone IIIB (Southern West)	Rohtas, Bhojpur, Buxar, Bhabhua, Arwal, Patna, Nalanda, Nawada, Jehanabad, Aurangabad, Gaya.

Three (Madhubani, Darbhanga and Samastipur) of the Eight Kosi Basin Project Districts fall under Agro-Climatic Zone I (Northern West) and the remaining Five Project Districts (Katihar, Sharsa, Supaul, Madhepura and Khagaria) fall under Agro-Climatic Zone II (Northern East).

Agro climatic zone I and II are located north of the river Ganges where as the Zone III is located south of the river Ganges. Zone I is situated in the north western part of the state whereas zone II is located in the north eastern part. Zone Iand II are flood prone whereas zone III is drought prone. Potential wise all three agro climatic zones have vast untapped potential for increasing the productivity of foodgrain crops. Across the states oil texture varies from sandy loam to heavy clay. However the majority type belongs to loam category which is good for cropcultivation. The natural precipitation varies from 990 to 1700 mm. Most of the precipitation is received during the month of July to September. Soil pH varies from 6.5 to 8.4. There are three crop seasons, Kharif, Rabi and Zaid. Rice, wheat and pulses are grown in all the districts however the choice of the crop and croprotation varies across the agro climatic zone. Being located between 25 to 27 degree North latitude the climate of Bihar is of mostly sub-tropical. Nevertheless region close to Tropic of Cancer experiences tropical climate during summer. Like all the Indian states Bihar also reels under hot summer season during months of March to May. Average temperature is 35-40 degree Celsius throughout the summer months. April and June are the hottest months of the year. December to January is the winter season in Bihar because of its location is Northern hemisphere. The winter in Bihar is mild with average temperature being 5 to 10 degree Celsius. Bihar gets its maximum rainfall during South-West monsoon season which prevails from June to September. The average rainfall of Bihar is around 120cm. As far as soil resources are concerned Bihar has three types of soil: montane, alluvium and marshy/swampy soil of Tarai.

2.4.3 Physiography and Soil

The important physiographic features of the agro-climatic zones are given in the table below:

Table 18: Physiography and Soil

S No	Agro-climatic Zone	Soil	pH	Total Rainfall (mm)	Temperature (°C)	
					Max	Min
1.	**Agro- climatic zone I (Northern West)**	Sandy Loam, Loam	6.5 – 8.4	1040 – 1450 (1245.00)	36.6	7.7
2.	**Agro-climatic Zone II (Northern East)**	Sandy Loam, Clay Loam	6.5 – 7.8	1200 – 1700 (1450.00)	33.8	8.8
3.	Agro-climatic zone IIIA (Southern East & West)	Sandy Loam, Clay Loam, Clay	6.8 – 8.0	990 – 1240 (1115.00)	37.1	7.8

As mentioned above the Kosi Basin Project Districts fall under Agro-Climatic Zones I and II.

2.4.3.1 Agro-Climatic Zone-I

The lands of this zone which are alluvial plains are sloppy towards the south east direction with a very low gradient as evidenced by the direction in which the rivers flow. However, the rivers move east ward direction along the natural levee before they finally meet the Ganga. As a result, there are vast water logged areas in the districts of Saran, Vaishali and Samastipur. Due to near flatness of the landscape, vast area gets flooded during rains. The north–eastern portion of this zone, the "Don hills valleys" is glacial hills and valleys.

Except for the northern portion and portion in the west of the zone under the influence of Adhwara system of rivers, the entire zone is under the influence of rivers like Gandak, Burhi Gandak and Ghaghra, all of which originate in the lime rich foot hills of the Himalayas. Thus, the soil under the influence of Gandak, Burhi Gandak and Ghaghra are mostly calcareous having different amounts of lime in them. The soils of Siwan and Gopalganj districts with less rainfall and more pronounced dry seasons have developed salinity as well as alkalinity. Similarly, the soil of nearly flat lands of East and West Champaran and Muzaffarpur also salt affected. The soils of the northern part not under the influence of the above rivers are neutral, acidic or saline depending on the micro–relief and local physiography.

This zone has the following six broad soil association groups:

i. Sub–Himalayan and forest soils
ii. Recent alluvial tarai soils
iii. Young alluvial calcareous soils
iv. Young alluvial calcareous saline soils
v. Young alluvial non–calcareous, non saline soils, and
vi. Recent alluvial calcareous soils

As all the rivers and rivulets originate in the high Himalayas, dominated by mechanical weathering of rocks, the soils are mostly light to medium light textured except those away from the direct influence of the rivers. The upland soils are well drained to moderately well drained. The medium low lands and the low lands soils,

although of good to moderate permeability, have become some what poorly drained due to high water table in the areas. The soils are moderately rich to poor in nitrogen (especially in Gopalganj and Siwan districts), moderate to very low in available phosphorus and medium to high in available potash. The soils are showing symptoms of deficiency of zinc and iron mostly induced by high available calcium.

2.4.3.2 Agro- Climatic Zone II

This zone, the alluvial plains of Kosi, Mahananda and its tributes and Ganga (an arrows trip in the south) is slightly undulating to rolling landscape mixed with long stretches of nearly flat landscape with pockets of areas having sub–normal relief. The area is full of streams with abandoned dead channels of Kosi river, which becomes notorious for its frequent and sudden change of courses forming small lakes and shallow marshes. In the south, in between the natural levees of Ganga, on the one hand and Kosi and Mahananda on the other, there are vast areas which remain water logged for a considerable part of the year. The general slope of the land is towards south east and the river sonreaching Ganga moves east ward for along distance before they meet river Ganga.

Unlike the rivers Gandak and Ghaghra, Kosi and Mahananda originate and have catchments in Himalayan region, which are not calcareous but rich in acidic minerals. As a result, the soils of this zone are non calcareous, accumulation of sodium salts and sodium adsorption has taken place in areas where the drainage is poor. Salinity and alkalinity are, however, on an increase in Saharsa and western part of Purnea and Katihar districts. As both Kosi and Mahananda carry a tremendous load of sediments, the soils are mostly light textured except in back waters of river Ganga and Kosi.

Three broad soil association groups have been identified in this zone are:

1. Recent alluvial taraisoil
2. Recent alluvialnoncalcareous soil,and
3. Recent alluvial calcareoussoil

The soils are very light to medium textured except for those in between the natural levees of Ganga and Kosi and Mahananda and away from the influence of running water of the rivers. Even the heavy textured soils under the influence of Kosi and Mahananda have sandy sub stratum below 40 to 100 cm depths. The soils are mostly moderately acidic to neutral. Very acidic soils are found in north east parts with heavy rainfall and high permeability. The soils are excessively drained to poorly drained mainly depending on local physiography and depth of water table. With the introduction of irrigation without providing adequate drainage ways, the water table is rising and water logged areas and saline patches are increasing. The soils are very poor to poor in nitrogen especially with the very light textured soils, very poor to medium in available phosphorus and potash. Deficiencies of zinc and boronand toxicity of manganese have been recognized in these areas.

2.4.3.3 Agro-Climatic Zone III

This zone is the all uvial plains of river Ganga on its southern side and the sediments are received both from river Ganga and those flowing from the south having their origins in the Chota Nagpur Plateau, which rise abruptly from the plains. The land's slope is towards northeast with gentle slope gradient and moderate to low gradient. In the south of the natural levee of the Ganga, there is vast stretch of back waters known as "Tal" land sextending from Buxar to Pirpaity, where most of the rivers and rivulets coming from the south get lost. The flood plains of Ganga, which get reworked and geteroded and deposited a tregular intervals, are lighter than "Tal" lands and are known locally as Diara lands.

The river originating from the Chotanagpur plateau brings a lot of fine sediments. The coarser sediments that they bring are either deposited in their beds or on their banks and as a consequence, the soils are mostly medium to heavy textured throughout the depth of the profiled. There are nomarshy lands in this zone.

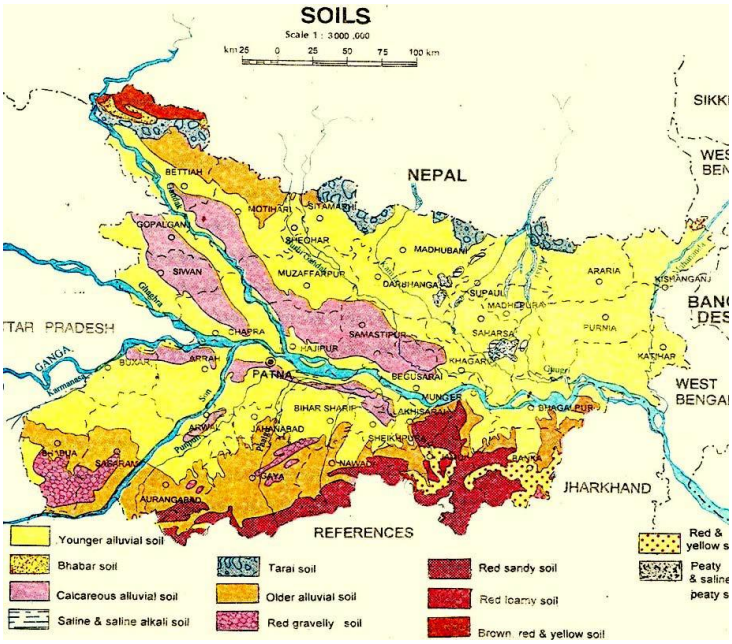


Figure 3: Soils in Bihar

The main broad soil association groups recognized in this zone are:

1. Recent alluvial calcareous soils
2. Tal land soils, light grey, dark grey medium to heavy textured soils
3. Old alluvial reddish yellow,yellowish grey centenary soils
4. Old alluvial grey, grayish yellow, heavy texture soils with cracking nature
5. Recent alluvial yellowish to reddish yellow non calcareous non saline soils
6. Old alluvial yellowish to red yellow soils of foot hills
7. Old alluvial saline and saline alkali soils

The soils of this zone except that of 'Diara' area and 'Tal' lands are moderately well drained to some what poorly drained, moderately acidic to slightly alkaline and medium textured to heavy textured soils. The soils of paddy lands have developed impervious layer of varying thickness and imperviousness varies from simple semi-developed some what porous clay pans to practically very hard impervious thick layers with slicken side. The soils are poor to moderate in nitrogen and poor to moderately rich in available phosphorus and potash. The soils of medium low to low

lands are comparatively more fertile. The soils of 'Tal' lands are highly clayey throughout their depths, grey to dark grey in colour, neutral to slightly alkaline in reaction. These soils are moderately rich in nitrogen, available Pand Kand very hard under normal conditions.

The Diara land soils with their undulating landscapes are generally very light to medium heavy textured but all under lainby sandy layers with in 80 to100 cm of their surface and very well drained to moderately well drained, neutral to slightly alkaline in reaction. Their fertility status varies widely from poor to very fertile depending upon their physio graphic positions but all are under moisturestress due to the occurrence of sandy substratum.

Below table gives the total area, net sown area, irrigated area and main cropping systems by agro-climatic zone.

Table 19: Total area, net sown area, irrigated area and main cropping systems by agro-climatic zone

Agro-climatic zone	Districts	Total area (m ha)	Net sown area (m ha)	Irrigated area (mha)	Main cropping systems
Zone-I North- West Alluvial Plain	West Champaran, East Champaran, Gopalganj, Saran, Siwan, Sitamarhi, Muzaffarpur, **Darbhanga**, Vaishali, **Samastipur**, Sheohar, **Madhubani**	3.26	2.15 (66)*	0.86 (40)**	Rice-Wheat, Maize-Wheat, Maize-Arhar, Maize-Potato-Moong, Maize-Sweet Potato-Onion, Maize-Mustard-Moong,
Zone-II (North-East Alluvial plain)	Purnea, **Katihar, Madhepura, Saharsa**, Araria, Akishanganj, **Supaul, Khagaria**, Begusarai	2.08	1.21 (58)*	0.24 (20)**	Jute-Rice, Jute-Wheat, Jute-Rice-Wheat, Jute- Potato, Jute-Kalai-Wheat, Jute-Mustard, Jute-Pea, Rice-Wheat-Moong
Zone-IIIA (South Bihar Alluvial plain (East)	Banka, Munger, Jamui, Lakhisarai, Shekhpura, Bhagalpur	1.11	0.49 (44)*	0.21 (43)**	Rice-Wheat, Rice-Wheat-Moong, Rice-Gram-Rice, Rice-Potato-Onion, Rice-Mustard-Moong, Rice-Berseem
Zone-IIIB (South Bihar Alluvial plain (West)	Patna, Gaya, Jahanabad, Nawada, Nalanda, Rohtas, Bhojpur, Aurangabad, Buxar, Kaimur.	2.92	1.68 (58)*	1.37 (81)**	Rice-Wheat-Moong, Rice-Wheat-Rice, Rice-Gram-Rice, Rice-Gram-Moong
Total		9.37	5.53 (59)*	2.68 (48)**	

* Figuresinparenthesisare%ofgeographicalarea.

** Figuresinparenthesisare%ofnetareasown.

2.4.4 Land use

Bihar has a geographical area of about 94,200sq.km. The state is divided by river Ganges into two parts, the North Bihar with an area of 53,300sq.km, and the South Bihar with an area of 40,900sq.km. Of the total geographic area of 94.16 lakh ha, about 60% is cropped and only about 22% of the area is cropped twice. The gross and net sown area in the State is estimated at 77.18 lakh ha and 56.65 lakh ha respectively. The cropping intensity is 1.36. Forest area is limited (6.6%) and the area under pastures and grazing lands is extremely scarce (0.18%).

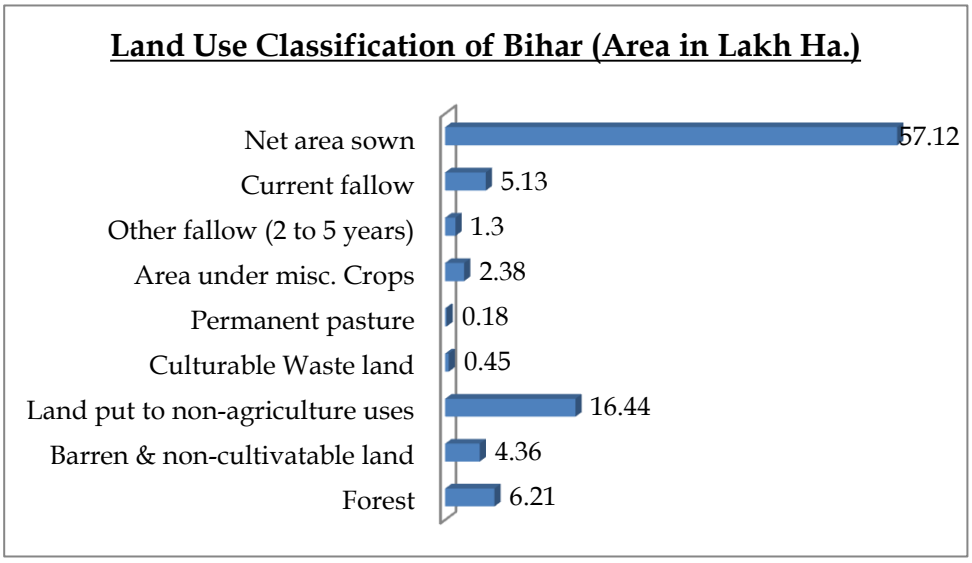


Figure 4: Land use Classification in Bihar

The districts of East and West Champaran, Rohtas, **Madhubani** and Purnea have the largest net sown area. However, interm softhenet sown area as a percentage of the district area Buxar, Bhojpur and Naland a top the list with more than 75% while Jamui and Monghyrareat the bottom of the list with less than 40%. The extent off allow lands is the maximum in the districts of Gaya, Jamui, Purnea (while as percentage of the district area Sheikhpura, Jamui and Gaya have more than 20% area under fallows). Cropping intensity is highest in **Saharsa** (1.76), Sivhar and **Supaul** and lowest in Banka (1.07), **Darbhanga** and Patna. The districts with more than 50,000ha under forests are Bhabua, Jamui, West Champaran, Gaya, Rohtas and Nawadha. Only 9 districts have more than 500 ha under pastures and grazing lands with Gaya having the maxium area at 2192 ha (0.44%).

Wastelands are spread over an area of 6,841sq.km in Bihar accounting for 7.26% of the state's geographic area. Of the total wasteland in the state, land with scrub (dense and open) accounts for 3715 sq km (about 4%), waterlogged area (permanent and seasonal) accounts for 1564 sq km (1.66%) and degraded forestland with scrub accounts for about 1200sqkm (1.27%). The districts of Jamui and Banka have more than 20% of their area under wasteland. Nalanda, Bhojpur, Buxarand **Khagaria** have the least extent of wastelands in the state. Jamui, Banka, West Champaran and **Katihar** have the maximum area under degraded scrubland. The districts most affected by permanent water logging are Saran, Siwan, Vaishali and Muzaffarpur and those affected by seasonal waterlogging are Purnia, **Madhepura** and **Saharsa**.

The land use details of Bihar and India are given in the table below for comparison.

Table 20: Land Use - India and Bihar ('000' Ha.)

	Item/Land Use	1986-87		1991-92		1996-97		2001-02		2004-05		2005-06		2006-07	
		India	Bihar	India	Bihar	India	Bihar	India	Bihar	India	Bihar	India	Bihar	India	Bihar
1	Forest	67416	609	68024	616	68750	616	69487	622		622		622		622
2	Area not available for cultivation	39729	1849	41013	1892	41543	2032	42136	2077		2082		2083		2083
(A)	Area under non-Agricultural uses	NA	1407	NA	1450	41543	1595	41780	1641		1646		1647		1647
(a)	Land Area	NA	1177	NA	1173	NA	1259	NA	1279		1285		1286		1286
(b)	Water Area	NA	230	NA	277	NA	336	NA	362		361		361		361
(i)	Perenial	NA	144	NA	182	NA	207	NA	207		207		207		207
(ii)	Temporary	NA	86	NA	95	NA	129	NA	155		154		154		154
(B)	Barrean and Uncultivable land	NA	442	NA	442	NA	437	NA	436		436		436		436
3	Other uncultivable Land														
	excluding Fallow Land	NA	292	NA	299	-	296	-	299		302		303		304
(i)	Permanent pasture and other grazing land	12050	34	11676	28	11040	19	10581	18		17		17		17
(ii)	Land under Misc. trees, crops and groves	3623	190	3643	202	3567	226	3335	235		239		240		241
(iii)	Cultivable Waste Land	16410	68	15072	69	13947	51	13352	46		46		46		46
4	Fallow Land	23049	1032	24222	823	23218	872	24927	698		781		795		686
(i)	Fallow Land otherthan Current Fallow	9563	207	9848	184	9892	157	10254	135		133		129		120
(ii)	Current Fallow	13486	825	14374	639	13326	715	14673	563		648		666		566
5	Net Area Sown	142003	5577	141408	5731	142813	5542	141383	5664		5572		5556		5665
6	Total Cropped Area	177042	8133	182728	8052	189592	8064	190488	7897		7399		7396		7719
7	Area Sown morethan once	35039	2556	41320	2322	46779	2522	49105	2233		1827		1840		2054

Source: Directorate of Economics & Statistics, Bihar Patna.

2. Statistical Abstract (C.S.O.) 1982, 1984, 1989, 1992, 2000 to 2006.

2.4.5 Agriculture and Cropping patterns

Bihar, with its bountiful natural resources of fertile soil, abundant water, varied climate and rich cultural and historical heritage is one of the most fascinating states of India. Bihar is one of the states where agriculture is considered as the backbone ofeconomic activity. About 80% of the land area is arable and supported with good monsoonrainfall. Though the agricultural practices are not well developed, but somehow supportsthe life line through its products.The farmers are intelligent and hard working. Therefore agriculture has been described as the core competence of Bihar by the Hon'ble President of India. Agriculture is the vital source of wealth in Bihar. 76% of its population is engaged in agricultural pursuits. Bihar's productive contribution in food grain, fruit, vegetables, spices and flowers can increase manifold with improved methods and system management. Bihar has a total geographical area of about 93.60 lakh hectare, out of which only 56.03 lakh hectare is the net cultivated area and gross cultivated area being 79.46 lakh hectare. About 33.51 lakh hectare net area and 43.86 lakh hectare gross area receive irrigation from different sources. Principal food crops are paddy, wheat, maize and pulses. Main cash crops are sugarcane, potato, tobacco, oilseeds, onion, chillies and jute and. Bihar has notified forest area of 6,764.14 sq km, which is 7.1 per cent of its geographical area. There are four classes of crop period in Bihar;

1. Bhadai
2. Aghani
3. Rabi crop
4. Summer crop

Bhadai: This crop is sown in the month of May-June i.e., in pre-monsoon periodand harvested during post monsoon period. It includes the crops such as rice, maize andjute and in some patches pulses and vegetables are also grown.The districts of Purnia, **Saharsa, Madhepura, Supaul**, Kishanganj, **Katihar** are themain areas where such crops yield. Marua is grown in the districts of Muzaffarpur, Vaishali,**Saharsa, Samastipur** and Sitamarhi.In the diara lands of Ganga and Kosi belt maize are grown.

Aghani: This is the main crop in Bihar. It contains all the crops which are sown duringrainy season immediate after the on-set of monsoon. The main paddy crop is sown tillAugust and harvested in the month of Nov.-Dec. That is why Bihar has its own well establishedrice culture.The main rice producing districts are Purnia, **Madhubani, Darbhanga**, Sitamarhi,**Saharsa**, Rohtas, etc. Two crops yield of paddy is usually practised because of the factthat a monsoon period prolongs over a wide range.

Rabi Crop: This is the winter crop usually sown in the month of Oct-Nov andharvested in the month of March-April. Wheat is the main product of this period along withother minor pulses and oil seeds.

Summer Crop: During this period summer paddy, vegetables oil seed, maize andpulses are grown.

2.4.5.1 Main Crops Yields

Paddy: Paddy is grown about a tune of 65.5 lakh MT each year. Three types ofpaddy are produced:

- Aghani Paddy (80% of the area)
- Boro Paddy (2% of the area)
- Summer Paddy (3% of the area)

ThedistrictsofRohtas,Aurangabad,Bhabha,BankaandNalandahavethehighestricepro duction (with productivity >2.3 tonnes/ha) while the lowest rice productivity is seen in Shivhar (0.52 tonnes/ha),**Samastipur**andMuzaffarpur.

Wheat: Wheat is the second most predominant product. It is produced in about26.5 lakh ha. land and the yield is of a tune of 35.7 lakh ton every year. In the past twodecades the production in Bihar has increased many fold and it has attained the sixthposition in the list of states producing wheat.The main wheat producing area is Ganga-Diara, **Kosi basin**, Begusarai district,area falling west of river Bagmati and in the districts of Buxar, Rohtas, Gaya, Jehanabad,Patna, Munger and Bhagalpur.

Rohtas,GopalganjandSaranhavethe highestwheat production(withproductivity>2.3tonnes/ha)whilethelowestwheatproductivityissee ninAraria(0.7 tonnes/ha),**Katihar**andKishanganj.

Maize: Maize is the third main crop of Bihar and is sown in 8% of the cultivablearea. It is mainly grown in the area Southwest of Burhi Gandak River and in the districts of Saran,Gopalganj, Siwan, **Samastipur** and Purbi and Pashcim Champaran. Approximately 18 lakh MT is produced every year.

The production of maize is the highest in **Khagaria, Samastipur** and Purnia (with productivity >3.5 tonnes/ha) while Jamui, Buxar and East Champaran have the lowestproductivityofthiscrop.

Barley: Barley is grown in almost similar ground situation as that of maize. It issown as mixed crop. Purbi and Paschim Champaran are the lead districts in its production.

Marua (Ragi): It is grown in the less fertile sandy soil and needs little water that iswhy its seed is sown in the month of June and transplanted after rainfall. It is the main foodof labour and down trodden class of population. It is grown in the districts of **Saharsa, Supaul, Madhepura** and **Darbhanga**, etc.

Pulses: About 12-13 lakh ha. land is used for growing such type of crops. Theannual production is of to a tune of 10 lakh MT.

Main Cash Crops: It includes Sugarcane, Tabacco, Potato, Jute and Chilli.Sugarcane is grown in alluvial soil having lime as main ingrediant. It is noted thatarea lying east of Bagmati is not suitable for sugarcane cultivation. Broadly, it is the arealying Northeast of Bagmati river which is considered most suitable for sugarcane cultivation.Tabacco is grown in 14000 ha. land and the production is of a tune of 17000 tonevery year. It is grown mainly on the margin of river banks almost extending from Gandakriver in the west to eastern boarder of Bihar.Potato is the main cash crop and is grown almost in every districts. Nalanda districtis considered as the leading producer of Potato.Jute is produced in the high rainfall and humid area of Bihar. It is grown at the marginof water bodies where pure water is vailable for washing. It is mainly grown in the districtsof Purnia, Kishanganj, **Katihar Saharsa**, etc.Chilli is a product grown throughout the year in about 75,000 ha. land.

2.4.5.2 Horticulture

Biharranks8thwithrespecttothearea(11.21lakhha)and5thwithrespecttotheproduction (173.35lakhMT)ofhorticultural cropsinthecountry.MajorfruitsgrowninthestateareMango, Litchi,Guava,Pineapple,Banana,Aonla,Bel and Makhana.Theprimefruit growingdistrictsare Muzaffarpur, Vaishali, **Samastipur**, Bhagalpur, Banka, **Darbhanga**, Munger, Jamui, Gaya, Aurangabad, Nalanda, Patna, West Champaran, East Champaran, Kishangaj, Purnea, Araria, **Katihar**and**Khagaria**.Themajorvegetablesgrownoncommercialscaleinthestateare Cauliflower, Potato,Okra,Brinjal,Onion,Chillies,Cabbage,Gourds,Peas,CowpeaandMelon.

Biharhasanetirrigatedareaof 34.61lakhha(61%of thenetsownareaof 56.65lakhha).Ofthenet irrigatedarea,64%isirrigatedbytubewellsand27%isirrigatedbycanals.Irrigationbytanksisless than 5%. The districts with the highest dependence on tubewells for irrigation (100%) are EastChamparan, **Samastipur, Madhubani**, Araria, Kishenganj and Sivhar. Rohtas, **Darbhanga**and Bhojpurhavelessthan30%oftheirnetirrigatedareairrigatedbytubewells.Canalsaccount formore than90%ofthenetirrigatedareainRohtasandformorethan70%areainBhojpur.

2.4.5.3 Fertilizers and Pesticides

TheuseofnitrogenousfertilizersinBiharismuchhigherascomparedto thenationalaverage. The national averages for N, P and K stand at 77.9, 33.69 and 17.1 kg/ha. respectively, while that of Bihar are 123.77, 33.37 and 21.83 kg/ha. respectively. In the year 2009-

10,theconsumptionofN,P,Kfertilizerswas8.94,2.47and1.67MTrespectively makingtheN:P:Kratio8.04:1.98:1(theoptimumnutrientratiorecommendedforIndianso ilsis4:2:1).The consumptionofchemicalpesticidesinBiharin2006-07was890MT and in the previous year it was 875 MT.

Gross area under irrigation by crops in Bihar is given in table below:

Table 21: Gross Area Under Irrigation by Crops in Bihar (Area In '000 Ha)				
S. No.	Crops	2003-04	2004-05	2005-06
1	2	3	4	5
1	Rice	1977	1631	1739308
2	Wheat	1878	1835	1826295
3	Barley	5	5	4259
4	Maize	352	359	391312
5	Gram	11	13	7210
6	Other Cereals and Pulses	7	14	11947
7	Other Food Crops	269	22	241953
8	Sugarcane	27	27	26999
9	Non-Food Crops	68	72	75404
Source: Directorate of Economics & Statistics, Bihar, Patna				

Area and Production of horticultural crops for years 2005-06, 2006-07, 2007-08 and 2008-09 is given the table below:

Table 22: Areaand Productionofhorticulturalcrops (Area– '000ha,Production– '000MT.)									
S. No.	**Particulars**	**2005-06**		**2006-07**		**2007-08**		**2008-09**	
		Area	**Prodn.**	**Area**	**Prodn.**	**Area**	**Prodn.**	**Area**	**Prodn.**
1.	Fruits	276.44	3068.42	279.41	3426.48	286.24	3252.37	291.50	3853.88
2.	Vegetables	498.52	7656.43	501.31	7866.62	508.24	8048.09	519.12	8329.02
3.	Spices	NA	NA	11.10	12.30	12.25	14.10	12.75	14.98
4.	Flowers	NA	NA	0.297	NA	0.325	NA	0.337	NA
5.	Aromatic Plants	NA	NA	2.10	NA	2.45	NA	2.60	NA

The below table gives the detail of irrigated area from different sources like, canal, tubewell and other sources by zone and district.

Nameof District	**Canal, ha.**	**Tubewell, ha.**	**Other Sources, ha.**	**Totalirrigated Area, ha.**
Darbhanga	-	95736	6351	102087
Madhubani	-	41113	97438	138551
Samastipur	-	112387	-	112387

Katihar	-	129408	-	129408
Khagaria	-	76748	6645	8339
Supaul	67352	73678	1084	142114
Bihar total	**1367664**	**2855202**	**343968**	**4566834**
	29.95	**62.52**	**7.53**	**100.00**

The sown area, production and yield of various crops sown during years 2007-08, 2008-09 and 2009-10 are given in the table below:

Table 23: Area, Production & Yield 2007-08, 2008-09, 2009-10

		Area in ha., Prod. In MT, Yield in kg/ha.								
S No.		2007-2008			2008-2009 (Last Est.)			2009-2010 (Forth Adv. Est.)		
	Crops	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
1	Aghani Rice	2842465	3967656	1396	2843335	4684428	1648	3079950	3461170	1124
2	Autumn Rice	524266	321220	613	546872	727684	1331			
3	Summer Rice	106284	183803	1729	105527	178240	1689	100330	159520	1590
	Total Rice	**3473015**	**4472679**	**1288**	**3495734**	**5590352**	**1599**	**3180280**	**3620690**	**1138**
4	W heat	2131232	4974663	2334	2158327	4410017	2043	2226680	4623000	2076
5	Autumn Maize	263299	321405	1221	244973	371822	1518	233910	422700	1807
6	Rabi	214521	858285	4001	208511	752725	3610			
7	Summer Maize	180064	677319	3762	186971	589454	3153	418260	1291230	3087
	Total Maize	**657884**	**1857009**	**2823**	**640455**	**1714001**	**2676**	**652170**	**1713930**	**2628**
8	Jowar	3426	3762	1098	2399	2540	1059	3930	4310	1097
9	Bajra	3497	3858	1103	2969	3599	1212	4170	4990	1197
10	Ragi	13222	7998	605	11435	9296	813	10680	8760	820
11	Barley	15402	18513	1202	14592	15898	1090	12730	14140	1111
12	Small Millets	7000	5169	738	7832	5993	765	5080	3930	774
	Total other Coarse	**42547**	**39300**	**924**	**39227**	**37326**	**952**	**36590**	**36130**	**987**
	Total Coarse Cereals	**700431**	**1896309**	**2707**	**679682**	**1751327**	**2577**	**688760**	**1750060**	**2541**
	Total Cereals	**6304678**	**11343651**	**1799**	**6333743**	**11751696**	**1855**	**6095720**	**9993750**	**1639**
13	Gram	64105	63473	990	61214	56637	925	60330	60660	1005
14	Lentil	158487	126134	796	163773	128599	785	171730	147800	861
15	Khesari	98114	82348	839	97195	79791	821	92960	94790	1020
16	Pea	23288	25083	1077	23768	22865	962	23290	22850	981
17	Summer	156044	93579	600	162666	108935	670	160690	94650	589
18	Other Rabi Pulses	3052	2261	0	4159	3082	741	3670	2700	736
	Total	**503090**	**392878**	**781**	**512775**	**399909**	**780**	**512670**	**423450**	**826**

	Rabi Pulses									
19	Tur	30860	42667	1383	28139	33119	1177	35980	49910	1387
20	Moong	8834	5358	607	8587	5609	653	8980	5880	655
21	Urad	22366	17497	782	21444	17980	838	26370	22460	852
22	Ghaghr	994	885	890	0	0	0	2060	1360	660
23	Kulthi	13711	12739	929	11308	10404	920	12840	10750	837
24	Other kharif Pulses	1403	917	654	2116	1414	668	0	0	0
25	**Total kharif Pulses**	**78168**	**80063**	**1024**	**71594**	**68526**	**957**	**86230**	**90360**	**1048**
26	**Total Pulses**	**581258**	**472941**	**814**	**584369**	**468435**	**802**	**598900**	**513810**	**858**
27	**Total Food grain**	**6885936**	**11816592**	**1716**	**6918112**	**12220131**	**1766**	**6694620**	**10507560**	**1570**
28	Carstor seed	203	194	956	185	177	957	180	180	1000
29	Ground nut	1207	868	719	1734	857	494	1650	820	497
30	Sesamu	2832	2245	793	2298	1842	802	3230	2600	805
31	Sunflo	22052	30646	1390	22419	31062	1386	23760	31050	1307
	Rapeseed and									
32	Mustard	88126	87464	992	85265	81811	959	87220	90800	1041
33	Linseed	27507	22691	825	25957	21959	846	27100	22930	846
34	Safflow	115	92	800	215	172	800	220	170	773
35	**Total oil**	**142042**	**144200**	**1015**	**138073**	**137880**	**999**	**143360**	**148550**	**1036**
36	Cotton									
37	Jute**	131627	1242822	1700	131949	1054798	1439	127340	1161090	1641
38	Mesta**	22626	209564	1667	19019	165323	1618	19420	144310	1338
39	**Jute and Mesta****	**154253**	**1452386**		**150968**	**1220121**		**146760**	**1305400**	
40	Sugerca	107039	4027229	3762	111902	4959918	44324	119420	4999620	41866
41	Onion	15216	136730	8.99	14775	137545	9.31	16230	155810	9.7
42	Potato	153909	1244108	8.08	151925	940496	6.19	154860	1259728	8.13

Production of Jute & Mesta in 000' Bales(1 bales = 180 kg) Yield of Potato & Onion in MT/ha

2.4.6 Livestock

Table 24: Livestock

	Population in Lakhs		% of Bihar to India
Cattle	India	Bihar	
Milch Cattle	1852	105	5.6
Buffaloes	979	58	5.9
Sheep	615	3.5	0.56

Goats	1244	96	7.7
Pigs	135	6	4.4

Biharhas5.6%ofCattle,5.9%ofbuffaloes,and7.7%ofthegoatpopulationofthecountry.About 35percent ofruralhouseholds inBiharowncattle, 20percent ownbuffalo, and15percent own sheep andgoats. Ofallruralhouseholds owning cattle and/or buffalo inBihar, morethanthree-quartersareeitherlandlessorhavelessthan1hectareofland.Sheepandgoatstendtobeeven moreconcentratedamonglandlessandmarginalruralhouseholds. The zone wise livestock population is given in the table below.

Table 25: Zone wise livestock

Particulars	Zone-I	Zone-II	Zone-III	Statetotal
Crossbred cattle	539573	281134	453545	1274252
DesiCattle	2826252	2719420	3909193	9454865
Total cattle	3365825	3000554	4362738	10729117
Buffalo	2130182	1076687	2536178	5743047
Bovine	5496007	4077241	6898916	16472164
Goats	3323600	2915198	3251032	9489830
Sheep	94759	16168	271309	382236
Pigs	125038	98739	448604	672381
Poultry	4096458	5085370	4729951	13911379

Source: Livestockcensus2003

2.4.6.1 Fodder

The estimated green fodder production from forests, permanent pastures, grazing lands and cultivated areas has declined from 13.77 lakh tonnes in 2000-2001 to 13.46 lakh tonnes in 2002-03. Dry fodder production (crop residue of cereals, pulses and oil seeds) over the same period declined from 195.23 lakh tonnes to 156.12 lakh tones. The area under pastures and grazing lands is extremely scarce (0.18% of the total geographic area). Gaya has the maximum area under pastures and grazing lands at 2192 ha. Of all rural households owning cattle and/or buffalo in Bihar, more than three-quarters are either landless or have less than 1 hectare of land. Sheep and goats tend to be even more concentrated among landless and marginal rural households.

2.4.7 Industries

There are 1674 factories registered in Bihar with 1438 of them in operation. These factories together put up a productive capital of Rs. 14,195 crores. These factories employ about 62,000 persons. While this data is as per annual survey of industries 2004-05, the situation is fast changing with several industrial and corporate houses choosing Bihar as their destination. The recent investment meet conducted during February 2012 at Patna was promising with several proposals made for investment. Bihar has emerged as brewery hub with major domestic and foreign firms setting up production units in the state. Three major firms,United Breweries Group, Danish

Brewery Company Carlsberg Group and Cobra Beer, are to set up new units in Patna and Muzaffarpurduring 2012.

Table 26: Annual Survey of Industries, Bihar

Sl. No.	Item	Year			
		2001-02	2002-03	2003-04	2004-05
1	No. of registered factories	1478	1403	1460	1674
2	No. of factories in operation	1319	1229	1224	1438
3	Productive Capital (lakh Rs.)	822846	1160587	1172082	1419499
4	Number of persons employed	62618	54184	57404	61775
5	Ex-factory value of output (Gross) (Lakh Rs.)	671339	807680	887711	122169
6	Value added by manufacturer (Lakh Rs.)	77401	105921	80945	115415

Source: Annual Survey of Industries, CSO, Industrial Statistics Wing

The outturn of selected mineral in Bihar for the years 2003-04 to 2006-07 is given in below table:

Table 27: Out Turn of Selected Minerals in Bihar (in M.Tonnes)

Sl. No.	Minerals	2002-03	2003-04	2004-05	2005-06	2006-07
1	Limestones ('000)	448.00	241.00	244.00	313.00	436.00
2	Mica Crude	11.00	3.00	3.00	-	-
3	Quartzite	1265.00	7942.00	12987.00	17061.00	30850.00
4	Steatite	260.00	1265.00	846.00	1466.00	1633.00
5	Quartzite	-	1150.00	-	910.00	-

Source: (I) Indian Bureau of Mines Nagpur
(ii) Directorate of Economics & Statistics, Bihar, Patna

2.4.8 Forests

Onlyabout6.87%of thegeographicalarea(6473sqkm)ofthestateofBiharis underforests.This consistsof 76sqkmofveryde nseforests,2951sq kmofdenseforests and2531sqkmof openforest.Thefo restsofBihararеof threetypes:Dryde ciduousforest,We tdeciduousforest and SubHimalayanan dTaraiforest.Thef

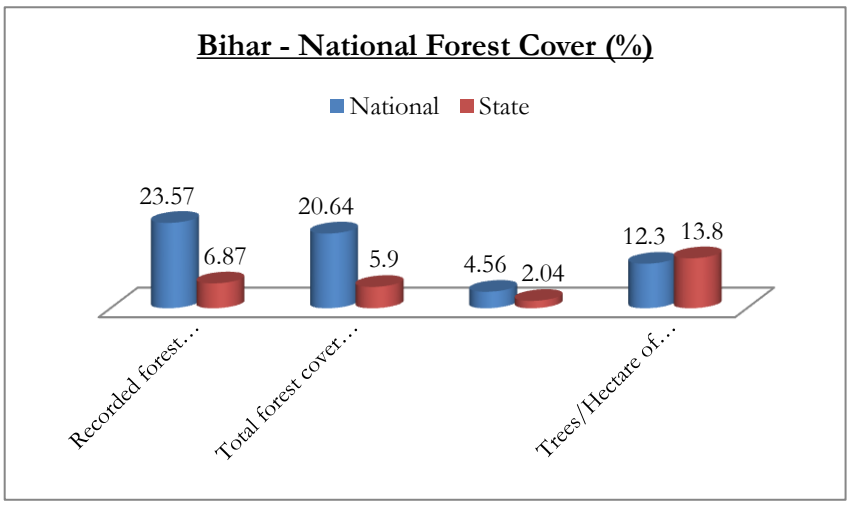


Figure 5: Bihar and national Forest Cover (%)

irsttypeisfoundinandaroundKishanganjdistrict,thesecond typeisfoundintheKaimurdistrictandalongthenorthernslopeofChotanagpur

plateau,thethird typeisfoundaroundtheSomeshwarhillsinPaschimChamparandistrict.Thedistricts with more than50,000haunderforestsareBhabua, Jamui,WestChamparan, Gaya,RohtasandNawadha.

2.4.9 Bio-diversity

Erstwhile Bihar, lying close to the foot hills of Nepal and covering an area of 1,73,877 sq km, harbours a very rich and diverse flora. Its unique phytogeographical position, topography and good precipitation are some of the important factors which are mainly responsible for high degree of plant diversity. The occurrence of different types of forests, ranging from subtropical to tropical and consequently theestablishment of three National Parks and twenty Wildlife sanctuaries in the state, which constitute an important source of germplasm, are of considerable interest. Although the state has beenbotanically surveyed since 1848 and the Flora was published during 1921-1925 which included Bihar, Orissa and parts of West Bengal, but the complete Flora of Bihar itself is not in hand.Simultaneously, the natural vegetation since Haines' publication has been continuously and increasingly under pressure owing to developmental projects including mining activities and non-judiciousexploitation of plant resources. These reasons coupled with the publication of a number of new plant records for the state warrant the need of fresh estimation of current status of floristic account of the state.

The jungles of Bihar abound in wildlife, though some of the notable game animals and birds like tiger, deer, buffalo, duck etc., are fast disappearing. In order to prevent the extinction of any species and to preserve them and maintain their balance with nature, thirteen wildlife sanctuaries have been set up. Three sanctuaries are in northern fringe of west Champaran district. As a result of strict management and proper protection given to wildlife, the present form has become much richer than the past and the difficult task of wildlife resuscitation and conservation has been greatly achieved, so that some of the rare animals on the verge of extinction, such as elephant, gaur, etc., have considerably multiplied.

2.4.9.1 Ecologically Sensitive Areas

Biharhas1nationalpark and11sanctuaries comprisingaprotectedareaof3208.47sqkm and a protected non-forest area of 76.30 sq. km. the details of the protected area are given below:

Table 28: Parks and Sanctuaries in Bihar

S.No.	Name of Park/Sanctuary	District	Type
1	Barela SAZS Sanctuary	Vaishali	Sanctuary
2	Bhimbandh Sanctuary	Monghyr	Sanctuary
3	**Gogabil Pakshi Vihar**	**Katihar**	**Closed Area**
4	Gautambuddha Sanctuary	Gaya	Sanctuary

5	Kaimur Sanctuary	Rohtas	Sanctuary
6	Kanwar Jheel Bird Sanctuary	Begusarai	Sanctuary
7	**Kusheshwarsthan**	**Darbhanga**	**Closed Area**
8	Nagi Dam Bird Sanctuary	Jamui	Sanctuary
9	Nakti Dam Bird Sanctuary	Jamui	Sanctuary
10	Rajgir Sanctuary	Nalanda	Sanctuary
11	Sanjay Gandhi Botanical Garden	Patna	Botanical Garden
12	Udaypur Sanctuary	West Champaran	Sanctuary
13	Valmiki National Park	West Champaran	National Park
14	Valmiki Sanctuary	West Champaran	Sanctuary
15	Vikramshila Gangetic Dolphin	Bhagalpur	Sanctuary

Among the above parks and sanctuaries only two fall under the project area; Gogabil Pakshi Vihar in Katihar District and Kusheshwarsthan in Darbhanga District and both are closed areas. Since these are closed areas no works related to project components, i.e., embankment, dredging, roads, bore wells and agriculture, can be taken up here.

2.5 Floods in Bihar

The State of Bihar is highly flood prone. 30 of its 38 districts comprising 73 percent of its geographical area are flood prone and afflicted by floods almost annually, especially from the rivers west of the Kosi River. Bihar's hydrological vulnerability is aggravated by its flat topography, high rainfall (more than 2,500 mm annually and up to 80 percent of annual precipitation from June to 49 September), and high sediment loads of rivers. The plains of north Bihar are drained by many rivers with catchments in the Himalayas. Kosi, Gandak, Burhi Gandak, Bagmati, Kamala Balan, Mahananda and Adhwara Group of rivers originate in Nepal and carry very high discharge and sediment loads. Since independence, Bihar had four other catastrophic flood events, in 1954, 1974, 1987, and 2004. However, the 2007 monsoon floods were Bihar's worst natural floods in 20 years, affecting more than 24 million people, killing nearly 1,000 people, and destroying over 700,000 homes. The timeline of past floods in Bihar is as follows:

- **1998:** Embankment damage along Burhi Gandak, Bagmati, Adhwara and Kosi rivers accounted for 381 deaths, asset damage worth Rs 1 billion and crops damage of Rs 3.67 billion.
- **1999:** Excessive precipitation in the catchments caused flooding of Kamala Balan and Kosi rivers. Crop damage was estimated at Rs 2.5 billion and property damage another Rs 0.5 billion.
- **2000:** Eastern Kosi Afflux Bund breached due to excessive discharge caused by heavy rainfall. This flooded 12351 villages. Crop damage was estimated at Rs 0.8 billion.

- **2001:** Breaches in Kosi, Bhutahi Balan, Bagmati and Burhi Gandak embankments. Crop and property damages were estimated at Rs 2.6 billion and Rs 1.8 billion respectively.
- **2002:** Kamala Balan left and Khiroi right embankment overtopped. The floods caused 489 deaths. Crop and property damages estimates stood at Rs 5 billion and Rs 4 billion respectively.
- **2003:** Ganga surpassed the 1978 HFL at Bhagalpur and the 1994 HFL at Patna.
- **2004:** Heavy rainfall caused 53 embankment breaches in Bagmati, Burhi Gandak, Kamala Balan, Bhutahi Balan and Adhwara rivers. 885 deaths were reported. Crop and property damages were assessed at Rs 5 billion and Rs 10 billion respectively.
- **2007:** Heavy rainfall caused 28 breaches in Burhi Gandak and Bagmati embankments causing extensive damage to life and property.
- **2008:** Eastern Kosi Afflux Bund breaches upstream and Kosi river floods five districts in north Bihar

In addition to floods, North Bihar is also vulnerable windstorms. The atrisk from floods districts are also exposed to geomorphological risks from earthquakes. Araria and Supaul lie in seismic hazard Zone V while Madhepura, Saharsa and Purnea lie in Zone IV. High hazard risk compounded by low human and economic development in the State, relatively insufficient capacity and other resources for proper planning and execution of disaster risk reduction programs, significantly increase vulnerabilities. During and after floods, water borne diseases are on the rise as observed by reporters.

2.5.1 Kosi River

Kosi originates at 7000 m above mean sea level (MSL) in the Himalayas. It enters India at Hanuman Nagar, Nepal and drains into the Ganga in Bihar, India. Its total catchment is 74,030 sq km of which 11,410 sq km is in India. The catchment area is home to 6.6 million people. The catchment has an annual average rainfall of 1456 mm and total discharge of 52,219 million cubic meters. Its main tributaries are Bagmati, Kamala Balan, Bhutahi Balan, Trijuga, Fariani Dhar and Dhemama Dhar.Tectonic forces are elevating Kosi"s gradient by 1 cm per year, aggravating erosion, inundation and sedimentation. Its annual sediment load is currently estimated at 100 million cubic meters. This is projected to grow six-fold to gradient elevation. As the gradient flattens in north Bihar, the river decelerates and deposits the sediment to on its bed. This elevates the bed progressively, forcing the river to break out to lower terrain, which it again begins to elevate by siltation. Thus, one of the world's largest conical alluvial fan over 15,000 sq km has evolved over centuries. Kosi records a flow of over 25,000 cubic meters per second (cumecs) where it exits the Himalayan foothills, enough to flood the entire alluvial fan with 1.5 meters in a week. This is a rough index of the flood vulnerability of the Kosi catchment.

The Kosi River is the main cause of recurrent floods in north Bihar. The river runs through a steep gradient in Nepal. Rainfall in the Kosi catchment in Nepal overloads the barrage compelling release from the Barrage which causes floods and water-logging in north Bihar. The heavy discharge from the Barrage causes downstream Bagmati, Burhi Gandak and Ganga rivers to inundate. In addition, the discharge carries enormous amounts of sandy silt that gets deposited over arable land and renders it fallow.

The Kosi River presents a challenge in terms of long and recurring flood hazard. A major flood in 1953-54 led to the `Kosi project' which was aimed at flood control and irrigation. The project led to the creation of a barrage and embankments on each side were designed to protect approximately 2800 sq. km of land in north Bihar and Nepal. Despite this intervention and a long history of flood control management in the basin for more than 5 decades, the river continues to cause extensive flooding due to breaches.

- **1963**: The first breach on the western embankment in Nepal
- **1968:** Five breaches in north Bihar
- **1971**: Collapse of the 1969-built Bhatania Approach Bund
- **1980:** Eastern embankment breach
- **1984:** Eastern embankment breach
- **1991**: Breach in the western embankment near Joginia in Nepal
- **2008:** Breach in eastern embankment

2.6 Conclusions from Baseline Information

The following conclusions are arrived after sifting through and assessing the baseline information:

- The Project area is socio-economically backward
- High population decadal growth rate
- Illiteracy in general
- Female illiteracy in particular
- Exclusion of Marginalised sections (in particular Mahadalits) from development
- Low per capita income
- Rural roads in poor condition
- Scarce health infrastructure
- Changing land use due to floods and river course change
- Sand casting due to floods
- Soil erosion due to floods

- Debris accumulation without disposal
- Damage to water management resources
- Damage to plantations
- Increasing salinity due to poor drainage
- Pressure on environmental resources in areas receiving the out-migration
- Environmental degradation due to pollution caused by reconstruction
- Change in land-use due to sand casting

2.6.1 Specific Sensitivities of Project Area

The Gogabil Pakshi Vihar in Katihar District and Kusheshwarsthan iin Darbhanga District are the only sensitive areas which fall in project area, but both these are closed areas. But the proposed sub-projects are not located near these to sensitive areas, as they are closed areas. Apart from these there is the presence of Gangetic Dolphins is observed in stretches of Kosi river.

3 Laws and Regulations Related to Environment and Social

3.1 Introduction

This chapter deals with the laws, regulations and policies, of Government of India, Government of Bihar and the World Bank, related to environmental and social issues. Only the laws, regulations and policies relevant to the project are discussed here. This sections needs to be updated as when new laws, regulations and policies are made and enforced or the existing ones are revised.

3.2 Operational Policies and Directive of the World Bank

The relevant and applicable safeguards policies of the World Bank are also reviewed. The below table describes the relevant safe guard policies of the World Bank and discusses their applicability to the project.

Table 29: Operational Policy and Directives of World Bank

Policy	Key Features	Applicability to this project
OP/BP 4.01 Environmental Assessment	Potential environmental consequences of projects identified early in project cycle. EAs and mitigation plans required for projects with significant environmental impacts or involuntary resettlement. EAs should include analysis of alternative designs and sites, or consideration of "no option" Requires public participation and information disclosure before Board approval.	**Applicable.** Specific interventions envisaged under the project such as those for flood control, irrigation and strengthening of transport network may have some potential adverse environmental impacts in their area of influence. Such impacts will depend upon the location, nature and magnitude of interventions - there will be clarity on this once the said details are known and the results from the environment screening process are available. OP 4.01 has been triggered to ensure that such investments are planned and designed to be sound andsustainable by integrating environmental dimensions into the over-all decision making process. Identification of any potential impacts and mitigation/ enhancement measures to address likely impacts is proposed.
OP/BP 4.04 Natural Habitats	Prohibits financing of projects involving "significant conversion of natural habitats unless there are no feasible alternatives". Requires environmental cost benefit analysis. Requires EA with mitigation measures.	**Applicable.** The schemes to be taken up under the project would not convert or degrade natural habitats. However, assessment procedures and mitigation measures have been put into place through the ESMF so that any likely negative impacts on the natural environment are minimized. The framework proposes screening

Policy	Key Features	Applicability to this project
		activities such as improvement/ strengthening of existing embankments, channel improvements, dredging and other flood protection works. Based on these screening exercises, environmental assessments for the respective sub-projects will analyze impacts on the natural habitats and formulate measures to avoid / mitigate impacts..
OP/BP 4.36 Forestry	Prohibits financing for commercial logging operations or acquisition of equipment for use in primary moist tropical forests.	**Not Applicable.** Proposed investments do not have any impact on forest habitats under the project areas.
OP 4.09 Pest Management	Supports environmentally sound pest management, including integrated pest management, but does not prohibit the use of highly hazardous pesticides. Pest management is the borrower's responsibility in the context of a project's EA.	**Applicable** Project is not financing procurement of any pesticides. Some proposed interventions for enhancing agricultural efficiencyunder Component 4 may trigger policy requirements of OP 4.09. While the proposed component largely aims to sustainably increase the productivity and profitability of agriculture in the selected projectareas, activities such as crop production enhancement/managementmay require adoption of strategies that promote use of biological/environmental control methods and reduces reliance on chemicalpesticides, including issues related to handling, application anddisposal of waste products.
OP/BP 4.12 Involuntary Resettlement	Implemented in projects which displace people. Requires public participation in resettlement planning as part of SA for project. Intended to restore or improve income earning capacity of displaced populations.	**Applicable.** Some project interventions are likely to trigger issues such as thoserelated to land acquisition, loss of assets and impact on livelihoodsources. Identification of any potential impacts and mitigation measures to address likely impacts is proposed.

Policy	Key Features	Applicability to this project
OP/BP 4.10 Indigenous Peoples	Purpose is to ensure indigenous peoples benefit from Bank financed development and to avoid or mitigate adverse effects on indigenous peoples. Applies to projects that might adversely affect indigenous peoples or when they are targeted beneficiaries. Requires participation of indigenous peoples in creation of "indigenous peoples development plans".	**Not Applicable.** Field visits and secondary information did not identify any indigenous peoples (IPs) in the project area and hence this OP is not triggered.
OP/BP 4.11 Physical Cultural Resources	Purpose is to assist in the preservation of cultural property, such as sites having archeological, paleontological, historical, religious and unique cultural values. Generally seeks to assist in their preservation and avoid their elimination. Discourages financing of projects that will damage cultural property.	**Applicable.** A few project interventions may be located close to sites, structures, natural/man-made features that have historical, archeological, religious or other cultural significance. Through screening and EA/SA process, the project's potential impacts on physical culturalresources will be determined and management measures, asrequired will be taken and integrated into the sub-project cycle. The ESMF also provides procedures to deal with chance finds during the sub-project implementation.
OP/BP 4.37 Safety of Dams	Applies to large dams (15 meters or more in height). Requires review by independent experts throughout project cycle. Requires preparation of EA and detailed plans for construction and operation, and periodic inspection by the Bank.	**Not Applicable.**
OP/BP 7.50 Projects on International Waterways	Covers riparian waterways that form boundary between two or more states, as well as any bay, gulf, strait or channel bordered by two or more states. Applies to dams, irrigation, flood control, navigation, water, sewage and industrial projects. Requires notification, agreement between states, detailed maps, feasibility surveys.	**Applicable.** Some of the proposed sub-projects are going to be taken in Nepal side of Kosi River.
OP/BP 7.60 Projects in Disputed Areas	Applies to projects where there are territorial disputes present. Allows Bank to proceed if governments agree to go forward without prejudice to claims. Requires early identification of territorial disputes and descriptions in all Bank documentation.	**Not Applicable.**

Other World Bank Policies important to Environmental Concerns is the BP 17.50. This policy deals with Disclosure of Operational Information. The Bank's Policy on

Disclosure of Information, has been incorporated in the project implementation plan.

3.3 Policy and Regulatory Framework of GoI and GoB

This deals with various policies, acts, rules and regulations promulgated by the central and state governments related to environment and relevant to present project.

3.3.1 Environmental Regulation

Scope of relevant environment regulations and implications for the ESMF are furnished in the table below.

Table 30: Environmental Regulations

S.No.	Relevant Act	Scope of the Act	Implication for the EMF
1	The Environment (Protection) Act No.29 of 1986	▪ Under this Act, the central government is empowered to take measures necessary to protect and improve the quality of the environment by setting standards for emissions and discharges; regulating the location of industries; management of hazardous wastes, and protection of public health and welfare. ▪ This encompasses all legislations providing for the protection of environment in the country. ▪ It includes the power to direct the closure, prohibition or regulation of any industry, operation or process by the government	▪ Relevant to sub-projects to be taken up, viz., roads, bridges, embankments, Agriculture, Horticulture, etc. activities ▪ Preservation of air and water quality ▪ Control of pesticides & insecticide runoff ▪ Control dust pollution due to quarrying, which might harm the vegetation
2	Water and Air (Prevention and Control of Pollution) Act, 1974 & 1981 (Central Act 6 of 1974) as amended in1988	▪ This Act prohibits the discharge of pollutants into water bodies beyond a given standard and lays down penalties for noncompliance. ▪ Water act includes the maintenance or restoring the wholesomeness of the water ▪ Air act restricts the operation of any industrial plant in an air pollution control area without a valid consent	▪ Generally not relevant to project activities. ▪ Relevant to hot mix/ batching plants/ stone crusherswhich might be established for executing sub-projects.
3	Forest (Conservation) Act No. 69 of 1980 and amended in 1988	▪ This Act restricts the powers of the state in respect of dereservation of forests and use of forestland for non-forest purposes. ▪ All diversions of forestlands to any non- forest purpose, even if the area is privately owned, require approval of the central government ▪ Leases of forest land to any organization or individual require	▪ Generally not relevant to project activities ▪ Permission is to be obtained from the Forest Department when forest land is required for the project activities.

S.No.	Relevant Act	Scope of the Act	Implication for the EMF
		approval of the central government ▪ Proposals for diversion of forest land for construction of dwelling houses are not to be entertained	
4	National Forest Policy, 1988	▪ Protect and enhance the yields of non-timber forest products in order to generate employment and income for forest and village communities	▪ Generally not relevant to project activities. ▪ Relevant if employment generation is taken up in villages near forests.
5	Joint Forest Management, 1993	▪ Induces people participation in forest management sharing mechanism to distribute the benefits of interventions carried out on common resources property, government lands, wastelands, etc. ▪ Benefits are categorized into two – ecological benefits and economic benefits	▪ Not relevant to project activities.
6	The Wildlife (Protection) Act I972, Amendment 1991	▪ This Act provides for protection to listed species of Flora and Fauna in the declared network of ecologically important protected areas such as wild life sanctuaries and national parks. ▪ The wildlife protection act has allowed the government to establish a number of national Parks and Sanctuaries, over the past 25 years, to protect and conserve the flora and fauna of the state	▪ Not relevant to project activities. ▪ Relevant if any activities, viz., intra state linking of rivers crosses such areas. ▪ Preservation of bio diversity ▪ Ecologically sensitive areas, wild life sanctuaries and national parks should be avoided while selecting sites for project components. If this is not possible, permission should be obtained from the Forest Department and appropriate safeguards must be adopted.
7	EIA Notification of MoEF 2006	▪ All projects listed under Schedule-I of the Notification require environmental clearance from the MoEF. The list of project categories under Schedule I of the Environmental Impact assessment Notification is available on the MoEF Website.	▪ Thesesub-projects does not require EIA. However, the EMF is designed to ensure that environmental safety measures are integrated into the project. ▪ For sub-projects like intra state linking of rivers where EA might be required will be dealt with by NWDA

S.No.	Relevant Act	Scope of the Act	Implication for the EMF
			as mandated.
8	The Ancient Monuments, Archaeological sites and Remains Act, 1958	▪ The Ancient Monuments and Archaeological sites should be protected from any developmental activity. The area within the radial of 100 m and 300m from the Protected Property are designated as Protected area and Controlled Area respectively. No development activity (including building, mining, excavating, blasting etc.,) is permitted in the Protected Area and developmental activities likely to damage the protected property are not permitted in the Controlled Area without prior permission of the Archaeological Survey of India.	▪ Deals with Cultural safeguards
9	Biological Diversity Act 2002 Biological Diversity Rules 2004	▪ The Biological Diversity Act, which came into force in February 2003, aims to promote conservation, sustainable use and equitable sharing of benefits of India's biodiversity resources. It provides for establishment of a National Biodiversity Authority at national level, State Biodiversity Boards at state level and Biodiversity Management Committees at the level of Panchayats and Municipalities	▪ Not relevant to project activities, except for Horticulture, Livestock, Pisciculture, Agriculture, etc. if taken up. ▪ Provides Ecological integration ▪ Increased ecological symbiosis (e.g. Pollination) increases production

This policy and regulatory analysis suggests that the proposed sub-projects to be taken does not fall under any of the project categories listed in Schedule-I of the Environmental Impact Assessment Notification and hence does not require any formal environmental clearance of the Ministry of Environment and Forests, GOI. The project area has not been notified as ecologically sensitive or fragile under the Environment Protection Act, 1986. Though the state of Bihar is dotted with a number of sites of religious, cultural and historical importance, wildlife sanctuaries and national parks, the proposed sub-projects are not expected to have any adverse impact on these sites.As only two of the protected areas Gogabil Pakshi Vihar (Katihar district) and Kusheshwarstan (Dharbhanga district) are located in the project districts and both are closed areas. Since these are closed areas no works related to project components, i.e., embankment, dredging, roads, bore wells and agriculture, can be taken up. The project will also ensure that the requirements of activities in the influence areas of these protected areas are also followed in the design and implementation of sub-projects.

3.3.2 Social Regulation

The Land Acquisition (LA) Act of 1894

The Land Acquisition (LA) Act of 1984 is commonly used for acquisition of land for any public purpose. It is used at the State level with State amendments made to suit local requirements. Expropriation of and compensation for land, houses and other immovable assets are carried out under the Land Acquisition (Amendment) Act, 1984. The Act deals with compulsory acquisition of private land for public purpose. The procedures set out include:

- Preliminary notification(Section 4)
- Declaration of Notification (Section 6)
- Notice to persons interested (Section 9)
- Enquiry and award (Section 11)
  Possession (Section 16)

The 1984 amendments to the LA Act addressed the matter of compensation and delays in payment. As regards, the level of compensation, the rate of solatium was increased from 15 per cent to 30 per cent. For delays, the amendment requires that:

- A time of one year was fixed for completing all formalities between the issuance of Section 4 and Section 6; and
- The compensation award must be determined within two years of the issuing of section 6 notification. Interest is payable at a rate of 12 per cent per year from the date of preliminary notification to the date of dispossession. These changes apply to cases before the Civil Courts even for awards made before the enactment of the amendments.

National Resettlement and Rehabilitation Policy, 2007

Prior to this policy evolution, there was no uniform approach adopted by states towards the project affected population, as there were no safeguard policy to deal with resettlement and rehabilitation of displaced persons in the country. In the absence of such policies, ad-hoc administrative instructions, in conformity with the land acquisition act were in practice. This policy was developed and promulgated by the GoI during October 2007. This policy takes into consideration the safeguard policies of international development bodies like the World Bank, Asian Development Bank etc. The salient features of this policy are given below:

- Makes SIA mandatory for all projects involving displacement of four hundred or more families' en-masse in plain areas, or two hundred or more families en-masse in tribal or hilly areas etc.
- Public hearing co-ordination with EIA done in the project affected area shall also cover issues related to SIA.
- Consultations with affected people and disclosure of relevant information to them at various stages of resettlement planning.
- Assistance to affected people without legal rights; affected people categorized as landless agricultural workers, forest dwellers, tenants and artisans who are critically dependent on the acquired assets for their subsistence/ livelihoods.

- Preparation of resettlement plans that are disclosed to the affected people in draft form, and reviewed and approved by competent authorities.
- Collection of socio-economic base line information of the project affected households.
- Vulnerable project affected people will get extra cash/kind assistance.
- The Grievance Redressal Cell shall have representatives of women, Schedule Castes, Schedule Tribes residing in the affected zone. The Cell shall have the power to consider and dispose of all complaints relating to resettlement and rehabilitation against the decision of the Administrator/R&R Committee at Project level.
- Constitution of a monitoring cell under the project.
- Each project affected family comprising of rural artisan/small trader and self employed person shall get one-time financial assistance for construction of working shed/shop for livelihood support.

Bihar Land AcquisitionResettlementandRehabilitationPolicy, 2007:

InFebruary2007, Government of Bihar has formulated and adopted a policy called Bihar Land Acquisition Resettlement and Rehabilitation Policy, 2007 (BLARRP-2007). The policy comprises provision for compensation according to revised rate of land and additional facilities to be provided to the affected families. The main features of policy are as follows:

- In order to meet the replacement cost of land, the compensation is revised with 50% additional as registration cost plus 30% solatium in compulsory acquisition and60%solatiumifownersagreetogive land voluntarily.
- Wherehomesteadlandisbeingacquiredthelandownershallbeentitledfor sameareaoflandbeingacquired (Maximum5Decimal)whichshall beacquired forthepurposeandshall be handedovertothe entitled person.
- Every land owner, whose homestead land has been acquired, shall be paid an amount equal to Rs. 10,000 (Rupees ten thousand) as one time assistance for temporary accommodation.
- Every Land Owner whose homestead land is being acquired shall be entitled for a onetime payment of Rs. 5,000 (Rupees five thousand) as assistance for transportation of his household goods.
- Displaced agricultural labourers who has been working for a period of minimum three years and who used to earn their livelihood by working on the land which is now under acquisition and who has become jobless because of the acquisition, shall be entitled for onetime payment of two hundred days wages as fixed by the Government under minimum wages act and shall also be entitled for National/State level job card under National Rural Employment Guarantee Program.

ThepolicyspecifiesthattheentirecostforResettlementandRehabilitation,in addition to thecostofacquisitionoflandshallbeborne bytherespectiverequisitioningauthorities.TheRequisitioningAuthority shalldepositanamountequivalentto0.5percentoftheestimatedcostof landunderacquisitiontotheCollector-cum-Administrator,Resettlementand Rehabilitationthrougha bankdraftsubjecttomaximumofRs.2(Twolakhs)only.Thisamount shallbe overandabovetheamountpaid forestablishmentexpenditureunderLAAct.This additionalamountshallbepaid foroutsourcingtheworkofsurvey forResettlement,Monitoring, Stationeries,POL and otherincidentalslikevehicle,Computer,ComputerOperator,Amins, Draftsman, Chainmanetc.

ThebetterpartoftheBLARRP-2007isthattherateoflandofferedunderitisnearto replacementvalue.The rateoflandaccordingto thispolicyis85%more thantherateofland beingprovidedbyLAAct 1894.Additionally,thispolicy alsoensuretransitionalassistance, transportation assistanceand assistanceforincome lossbythe Project Displaced Persons.

The ESMF is prepared using the NRRP 2007 and The Bihar Land Acquisition Resettlement and Rehabilitation Policy 2007. Whenever there is a new LA and R&R Policy, the ESMF will be revised in light of that Policy.

Other Applicable Acts

The following acts are applicable for the sub-projects to be taken up under the present project:

- Minimum Wages Act, 1948
- Contract Labour Act, 1970
- The Bonded Labour System (Abolition) Act, 1976
- Child Labour (Prohibition and Regulation) Act 1996 along with Rules, 1988
- Children (Pledging of Labour) Act, 1933 (as amended in 2002)
- The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995
- The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Rules, 1996
- Untouchability Offences Act, 1955
- The Scheduled Castes and the Scheduled Tribes (Prevention of Atrocities) Act, 1989
- The Scheduled Castes and the Scheduled Tribes (Prevention of Atrocities) Rules, 1995
- Bihar Privileged Persons Homestead Tenancy, 1947, 1949
- Bihar Public Land Encroachment Act, 1956
- Kosi Calamity Rehabilitation and Reconstruction Policy, 2008
- Bihar Irrigation Act, 1997

- Irrigation, Flood Management and Water Drainage Rules, 2003

3.3.3 Stake Holder Agencies

National Water Development Agency

The National Water Development Agency was set up in July, 1982 as autonomous society under the Societies Registration Act, 1860, to carry out the water balance and other studies on a scientific and realistic basis for optimum utilization of water resources of the peninsular rivers system for preparation of feasibility reports and thus to give concrete shape to Peninsular Rivers Development Component of National Perspective. In 1990, NWDA was also entrusted with the task of Himalayan Rivers Development Component of National Perspectives. The functions of NWDA are;

- To carry out detailed surveys and investigations of possible reservoir sites and interconnecting links in order to establish feasibility of the proposal of Peninsular Rivers Development and Himalayan Rivers Development components forming part of National Perspective for Water Resources Development prepared by the Ministry of Water Resources and Central Water Commission.
- To carry out detailed surveys about the quantum of water in various Peninsular River Systems and Himalayan River Systems which can be transferred to other basins/States after meeting the reasonable needs of basin/states in the foreseeable future.
- To prepare Feasibility Reports of the various components of the scheme relating to Peninsular Rivers development and Himalayan Rivers development.
- To prepare Detailed Project Reports of river link proposals under National Perspective Plan for Water Resources Development after concurrence of the concerned States.
- To prepare Pre-Feasibility/Feasibility Report of the intra-state links as may be proposed by the States.
- To do all such other things the Society may consider necessary, incidental, supplementary or conducive to the attainment of above objectives.

Ministry of Water Resources in June 2005 conveyed the approval to identify Intra-State links in the States like Bihar and to prepare Pre–Feasibility/ Feasibility Reports of these links by NWDA. This work has now been added to the functions of NWDA after the approval in the Special General Meeting of NWDA Society held on 28th June 2006. Since then NWDA requested all the States/ Union Territories to inform the details of Intra–State links for further studies by NWDA. The Governments of Nagaland, Meghalaya, Kerala, Punjab, Delhi, Sikkim, Haryana,

Union Territories of Puducherry, Andaman & Nicobar islands, Daman & Diu and Lakshadweep have indicated that there is no Intra-State link proposal concerning to their States/ territories. Govt. of Puducherry has send a proposal for one interstate link namely Pennaiyar–Sankarabarani link instead of intra-state link proposal. Govt. of Puducherry has been informed accordingly.The States Governments of Bihar, Maharashtra, Gujarat, Orissa, Rajasthan, Jharkhand and Tamil Nadu have informed about the Intra-State proposals pertaining to their States.

Role of NWDA with the BKBDP

The functions of NWDA include the work of preparation of Detailed Project Reports (DPR) of various link proposals and Pre-feasibility Reports (PFR) and Feasibility Reports (FR) of intra-State links as proposed by the States have been included in the functions of NWDA.

With regard to the BKBDP, any sub-project dealing with river modification, river training and inter/ intra state links need to be referred to NWDA.

With regard to the state of Bihar, the following studies were taken up by NWDA and status is as follows:

- **Kosi-Mechi (entirely lies in India)**: This Pre-feasibility Study was completed in 2008-09 and the same was sent to the state Government on 24th June 2009.
- Barh–Nawada: This Pre-feasibility Study taken un during 2009-10 is under Progress.
- Kohra–Chandravat (Lalbegi): This Pre-feasibility Study completed during 2009-10 and the same was sent to the state government on 30th October 2009.
- Burhi Gandak–None–Baya–Ganga: This Pre-feasibility Study completed during 2009-10 and was sent to the state government on 06th July 2009.
- Burhi Gandak–Bagmati (Belwadhar): This Pre-feasibility Study taken un during 2009-10 is under Progress.
- **Kosi–Ganga:** This Pre-feasibility Studyinitiated in 2009-10 and in Progress.

The Terms of Reference given to NWDA is quite comprehensive in terms of Environmental Impact Assessment. Presently with regard to Bihar and Kosi River the interlinking Detailed Project Reports being prepared by NWDA. Generally NWDA requires about 1 year to prepare Pre-Feasibility Reports, 2 to 3 years for preparation of Feasibility Reports and 3 to 4 years for preparation of Detailed Project Reports. In case urgent attentions is required the Director General need to be contacted.

Ganga Flood Control Commission

Ganga Flood Control Commission (GFCC), a subordinate office of Ministry of Water Resources, with its headquarter at Patna, was created in the year 1972 to deal with floods and its management in Ganga Basin States vide Govt. of India Resolution No. F.C. 47(3)/72 dated 18th April 1972, as secretariat and executive wing of Ganga Flood Control Board, headed by Hon'ble Union Minister of Water Resources, Chief Ministers of basin States or their representatives and Members of Planning Commission, are the members of the Board. Chairman, GFCC acts as the Member-Secretary of the Board. The Commission is headed by a Chairman, who is assisted by two full time Members, four Directors and 94 supporting staff. The representatives of the concerned Central Ministries as well as Chief Engineers of the basin States are either part-time Members or permanent invitees of the Commission.The concerned Ganga Basin States are Bihar, Chhattisgarh, Haryana, Himachal Pradesh, Jharkhand, Madhya Pradesh, NCT of Delhi, Rajasthan, Uttaranchal, Uttar Pradesh and West Bengal. GFCC carries out several activities as outlined below:

- Preparation and updating of comprehensive plan of flood management.
- Techno-Economic Appraisal of Flood Management Schemes.
- Assessment of adequacy of waterways under road and rail bridges.
- Programming of implementation of flood management works.
- Framing of guidelines for quality control and maintenance.
- Monitoring of all flood management schemes funded by Central Govt. and important flood management schemes funded by State Government.
- Documentation and Dissemination of recommendations of special studies.
- Performance evaluation of completed Flood Management Schemes.
- GFCC has prepared a comprehensive plan for flood management for Kosi during 1986 and assessment of adequacy of waterways under existing Rail and Road Bridges of Kosi was completed 2002.

GFCC has done performance evaluation of flood management Kamla-Balan Embankment Scheme and Mahananda Embankment Schemes. Since its inception, several special studies on flood management were conducted by GFCC.

Role of GFCC with the BKBDP

All the sub-projects related to flood management prepared under the present BKBDPneed to be appraised by the GFCC.

3.4 List of Statutory Clearances and Authorizations Required

It is expected that certain permission, clearances and authorizations need to be obtained from competent authorities during the design, planning and implementation of the sub-projects. This will depend mainly on the area, type, size and scope of the sub-project. This requirement is summarized below:

Table 31: List of Statutory Clearances and Authorization Requirement

S.No.	Clearance/ Authorization	Relevant Act	Competent Authority	Responsibility
1	Environment Clearance/NOC (For sub-projects which requires such clearance, ex.: could be embankment works if their location and size requires)	EIA Notification, 2006 (including amendments) issued under Environment Protection Act, 1986	State Pollution Control Board; MoEF, Govt. of India	BAPEPS/ Line Department
2	Forest clearance	Forest Conservation Act, 1980	State Forest Department, MoEF, Govt. of India	BAPEPS/ Line Department
3	Tree Cutting Permission	Forest Conservation Act, 1980	State Forest Department, MoEF, Govt. of India	BAPEPS/ Line Department
4	Hot mix plants, Wet Mix Macadam plants, Crushers, Batching Plants	Air (Prevention and Control of Pollution) Act, 1981 and Noise Pollution (Regulation and Control) Rules, 2000	State Pollution Control Board	Concerned Contractor
5	Storage, handling and transport of hazardous materials	Hazardous Waste (Management and Handling) Rules, 1989 and Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989	State Pollution Control Board	Concerned Contractor
6	Location/ layout of workers camp, equipment and storage yards	Environment Protection Act, 1986 and Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989	State Pollution Control Board	Concerned Contractor
7	Discharges from Labor Camp	Water (Prevention and Control of Pollution) Act, 1974	State Pollution Control Board	Concerned Contractor
8	Permission for sand mining from river bed	Environment Protection Act, 1986	Irrigation Department, GoB	Concerned Contractor

4 Environmental and Social Impacts

4.1 Prediction of Impacts

The BKBDP aims not only to provide safety and security from the flood to the affected population but also to improve the quality of living of the habitants of the project area. Hence, from the very project development objective, it can be seen that this project and the concomitant sub-projects are yielding positive and beneficial impacts on the target population. However, any and all development interventions will have both positive and negative impacts; keeping this in view the likely positive and negative impacts are listed below. The significance of these listed impacts would vary depending on the individual project, its size and location. The size of the projects would be small both physically and financially. Due to the likely small size of the sub-projects, adverse impacts, if any, would be at its minimumand localized for the following reasons:

- Proposed project itself is a mitigation measure for floods
- The sub-projects are yet to be proposed
- Likely inclusion of new sub-projects
- Significantly low social and environmental impacts
- Time lag between sub-project identification and implementation
- Prior experience of implementing BKBDP by BAPEPS
- Socially and Environmentally relevant policies of BAPEPS

The following environmental and social impacts are predicted based on the assessment. The impacts could occur during the construction phase and/or operation phase.These possible positive impacts are listed below:

- Improved public safety
- Security during floods
- Less suffering during monsoons and adverse climatic conditions
- Better infrastructure and transportation facilities
- Improved access to services
- Productive use of time
- Improvements in income patterns
- Health and Environmental improvements
- Improvements in quality of life and human dignity
- Opportunities for social interaction
- Improved community participation and sense of ownership

The negative environmental and social impacts for each type of sub-projects are summarized in the table below:

Table 32: Negative environmental and social impacts																		
Project Type	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**	**Q**	**R**
1. Improving Flood Risk Management																		
1.1. Reinforcements of Flood control Infrastructure																		
1.1.a. Easter Embankments (75 km), associated embankments (25 km), closing gaps in embankments*	**L**	**S**	**L**	**M**	**L**	**L**	**L**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
1.1.b. Procurement of 12 No. Dredgers	**L**	**L**	**M**	**M**	**L**	**L**	**L**	**M**	**L**	**L**	**L**	**S**	**L**	**S**	**L**	**L**	**L**	**L**
1.2. Support to Strengthen Institutional Capacity to Manage Floods	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
1.3. Flood Mitigation Works (to be identified)																		
2. Strengthening Irrigation Capacity																		
2.1. Private Tube Well Development	**L**	**L**	**L**	**L**	**M**	**M**	**M**	**L**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
2.2. Solar Electrification of Government Tube Wells	**L**	**L**	**L**	**L**	**M**	**M**	**M**	**L**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
2.3. Support to Irrigation Schemes in Kosi (investments to be identified)																		
2.4. Water Table Monitoring and Technical Assistance to MWRD	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
3. Augmenting Connectivity																		
3.a. Upgrading of rural roads	**S**	**S**	**L**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**M**
3.b. Construction of small and medium bridges	**M**	**M**	**L**	**M**	**M**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
4. Financing Agricultural Production																		
4.a. Multiple Cropping Cycles	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**L**	**M**	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
4.b. Reviving Heavily Sedimented Areas	**L**	**L**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**S**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
4.c. Alternate Livelihoods Promotion	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**L**	**L**	**L**	**L**	**M**	**M**	**M**	**L**	**L**
5. Contingency Emergency Response	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
6. Implementation Support	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**

Code	Impact	Code	Impact	Code	Impact
A	Land acquisition	G	Ground Water Quality	M	Bio-diversity
B	Involuntary Resettlement	H	Destruction of Habitat/Flora Fauna	N	Noise
C	Land Use	I	Insect and Pest Menace	O	Smell
D	Hydrology and drainage Pattern	J	Increased chemical pesticides/ fertilizers use	P	Smoke
E	Water logging	K	Public Health	Q	Disturbance to Other Services
F	Surface Water Quality	L	Safety	R	Air Quality

Impacts: S – Significant M – Medium L - Low

If the impacts are significant, then a detailed Environmental/ Social Assessment will be carried out and if they are medium, then an EA and EMP will be prepared as per the guidelines given in this ESMF.

These adverse environmental and social impacts are described in detail below:

4.2 Environmental Impacts

Since the sub-projects are yet to be finalized, mostly generic impacts which mostly could be caused by typical projects are listed under this section. However, certain specific impacts due to Embankments and Roads and Bridges projects are also listed below:

Specific Impacts due to Embankments

- Loss of trees due to tree cutting
- Impacton landand soil like lossof productive soil and soil erosion
- Impacts due to borrow areas and quarries
- Compaction and contamination of soil due to vehicular movements
- Impact on surface water bodies due to siltation
- Impacts on surface water quality of rivers and other water bodies
- Changes in hydrology and drainage
- Impacts on aquatic ecology due to deposition of debris and temporary sedimentation and turbidity
- Impacts due to construction debris/waste
- Health and safety of construction workers and local people/ community
- Impacts due to transportation and storage of construction materials
- Reduction in air quality due to construction activities
- Increase in noise levels during construction

Specific Impacts due to Roads and Bridges

- Loss of trees due to tree cutting
- Impacton landand soil like lossof productive soil and soil erosion
- Changes in land use
- Impacts due to borrow areas and quarries
- Compaction and contamination of soil due to vehicular movements
- Impact on surface water bodies due to siltation
- Impacts on surface water quality of rivers and other water bodies
- Changes in hydrology and drainage
- Impacts due to construction debris/waste
- Health and safety of construction workers and local people/ community
- Obstruction and disruption of traffic
- Impacts due to transportation and storage of construction materials
- Reduction in air quality due to construction activities
- Increase in noise levels during construction
- Loss/ impact on common property resources

The generic impacts for typical projects to be taken up under the project are listed below:

4.2.1 Impacts on Topography

There will not be major adverse impacts on the topography on account of the sub-projects to be proposed. Yet there might be the following temporary impacts, which could be mitigated using the specified mitigation measures.

- Erosion and sedimentation
- Temporary disruption of natural drainage pattern
- Loss of fertile top soil of the agriculture lands
- Accumulation of excess excavated earth in the area of construction and operation
- Excess earth and debris blockage and change in drainage pattern
- Changes to hydrological regime, increased flooding, siltation hampering stream flows, etc.

4.2.2 Impacts on Climate

No changes in climatic conditions or impacts on climate are anticipated due to the sub-projects to be proposed as part of the BKBDP.

4.2.3 Impacts on Surface Water

The sub-project activities during construction or operations are not expected to interfere with the surface water characteristic of the river or its tributaries. Hence, impacts on surface water are not anticipated. The following temporary impacts are identified.

- Impacts on water use (including indirect and cumulative impacts) due to increased water use from irrigation sub-projects
- Reduced flow to the downstream users at specific points due to temporary diversions
- Surface water pollution due to oil and grease from construction vehicles
- Degradation of river banks due to excavation and construction activities
- Impacts on surface water quality due to increase use of chemical fertilizers as pesticides.

4.2.4 Impacts on Ground Water

No Sub-project activities during construction or operations are expected to interfere with the ground water characteristic of the area. Hence, impacts on ground water are not anticipated. The following temporary impacts are identified.

- Impacts on water use (including indirect and cumulative impacts) due to increased water use from irrigation sub-projects
- Temporary lowering of groundwater table due to pumping of water during excavation
- Lowering of groundwater table due to extraction of groundwater through tube well for irrigation
- Impacts on groundwater quality due to increase use of chemical fertilizers as pesticides.

4.2.5 Impacts on Air Quality

During the construction phase excavation process, suspended particulate matter and dust are major sources of pollution impairing air quality. However, on the construction sites the impact on air quality due to the sub-projects is likely to be higher.During construction and sometimes during operation, use of hot mix plants, generators, transportation and lifting machinery will be unavoidable. Emissions from the exhaust of these are likely to cause localized and temporary air quality impacts.Adequate dust suppression measures and protective measures to the work force will significantly reduce impacts. As the sub-projects to be proposed would be small by nature, the impact of air pollution will not be very significant. Since these impacts are temporary, adequate precautions during the construction period will mitigate them.There will not be any significant air quality impacts during the operation phase of the sub-projects.However, the following possible impacts are listed.

- Increased dust levels due to earth work excavation and construction activities
- Increased air pollution and smell
- Air pollution through ventilating shafts of machinery, plant and equipment

4.2.6 Impacts on Noise Levels

Movement of vehicles transporting construction material and noise generating activities at the construction site, are major sources of noise pollution during construction. Material movement and associated work are the primary noise generating activities on site. These will be distributed over the entire construction period. Construction activities are expected to produce noise levels that can affect the personnel working on site. Activities involving vehicles, plant and equipment in the close proximity of households will have an adverse impact due to noise pollution. These impacts are temporary and limited to the construction phase. Except during regular maintenance activities, no noise generating activities are envisaged during the sub-projects operation phase. Hence, no noise impacts are predicted.However, the some possible impacts are listed.

- Increased Noise Levels during Construction
- Noise due to movement of vehicles
- Increased Noise Levels during operation
- Noise impact due to operation of DG sets

4.2.7 Impacts on soils

No significant impact on soils is envisaged at the moment. However the following are predicted due to excessive use of chemical fertilizers and pesticides

- Soil pollution due to increased use of chemical fertilizers and pesticides
- Loss of soil fertility due to mono-cropping

4.2.8 Impacts on Ecological Resources

The sub-project activities do not involve encroachment of sensitive environmental features, cutting of trees or removal of vegetation. The proposed sub-projects are not in an eco-sensitive zone or coastal zone. Hence, there will not be any adverse ecological impacts due to the project. However, the following impacts are enumerated, which need to be taken care of in the SEMF.

- Ecological impacts due to cutting of trees

4.2.9 Impacts on Bio-diversity

No adverse impacts are foreseen to the bio-diversity of the state due the sub-projects to be proposed. The framework however, proposes to screen bio-diversity impacts through a structured screening process and analyze the impacts as part of the environmental assessments for the respective sub-projects and recommend measures for avoidance / minimize impacts on bio-diversity.

4.2.10 Impacts on cultural resources

No adverse impacts are foreseen to the cultural resources or relics due the sub-projects to be proposed.The framework however, proposes to screen bio-diversity impacts through a structured screening process and analyze the impacts as part of the environmental assessments for the respective sub-projects and recommend measures for avoidance / minimize impacts on bio-diversity.

4.2.11 Other Issues

Visual impacts

- Disruption to visual resources
- Standing out as Eyesore in the surroundings
- Ugly and unsightly conditions

Damage

- Damage to road surface /other utilities

Hazards

- Digging of unplanned borrow pits on the road side causing inconvenience to public and leading to accidents

Nuisance

- Storage of materials causing disturbance to public and traffic
- Mosquito and fly nuisance

Disease

- Disease transmission and Public Health issues

- Spills of solid waste enroute construction sites

Other probable issues
- Plying vehicles on unpaved roads
- Stagnation of water inside facilities and on roads
- Tree branches obstructing the vision of the drivers of vehicles
- Oil spillages

4.3 Social Impacts

The proposed works may not have significant social impacts due to the nature, type and size of the works. However, the following social impacts could possibly arise out of the proposed projects:

- Deprivation and Displacement
    - Due to acquisition of private residential or agricultural or commercial land
    - Loss of assets/ infrastructure
    - Loss of Common Property Resources/ Community Assets
    - Loss of Livelihoods
    - Loss of access to houses/ businesses
- Inconvenience and nuisance to Public
    - Due to accumulation of excavated earth
    - Disturbance to traffic and resulting congestion
    - Disruption of utilities such as water, electricity, telephone, cable, etc.
- Social issues
    - Social disruption in the area of construction
    - Social unrest issues on construction sites
    - Regional labour issues
- Safety hazards
    - To the households in the neighborhood during construction
    - Due to impact of vehicles on land outside RoW
    - Due to risk of accidents
- Health Hazards
    - Due to stagnation of water leading to mosquito breeding and public health problems
    - Due to spread of AIDS at construction sites
    - Due to surface water pollution
    - Due to groundwater pollution

Implementing an appropriate Environment Management Plan, suitable Pest Management Plan and an R&R policy and entitlement framework along with proper implementation of the Environmental Social Management Framework could mitigate the above mentioned negative social impacts.

5 Environmental and Social Management Framework

5.1 Introduction

As mentioned in earlier chapters, BKBDP has several sub-projects. All these sub-projects are not identified at this stage. Further the implementation of these sub-projects will take place over a period of time and this time lag will lead to changes in the environmental and social assessments. For such reasons preparation and implementation of an ESMF is proposed for this project.

5.2 Screening

During the screening, as a first step, the environmental and social impacts are identified through filling in an environmental and social checklist. The basic objective of the filling in this checklist is to collect basic information on environmental and social aspects of the proposed sub-project. Further the ESMF requires that basic environmental and social data pertaining to the proposed sub-project be compiled during the field data collection stage. For this purpose, a simple Environmental and Social Checklists (ESC) were formulated for various sub-projects. The ESC for Embankments and Roads and Bridges are furnished under Annexures. The sub-project Implementing Agency fills up this ESC with the facilitation support of the BAPEPS field office duly identifying the environmental and social issues of concern. A supplementary note on environmental and social concerns will also be added to that ESC. The sub-project Implementing Agency will do the screening through collection of necessary filed data. These ESC are attached to the sub-project project proposal/ concept note.

During the screening process, the sub-projects are also categorized. The basic objective of this categorization is to ensure that sub-projects with potentially significant environmental/ social issues are identified at an early stage for detailed environmental/ social assessment. Further evaluation of all the available information on environmental and social aspects as provided in the ESC and assessment based on the level of expected environmental and social impacts (including any field visits if required), whether the proposed sub-project is qualified for categorization as Ea/Eb and Sa/ Sb takes place during this phase. As a part of ESMF process the screening and sub-project categorization will be cleared by The World Bank, before taking up EA/SA. This is further detailed in the paragraphs below.

5.3 Categorization

In order to give an indication of scale and size of environmental and social impacts, the projects are categorized. This categorization is required to carry out the appropriate level of assessments for different types of sub-projects based on the nature, scale and magnitude of their social and environmental impacts. Categorization would help in focussing time and effort in sub-projects that have significant impacts.The social and environmental categorization of sub-projects is proposed to be as under:

5.3.1 Environmental

Based on environmental impacts sub-projects are categorized into two categories;
1) Ea, where there are significant adverse environmental impacts
2) Eb, where there are moderate to minimal adverse environmental impacts

The Ea category sub-projects require conducting a comprehensive Environmental Impact Assessment (EIA) and preparation of an Environment Management Plan (EMP) by Independent Consultants prior to preparation of DPR for appraisal by BAPEPS. This EIA and EMP need to be disclosed before the start of procurement for that sub-project.

The Eb category sub-projects need not conduct an EIA, but require an EMP, which is to be prepared by Design Consultants following the guidelines given in this ESMF. This EMP becomes a part of the DPR, which will be appraised by BAPEPS. If, under special circumstances, BAPEPS identifies a need for a limited environmental assessment, then it needs to be conducted.

5.3.2 Social

Based on social impacts the sub-projects are categorized into two categories;
1) Sa, where there are more than 20 Project Affected Families (PAFs),
2) Sb, where there are less than 20 PAFs

The Sa category sub-projects require conducting a comprehensive Social Assessment (SA) and preparation of a Resettlement Action Plan (RAP), as per format attached in Annexures,by Independent Consultants prior to preparation of Detailed Project Report (DPR) for appraisal by BAPEPS.This SIA and RAP need to be disclosed before start of procurement for that sub-project. It may be noted that if more than 20 PAFs are there in a sub-project, then an RAP need to be prepared.

The Sb category sub-projects need not conduct SA but need to prepare an Abbreviated Resettlement Action Plan (ARAP), as per format attached in Annexures, and need to include the Social Management Plan (SMP) which is to be prepared by Design Consultants following the guidelines given in this ESMF. This SMP becomes a part of the DPR, which will be appraised by BAPEPS. If, under special circumstances, BAPEPS identifies a need for a limited social assessment, then it needs to be conducted.

5.4 Summary of Impacts and Categorization

A summary of likely impacts due to the sub-projects is given in below table for reference.

Social and Environmental Impacts on Projects **Impacts: S – Significant M – Medium L - Low**

Table 33: Social and Environmental Impacts on Projects

Project Type	Social Category	Envi. Category	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1. Improving Flood Risk Management																				
1.1. Reinforcements of Flood control Infrastructure																				
1.1.a. Easter Embankments (75 km), associated embankments (25 km), closing gaps in embankments*	Sa*	Ea*	L	S	L	M	L	L	L	M	L	L	L	L	L	L	L	L	L	L
1.1.b. Procurement of 12 No. Dredgers	Sb	Eb	L	L	M	M	L	L	L	M	L	L	L	S	L	S	L	L	L	L
1.2. Support to Strengthen Institutional Capacity to Manage Floods	Sb	Eb	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
1.3. Flood Mitigation Works (to be identified)	Sa	Ea																		
2. Strengthening Irrigation Capacity																				
2.1. Private Tube Well Development	Sb	Eb	L	L	L	L	M	M	M	L	M	M	L	L	L	L	L	L	L	L
2.2. Solar Electrification of Government Tube Wells	Sb	Eb	L	L	L	L	M	M	M	L	M	M	L	L	L	L	L	L	L	L
2.3. Support to Irrigation Schemes in Kosi (investments to be identified)	Sa	Ea																		
2.4. Water Table Monitoring and Technical Assistance to MWRD	Sb	Eb	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
3. Augmenting Connectivity																				
3.a. Upgrading of rural roads	Sa	Eb	S	S	L	M	M	L	L	L	L	L	L	L	L	L	L	L	L	M
3.b. Construction of small and medium bridges	Sb	Eb	M	M	L	M	M	M	M	L	L	L	L	L	L	L	L	L	L	L
4. Financing Agricultural Production																				
4.a. Multiple Cropping Cycles	Sb	Ea	L	L	L	L	L	M	M	L	M	S	M	L	L	L	L	L	L	L
4.b.Reviving Heavily Sedimented Areas	Sb	Ea	L	L	M	M	M	M	M	M	M	S	M	L	L	L	L	L	L	L
4.c. Alternate Livelihoods Promotion	Sb	Ea#	M	M	L	L	L	L	L	L	M	L	L	L	L	M	M	M	L	L
5. Contingency Emergency Response	Sb	Eb	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
6. Implementation Support	Sb	Eb	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L

Code	Impact	Code	Impact	Code	Impact
A	Land acquisition	G	Ground Water Quality	M	Bio-diversity
B	Involuntary Resettlement	H	Destruction of Habitat/Flora Fauna	N	Noise
C	Land Use	I	Insect and Pest Menace	O	Smell
D	Hydrology and drainage Pattern	J	Increased chemical pesticides/ fertilizers use	P	Smoke
E	Water logging	K	Public Health	Q	Disturbance to Other Services
F	Surface Water Quality	L	Safety	R	Air Quality

*** - To be decided, whether Ea/ Eb and Sa/ Sb, based on the magnitude if impacts due to sub-project by BAPEPS during screening**
 # - if agro based livelihoods like dairy, sugar plant, breweries, etc. are proposed

5.5 Environmental Impacts and Mitigation

As a part of preparation of ESMF, secondary research was undertaken to predict/ estimate the nature, scale, magnitude and scope of the environmental impacts due to the sub-projects. The environmental impacts were analyzed vis-à-vis the various sub-projects under BKBDP. The sub-project categorization as Ea or Eb was done on the basis of this analysis. After identifying the impacts, the mitigation measures were also determined. These mitigation measures were included as a guidance in this ESMF. These have not been included here to avoid repetition. This guidance table also includes information on whether these mitigation measures have to be undertaken in the planning/ design, construction and operation phases. However, each category of sub-projects need to incorporate mitigation measures given below:

5.5.1 Ea Category

For Ea category sub-projects, a social and environmental consultant, independent of the design consultants,need to be engaged to carry out an Environment Impact Assessment and prepare an Environment Management Plan. In this regard BAPEPS need to prepare a Terms of Reference (ToR) for the environmental consultants for EIA of this category of projects. This ESMF needs to be shared with these consultants for following the procedures and using the relevant information in their assessment.This EIA and EMP need to be prepared in consistent with 'Category A' projects of The World Bank, shall carry out at least two consultations during the process and shall be disclosed (both locally and at the Bank Infoshop) before the start of procurement for that sub-project.

5.5.2 Eb Category

For Eb category sub-projects, the design consultants would have to prepare the EMP. BAPEPS need to share this ESMF containing the impacts and mitigation measures with the design consultants for them to use in the preparation of the EMP that needs to be submitted along with the DPR. BAPEPS will ensure that the Terms of Reference for the Design Consultants will include these.

5.5.3 Pest Management Plan

In addition to the above a Pest Management Plan has been prepared as a part of this ESMF. This is given in the of guidance section. The concerned line departments, i.e. Agriculture Department need to ensure that this plan is implemented at the field level. The NGO partner will have a major role in mobilizing the farmers to implement the provisions of this plan.

5.6 EMP to be Part of Contract Documents

In case of Ea and Eb sub-projects, BAPEPS need to ensure that the EMP is provided as a part of the contract documents to the contractor facilitating its integration into the main works.

5.7 Social Impacts and Mitigation

As mentioned earlier, all the sub-projects under the BKBDPaim at improving safety and security of the target population from floods and improving their living standards. Many of the sub-projects under BKBDP are mere rehabilitation/ strengthening/ improvement/ augmentation/ extension to the existing infrastructure and systems. These investments would improve the performance of the existing infrastructure and systems. The financial and physical size of the sub-projects would be comparatively small. This makes the significance of the social impacts, if any, to be low. However at this stage, it is not possible to identify as to how many and who will be affected by which sub-project. The individual sub-projects proposals will mention the number and categories of the population likely to be affected. Hence, a Resettlement Policy Framework is prepared for the following reasons:

- Most sub-projects are mere rehabilitation of existing infrastructure
- The sub-projects are yet to be finalized/ proposed
- Likely inclusion of new sub-projects
- Time lag between sub-project identification and implementation

The proposed Resettlement Policy Framework would address these impacts. BAPEPS will screen all the sub-projects prior to approval to ensure their consistency with the Resettlement Policy Framework provided as guidance.

5.7.1 Sa Category

As per the categorization of the projects, for Sa category sub-projects, if the number of PAFs exceeds 20, then BAPEPS would ask the concerned department to conduct a comprehensive Social Assessment and prepare a Resettlement Action Plan (RAP), as per format attached in Annexures before project appraisal.Like in case of Environmental Impact Assessment, this Social Assessment too will be done by a consultant independent of the design consultants and this SIA and RAP need to be disclosed before the start of procurement for that sub-project.

5.7.2 Sb Category

For these category sub-projects, BAPEPS will ensure that an Abbreviated Resettlement Action Plan (ARAP) is prepared as per format attached in Annexures and the project proposals prepared by design consultants would include measures to mitigate adverse impacts as per the Resettlement Policy Framework. BAPEPS will ensure that the Terms of Reference for Design Consultants will include these.

5.8 Sub-project Cycle and Environmental and Social Requirements

The environmental and social required to be fulfilled during the sub-project cycle; i.e., during pre-planning, planning, implementation and Operation and Maintenance (O&M) are listed in the below table.

Table 34: Environmental and SocialActivities and Responsibilities to be fulfilled during the sub-project cycle

Phase	ESMF Activity	Objectives	Process	Responsibility	Result
Preplanning	**Identification** Environmental and Social Checklist	To collect basic information on environmental and social aspects of the proposed sub-project.	The ESMF requires that basic environmental and social data pertaining to the proposed sub-project be compiled at the field data collection stage. For this purpose, a simple Environmental and Social Checklist (ESC) and a simple Socio-Economic Survey format were formulated for sub-projects. The formats for the ESC are furnished under annexures. The sub-project Implementing Agency fills up the ESC with the facilitation support of the BAPEPS field office duly identifying the environmental and issues of concern. Supplementary notes on environmental and social concerns be added to those checklists.	NGO and /or Implementing Agencies	ESC prepared and attached with the project proposal / concept note
Planning	**Screening and Categorization** Environmental and Social classification of the sub-project	To ensure that sub-projects with potentially significant environmental/ social issues are identified at an early stage for detailed environmental/ social assessment.	Evaluate all the available information on environmental and social aspects as provided in the ESC and assess, based on the level of expected environmental and social impacts (including any field visits if required), whether the proposed sub-project is Ea/Eb and Sa/ Sb. For Eb and Sb, the design consultants will prepare EMP along with the DPR.	BAPEPS Field Office Design Consultants	Sub-project classified as Ea/Eb and Sa/Sb. As a part of ESMF process the screening and sub-project categorization need to be cleared by The World Bank, before taking up EA/SA.
Planning	**Preparation** Environmental and Social Assessment and Management Plans	To conduct Environmental/ Social Assessment and Prepare Management Plans for integration into sub-project DPR	For Ea/ Sa category sub-projects for which detailed environmental/ social assessment is required, this EA/SA and preparation of EMP/ RAP/ ARAP will be done by consultants independent of the Design Consultants.	Independent Consultants	EA/ SA done. EMP/ RAP/ ARAP Prepared and disclosed prior to start of procurement for that sub-project. EMP/RAP/ARAP/EA/SA will be cleared by the Bank prior to disclosure.
Planning	**Appraisal** Environmental and Social	To ensure that relevant environmental and	For Eb and Sb sub-projects, there shall be no separate environmental/ Social appraisal but environmental/ social aspects shall be included in the normal appraisal and	BAPEPS Environmental Specialist	Environmental and social appraisal of the project is made and

Phase	ESMF Activity	Objectives	Process	Responsibility	Result
	appraisal	social issues have been identified and appropriate mitigation measures have been designed to address them.	evaluation process for the proposed sub-project, based on the ESC included in the DPR. All these sub-projects need to follow the mitigation measures detailed in the ESMF Guidance. This will be ensured by the BAPEPS branch office. For projects requiring a detailed Environmental/ Social Assessment, including evaluation of environmental/ social impacts, risk assessment if needed, and design of mitigation measures, will be done by the BAPEPS Environmental and Social specialists.	Social Specialist	approval of proposed sub-project, with decision to (i) accept scheme as submitted, or (ii) accept scheme with modification suggested in the environmental/ social appraisal.
Planning	**Approval** Environmental and Social approval required	To ensure that mitigation measures and their cost are integrated in scheme design and implementation plans	Approval for the sub-project will not be accorded without the appraisal by BAPEPS and the review of ESA by the The World Bank	BAPEPS	Technical Sanction for sub-projects with environmental and social mitigation measures and accordingly its costs are integrated in sub-project design and implementation plans.
Implementation	**Implementation** Implementation of Environmental and social mitigation measures.	To ensure that the prescribed environmental and social mitigation measures (including construction stage) are implemented.	The prescribed environmental and social mitigation measures (including construction stage measures) and pest management plan as identified through the environmental and social appraisal process are adequately implemented. Implementation Completion Report (ICR) for sub-project will need to include an Environmental Compliance Certificate and Social Compliance Certificate given by the Gram Panchayat indicating that the mitigation measures identified in the appraisal (including construction stage) have been implemented.	NGO Gram Panchayat BAPEPS	ICR with environmental and social compliance information.
O&M	**Supervision, Monitoring and Evaluation** Environmental supervision, monitoring and	To ensure that environmental and social aspects are integrated in the O&M phase.	Monitoring of indictors will be conducted as per project monitoring protocol. Supervision will be conducted by the designated environmental officers of the implementing agencies for all the sub-projects All sub-projects will be monitored by BAPEPS.	BAPEPS NGO External Consultants	BAPEPS will submit quarterly reports to The World Bank on Safeguards Implementation. Quarterly monitoring

Phase	ESMF Activity	Objectives	Process	Responsibility	Result
	evaluation IEC and capacity building on environmental and social issues.		Capacity building and IEC activities are undertaken to enable effective implementation of the ESMF including assessment procedures, supervision, monitoring, etc. as well as for community awareness and sensitization. This will be done by the NGO and in turn the NGO will be trained by BAPEPS.		reports by Independent Consultants. Periodic environmental and social supervision reports. Training and IEC activity reports.

5.9 Monitoring and Evaluation

The ESMF requires detailed supervision, monitoring and evaluation of the impact of the project on the environment and social aspects. In order to carry out this, BAPEPS will have specific arrangements made at state and division/ district level. This includes appointment of an Environmental Specialist and Social Specialist for the project period. Further the BAPEPS will instruct the District and Field level implementing agencies on how to implement the provisions of this ESMF. At the field level the staff of the implementing agencies (viz. RCD, RWD, WRD, BPNNL, Agriculture Dept. etc.) have the experience of implementing projects concerning their departments and do land acquisition for their project.Implementation of the provisions of ESMF will be new to these staff and hence several orientations and trainings are proposed as a part of this ESMF to build their capacity. In order to achieve the objectives of this ESMF and to ensure the safeguards are implemented in a proper manner, the following provisions are made in this ESMF:

- Independent Consultants for Quarterly Monitoring of ESMF

The BAPEPS will be in charge of implementing the ESMF. The Environmental and Social Specialists of BAPEPS will guide and oversee the implementation of the ESMF at field level. This overall guidance will be given by them. Further the BAPEPS will incorporate the provisions of this ESMF as actionable points in the Project Operations Manual or other similar document for the project. These will be non-negotiable and will have to be followed by all the field units of the implementing agencies. The Environmental and Social Specialists will oversee the application of these provisions and guide the process, while at the same time building the capacity of the field units.

At the field level the designated environmental engineers of the implementing agencies / the supervision consultants will ensure the implementation of the ESMF.

The following provisions include the arrangements made for the effective implementation of the ESMF:

5.9.1 Environmental supervision

This is basically done by BAPEPS. All the sub-projects will be visited at regular intervals by BAPEPS to check if all safeguard requirements are met and to identify any issues that need to be addressed. BAPEPS would submit quarterly progress reports to The World Bank on safeguards implementation.

5.9.1.1 Environmental and Social Parameters

Once every year, the BAPEPS will prepare a report of the environmental and social situation in the project districts including data and analysis of relevant parameters as given below:

- Environmental parameters
  - Rainfall
  - Water quality
  - Soil erosion
  - Soil quality
  - Sand casting
  - Sedimentation in water bodies
  - Changes in land use
  - Usage of chemical pesticides
  - Use of chemical fertilizers
  - Introduction of new crops
  - Presence of pests (new and revived)
  - Introduction of new breeds of livestock, etc.

- Social parameters
  - Adequacy of entitlements
  - Amount of land acquired/ required
  - Payment of compensation and entitlements before displacement or taking over of the asset
  - Time taken for land acquisition
  - Number of grievances registered and resolved
  - Number of court cases
  - Income restoration
  - Land holding status
  - Literacy
  - Housing
  - Ownership of household assets
  - Water supply
  - Sanitation
  - Latrine usage
  - Empowerment, etc.

This report also should give a listing of relevant new legislation and regulations that have a bearing on the environmental social performance of the project. BAPEPS will submit this report to The World Bank. The ESMF will be suitably revised annually on the basis of this document by the BAPEPS.

5.9.2 Quarterly Monitoring

The concurrent internal environmental social monitoring will be done as part of the regular monitoring by the design and supervision consultants and implementing agencies. However, independent consultants appointed by BAPEPS, will do the quarterly environmental and social monitoring of sub-projects for safeguards compliance.

5.9.3 Monitoring Plan

Given in the table below are indicators for project investments, for which monitoring need to be taken up by BAPEPS in a regular manner.

Table 35: Indicators for project investments

Project Components	Monitoring Indicators	Frequency	Agency
1.0 Improving Flood Risk Management 1.1. Reinforcements of Flood control Infrastructure 1.1.a. Easter Embankments (75 km), associated embankments (25 km), closing gaps in embankments 1.1.b. Procurement of 12 No. Dredgers 1.2. Support to Strengthen Institutional Capacity to Manage Floods 1.3. Flood Mitigation Works (to be identified)	**Environmental parameters** • Rainfall • Water Availability in downstream sources • Water quality – Surface and Groundwater • Soil erosion • Soil quality • Sand casting • Sedimentation in water bodies • Debris deposits on lands • Changes in land use • Usage of chemical pesticides • Use of chemical fertilizers • Introduction of new crops • Introduction of new breeds of livestock • Yield of Milk • Yield of crops. • Quality of produce (taste, odour, color, perishability etc.) • Damage of crops against diseases. • Presence of pests • Use of bio pesticides, green manure, etc. **Social parameters** • Adequacy of entitlements • Payment of compensation and entitlements before replacement • Time taken for land acquisition • Number of grievances registered and resolved • Number of court cases • Income patterns • Land holding status • Income from land • Changes in occupations • Literacy • Nutrition • Housing status • Ownership of household assets	• Quarterly by Independent Consultants • Annually by BAPEPS	• BAPEPS guiding the collection of information on indicators • Independent Quarterly Monitoring Consultants • NGO collecting information at field level • Implementing Agencies/ Departments for department specific information
2. Strengthening Irrigation Capacity 2.1. Private Tube Well Development 2.2. Solar Electrification of Government Tube Wells 2.3. Support to Irrigation Schemes in Kosi (investments to be identified) 2.4. Water Table Monitoring and Technical Assistance to MWRD			
3. Augmenting Connectivity 3.a. Upgrading of rural roads 3.b. Construction of small and medium bridges			
4. Financing Agricultural Production 4.a. Multiple Cropping Cycles 4.b.Reviving Heavily Sedimented Areas 4.c. Alternate Livelihoods Promotion			
5. Contingency Emergency Response			

Table 35: Indicators for project investments			
Project Components	**Monitoring Indicators**	**Frequency**	**Agency**
6. Implementation Support	• Water supply coverage • Sanitation coverage • Latrine usage • Length of rural in roads • Journey time • Empowerment of Women and Mahadalits **Other** • No. of training programs conducted • No. of personnel trained • Trainees' understanding training content • Achievement of learning objectives • Application of methods, tools and techniques learnt during training • Adherence to contract conditions and standards • Absence of inconvenience, nuisance, complaints • No. of sub-projects completed without time and cost overruns • Adherence to project guidelines		

5.10 Stakeholder Consultation

As a part of ESMF preparation sample sub-projects that were identified for investments in the first phase were visited and, stakeholders were consulted. The information gathered during these consultations was incorporated in the environmental andsocial assessment, and in the ESMF as appropriate. The field visits were conducted during 12-23 February 2012, 10-12 April 2012 and 7-10 August 2012. Apart from the field visits, several meetings were held with the participating departments during which their experiences, views, opinions and perceptions were gathered and these were incorporated into this ESMF.

The issues presented in these sections are the summary of those consultations. The lists of participants during these consultations is given in annexure 6 along with some photographs of these consultations.

Further a Stakeholder Consultation Workshop with the participating departments and other stakeholders was conducted during 10 April 2012 to gather their feedback on the ESMF and accordingly the ESMF was revised.

5.10.1 Stakeholder Involvement and Consultation

BAPEPS would engage Design consultants to assist them in preparing the sub-project DPRs. In the ToR for these consultants, there is an explicit requirement for the consultants to carry out public/ stakeholder consultations. This is a mechanism to ensure the upfront public/ stakeholder inputs in the preparation of the sub-projects.

For Category Ea and Sa sub-projects, BAPEPS would have to engage independent consultants to prepare the SA / RAP and EIA / EMP respectively. In the ToR for the

preparation of these outputs, public/ stakeholder consultations forms an integral part.For such type of sub-projects obtaining consent of the local agencies and necessary clearances from competent authorities is mandatory and should form part of the EA/ SA. These EA/ SA will be reviewed by The World Bank.

During sub-project implementation GPs, NGOs, Community Based Organisations (CBOs) will be involved. Project monitoring reports would be disseminated in the public consultation meetings in the GPs. The stakeholder meetings would discuss the sub-project progress reports and make recommendations for sub-project control and modifications. These recommendations would be made use for future sub-project design. Consultations are required for preparation of all safeguards mitigation documents and these consultations should be an on-going activity of the project.

5.11 Disclosure

5.11.1 State Level

BAPEPS and the implementing agencies shall disclose this entire ESMF at their website. The summary of the ESMF need to be translated into local language (Hindi) and placed on the website. The Resettlement Policy Framework will be disclosed along with the entitlement framework, though this is a part of the SEMF, these documents shall be separately identified and disclosed in the BAPEPS website. These two documents shall also be translated into Hindi and made available at the BAPEPS's website.

5.11.2 District Level

BAPEPS has also arranged to disclose the final versions of the ESMF and Resettlement Policy Framework and Entitlement Matrix in all the District Collectors Offices and the local offices of the implementing agencies. These would be in place once the final versions are ready. When this document is updated, then the copies in the different locations would also be updated.

5.11.3 Disclosure by The World Bank at the Infoshop

The World Bank will disclose this ESMF and any future EA/ SA along with EMP/ RAP at the infoshop for downloading and reference by interested parties.

During the implementation phase, all the sub-project ESAs shall be disclosed by BAPEPS and the implementing agencies both at the local level and at the state level. These ESA s will also be disclosed at the Infoshop of The World Bank.

5.11.4 Grievance Redressal Mechanism

BAPEPS has developed a grievance redressal mechanism which will look into all aspects of sub-projects and their activities apart from R&R related grievances. The Resettlement Policy Framework can be referred for details on Grievance Redressal Mechanism.

6 Institutional and ImplementationArrangements

6.1 Introduction

The BKBDPwill be implemented in identified eight flood prone districts of Kosi basin. This project will focus on increasing the safety and security of the flood prone population and at the same time will focus on increase the quality of life of them.

At the state level the Planning Department is the implementing agency and there are several participating departments implementing the project components; viz.,

- Water Resources Department (WRD) implementing the flood management and irrigation works and capacity building initiatives for Flood Management
- Minor Water Resources Department (MWRD) implementing the Tube Well irrigation component.
- Road Construction Department (RCD) through its implementation arm the 'Bihar Rajya Phool Nirman Nigam (BRPNN)' which will construct the brides on the State Highways and Major District Roads.
- Rural Works Department (RWD) that will implement rural road works through its implementation arm, the Bihar Rural Road Development Agency (BRRDA).
- AgricultureDepartment (Ag.D) that will implement the component related to agriculture and horticulture
- Animal Husbandry Department that will implement the component related Livestock
- Project Management Unit for the Bihar Rural Livelihood Project known and 'Jeevika' which will be responsible for implementation of the Livelihood Support and Enhancement component.
- Disaster Management Department (DMD) for coordinating the disaster management efforts and building disaster management capacity.

In order to coordinate the efforts of several participation departments, the Bihar Aapada Punarwas Evam Punarnirman Society (BAPEPS) has been established.Principally implementation will be at the level of the Planning Department, but also beyond, with regards to any convergence with other programs, under other departments and other related government and research agencies. Also the leadership for the components will be shared across concerned agencies, where the BAPEPS will play a greater role in managing all components, in particular planning, coordination and monitoring.

6.2 State Level Management

6.2.1 BAPEPS, The Project Implementing Agency

The **Project Implementing Agency (PIA)** will be the BAPEPS. The Project Director BAPEPS will be the responsible for overall project implementation. For effective day to day co-ordination of project implementation the PD will be assisted by the Deputy Directors, and other functionaries. PIA would contract any additional experienced agency to provide additional technical support for planning and implementation or

especially with regards to managing convergence, and linking into overall disaster management planning.

The BAPEPS is headed by a Project Director. This society will be primarily responsible for the implementation of the project. Ex-Officio Chairperson of the Society is the Development Commissioner, Government of Bihar. The Project Director is supported by Deputy Director (Projects) and Deputy Director (Finance and Administration). The DD (P) will have the support of several Managers experts in the field of Project Implementation, Procurement, Quality Control, Environment and Social Safeguards, MIS and reporting, etc. the DD (F&A) will be supported by Accounts and Financer Officer, Administrative Officer, Accounts and Administrative Assistants, etc. BAPEPS may utilize the services of consultants based on needs and requirements. However it will be ensured that BAPEPS will have functional and management teams comprising of the Project Managers, Engineers, Procurement Specialists, Financial Specialist, Environment & Social Specialist and support staff. BAPEPS shall implement the sub project activities through the relevant line departments. BAPEPS will have a representative office in the field of operation.

6.2.1.1 Functions of BAPEPS

The primary functions of BAPEPS will be:

- To prepare the Bihar Kosi Flood Recovery Project-II and implement the same.
- To coordinate with the World Bank and line agencies in both preparation and implementation phase and be singularly responsible for reporting to the Bank on project progress, procurement control, financial management, audit & disbursement aspects, results monitoring and evaluation of the project and ensuring that the project is implemented in accordance with agreed procedures and guidelines of the Bank (Procurement, Financial, Environment, Social etc.)
- Coordination with line agencies, progress monitoring and acting as Employer under the contracts.
- Procurement Control (Approval of Bidding Documents and approval of contract award recommendations from the implementing agency that come through nodal officers).
- Quality assurance through third party audits and social audit.
- Ensuring compliance with agreed ESMF, implementation procedures and other Bank requirements.
- Payments (direct to contractors and consultants; and cash transfers to beneficiaries through district administration), and Financial Management.
- Financial audit and reporting to Bank.
- Maintaining MIS and Quarterly reporting.
- Appointment of technical assistance consultants and management of consultancies.

BAPEPS will also hire support consultants using pre-agreed Terms of References, for:

- Design Consultants (DPR Consultants) (might use them for supervision as well)
- Financial Management support

- Quality Audit of Works
- Conducting environmental assessments for all the sub-projects as per the agreed terms of reference, as per the ESMF
- Independent Environmental and Social Monitoring Consultants
- Impact Evaluation and Assessment

6.2.2 Project Empowered Committee

The **Project Empowered Committee (PEC)** will govern the overall project, and guide the PIA. The PEC will be constituted by the main implementing agencies, and chaired by the Development Commissioner GOB. The committee will have Secretary i) Planning, ii) WRD, iii) RCD, iv) RWD, vi) BRPNNL, vii) Ag.D, viii) DMD, ix) PD, BAPEPS, etc. as members, while the PD, BAPEPS will be the member Secretary. There shall also be representation by civil society experienced in participatory and integrated disaster management. The PEC will provide overall guidance on policy aspects relating to project development, integration between departments and on convergence. It will also look into mid-course correction, and issuing guidelines for smooth implementation of the project. Also, the PEC has the powers of the State Cabinet in matters relating to financial and administrative sanctions, recruitments, and entrustment of works and assignments. It will approve the overall annual implementation plan, and procurement of goods (by the line departments) exceeding Rs. 10 million, and works and services (required by the line departments) exceeding Rs. 1 million.

6.3 Field Level Management

6.3.1 BAPEPS Field Office

The Field Office of BAPEPS will ensure coordination among the participating departments, monitoring and reporting functions. This field office will have deputed or contracted experts sector and functional management area.BAPEPS will have one Environmental Specialist and one Social Specialist. They will work as a team. The functions of this team are:

- Ensuring overall implementation of the ESMF in the project.
- Coordinating on a day-to-day basis with the implementing departments for implementation of the ESMF.
- Advising and assisting the BAPEPS and implementing departments during the appraisal of the sub-projects to be taken up.
- Acting as an early warning system for the BAPEPS with regard to the actions to be taken as per the ESMF.
- Preparing regular periodic reports on the environmental and social compliance for the BAPEPS for its own use or for transmission to The World Bank
- Ensuring that recommendations from supervision and monitoring are integrated into the project and the ESMF is updated periodically as necessary.
- Recruiting external agency for conducting Environmental and Social Audit once in a year and ensure that the relevant recommendations are integrated into the project.

- Conducting environmental supervision of sub-projects on a quarterly/ half yearly basis.
- Ensuring availability of required human resources for implementation of ESMF.
- Arranging funds required for implementing the provisions of ESMF by coordination with the BAPEPS.
- Taking all those actions which are necessary for effective implementation of the ESMF.
- Training and orientation of the PMU and implementing agency teams on the requirement, application and implementation of the ESMF.
- Reviewing the monitoring reports submitted by the implementing agencies to check compliance with the ESMF, including EMP and the RP, as applicable to the sub-component/activity.
- Regularly visit project sites to review compliance of ESMF.
- Provide guidance and inputs to the BAPEPS and implementing agency teams on environment and social management aspects.
- Act as a single point of contact for resolving queries related to environment and social issues.

The Environment and Social Specialists of the BAPEPS shall provide regular feedback based on the field visits, monitoring activities undertaken and third party audits to the respective implementing agencies and to the Project Director.

6.3.2 Sub-Project Implementing Agencies

The Participating departments will be responsible for the execution of the contracted work either through the contractors. The concerned department will ensure during the day-to-day functioning and contract administration that the ESMF, including the EMPs and the RAPs are implemented on their respective sub-projects. The tasks of the line departments/implementing agencies will include, but will not limit to:

- Planning and Design: Preparation of DPRs, cost estimates and bidding documents. Support preparation of the EA / EMP and SA/ RAP documents along with DPRs, as applicable either internally or through external consultants. Preparation of environment and social checklists and their integration into DPRs and Bid Documents.
- Procurement: Receipt of tenders; opening and preparation of preliminary bid evaluation reports jointly with BAPEPS Field Representatives; review and check by nodal officers and forwarding to BAPEPS for final decision.
- Implementation: Contract Management (acting as 'Engineer' under the contract).
- Supervision: Quality assurance. Regular on-site supervision for compliance of the EMP and the RAP.
- Reporting: Work Progress Reporting. ESMF implementation progress reporting. Provide reports on status and progress on EMSF implementation from time to time (as decided) to the PMU.
- Financial: Recommend for payments.

6.3.3 Design (and Supervision) Consultants

The design (and supervision) consultants are contracted by BAPEPS for sub-projects' planning and design and for implementation supervision. They will have one Environmental Engineer and a Social Scientist in their team. Their ToR should include the following:

6.3.3.1 Environmental

- To ensure compliance of the Environmental Management Plan (EMP) by regular monitoring and issuing instructions to the contractor(s) for remedial actions as appropriate. If the contractor fails to respond to repeated requests / reminders, to bring to the notice of the participating department.
- To prepare monthly reports on EMP compliance that would be submitted to the participating department and BAPEPS. To highlight any deviations related to legal compliance, if any, in these reports.
- To develop, organize and deliver onsite contractor staff training programs to improve EMP implementation.
- To hold regular consultative meetings with the stakeholders in order to learn and be able to address their concerns.
- To coordinate and contract the periodic environmental monitoring (air, noise, water, etc.) to appropriate agencies, and to initiate suitable follow-up action.
- To guide the contractor on liaisoning with Government Agencies such as the Pollution Control Boards and Forest Department in order to obtain the required clearances, and to ensure that the contractor activities are carried out in line with any conditions placed.
- To ensure adoption of good construction-related safety practices are adopted during the construction phase.

6.3.3.2 Social

- To act as an early warning system to the participating department and BAPEPS to ensure compliance with the R&R policy / RAP by regular monitoring. Issuing instructions to the involved agencies and contractor(s), when contractor is involved, for remedial actions as appropriate. If the agency / contractor(s) fails to respond to repeated requests / reminders, to bring it to the notice of the participating department and BAPEPS.
- To prepare monthly reports on RAP compliance that would be submitted to the participating department and BAPEPS. To highlight any deviations related to legal and R&R policy compliance, if any, in these reports.
- To develop, organize and deliver onsite training programmes to participating department and BAPEPS and other involved staff to improve RAP implementation.
- To hold regular consultative meetings with the stakeholders in order to learn and be able to address their concerns.

- To coordinate and contract the periodic external interventions (ex.; training) through local outstanding NGOs and other institutions to appropriate agencies, and to initiate suitable follow-up action.
- To guide the participating department and BAPEPS staff on liaisoning with Government Agencies for providing support to PAPs, and to ensure that the support is carried out in line with the R&R policy.

6.3.4 Independent Environmental Social Safeguards Quarterly Monitoring Consultants

The concurrent internal environmental social monitoring will be done as part of the regular monitoring by the design and supervision consultants and implementing agencies. However, independent consultants appointed by BAPEPS, will do the quarterly environmental and social monitoring of sub-projects for safeguards compliance. The Independent Environmental and Social Quarterly Monitoring Consultant will have the following functions:

- Review all project documents related to Environment and Social issues including Checklists, EA/ SA Reports, EMPs/ RAPs, Quarterly progress reports, aid memoirs, all statutory and regulatory requirements and safeguards, etc.
- Check and verity the compliance of sub-project activities with the ESMF and statutory and regulatory requirements.
- Check for any good practices in ESMF implementation and document them.
- Evaluate the environmental and social training programs and their outcomes
- Give recommendations to improve compliance on environment and social management aspects during planning, design and implementation of sub-project activities/works.
- Prepare report on compliance with ESMF and other statutory/regulatory requirements duly incorporating good practices and recommendations.

7 Capacity building and Training

7.1.1 Introduction

The launch of BKFRP-I, has given BAPEPS and the participating departments some exposure to the environmental and social safeguards issues. But the interactions with them reveal that, this mere exposure is not enough for preparing and implementing environmental and social management plans. They need to have awareness, sensitivity, skills and experience regarding the environmental and social aspects of sub-projects planning and implementation.

For sustainability and seamless adaption of the environmental and social principles and safeguards by all the implementing partners, awareness creation and capacity building becomes necessary. This is best done with the assistance of experts. Hence a few of the known expert agencies are proposed for this task. It may be noted that some staff of GoB might have the skills and capacity to help build the environmental and social awareness and capacity of implementing partners.

This capacity building and IEC strategy has been outlined as part of the ESMF program developed for the project aims at building environmental and social awareness and environmental and social management capacity in the project administration structure as well as in the intended target communities. Capacity building for environmental and social management will be integrated with overall capacity building component of the project.

7.1.2 Objectives

The objectives of the capacity building initiatives are:

- To build and strengthen the capability of BAPEPS, participating departments, and other partners (NGOs) to integrate sound environmental and social management into sub-project implementation.
- To orient the BAPEPS staff, participating departments and NGOsat district level and communities to the requirements of the project's ESMF.

7.1.3 Approach

Systematic capacity building initiatives need to be introduced only after completion of training needs assessment. The training should be of cascade mode. All the trained staff and others will in turn conduct further trainings at district, block and village levels. However, since capacity building goes beyond mere imparting training, institutionalization of best practices becomes a prerequisite for improved sub-project environmental and social management. The training outcomes like trainees' understanding of the training content, achievement of learning objectives, application of methods, tools and techniques learnt during training, etc. need to be monitored and audited. This will be done by the Quarter monitoring consultants,

7.1.4 Institutions for Training

In view of the specialized training and capacity building envisaged under the ESMF of the project, it is necessary to identify nodal training institutes that will work closely with BAPEPS for conceptualizing, designing, conducting and managing training programs on the ESMF. Some such specialized institutions are:

- Selected Expert Staff of Participating Departments (viz., RCD, RWD, WRD, BRPNNL, Agriculture, etc.)
- Selected Expert Staff of Disaster Management Department, Environment and Forest Department, Mines and Geology Department, etc.
- Bihar Institute of Public Administration
- Indian Institute of Technology, Patna
- A.N. Sinha Institute of Social Studies
- Bihar State Pollution Control Board
- Engineering Staff College of India, Hyderabad
- Administrative Staff College of India, Hyderabad
- Other Identified Consultants

7.1.5 Details of Training Programs

7.1.5.1 **T1. Orientation/ Learning Training Programs**

Purpose of the training:

- To orient the project staff at the project launch towards the environmental and social issue of the project
- To orient the project staff about the ESMF and its importance, provision and implications. There after annual orientation cum experience sharing and learning training programs will be conducted.
- To re-orient the project staff on the ESMF and to share their experiences in implementing the ESMF
- To draw lessons learnt during the implementing the ESMF and to incorporate them into the ESMF revision.

Participants: All Key officials of the project including BAPEPS, participating departments, NGO and State Level Environmental and Social Specialist. BAPEPS will be responsible for selection of suitable candidates for the training, and the expense will be borne by the overall project capacity building budget.

Schedule: The training will include a project launch training workshop and annual re-orientation and learning workshops, on environmental and social assessment and management. These training programs will be for duration of 1-2 days each.These will total to 6 training workshops.

7.1.5.2 T2. Training on the ESMF and Mitigation Plans

Purpose of the training:

- To equip with knowledge and skills necessary for undertaking environmental and social appraisal as per the requirements of the ESMF and preparation of mitigation plans
- To prepare for undertaking periodic supervision of implementation of environmental and social mitigation plans and performance of sub-projects
- To prepare for implementing Community Based System for Environmental and Social Monitoring

Participants: Key officials of the project including BAPEPS, participating departments, NGO and State Level Environmental and Social Specialist. BAPEPS will be responsible for selection of suitable candidates for the training, and the expense will be borne by the overall project capacity building budget.

Schedule: The training will include an annual orientation workshop, one main and annual refresher training workshops on environmental and social assessment. The main and refresher training programs will be for duration of 2-3 days each, whereas the initial orientation workshop will be of one day duration. 2 maintraining programs will be conducted during the first year and 1 refresher program per year will be conducted for the next 4 years. This will total to 6 programs and 6 workshops.

7.1.5.3 T3. Training on Environmental and Social Management

Purpose of the training:

- To equip with knowledge and skills necessary for meaningful participation in the environmental and social appraisal as per the requirements of the ESMF
- To prepare for planning and monitoring implementation of environmental and social mitigation measures identified through the appraisal process
- To equip with skills necessary for Community Based Environmental and Social Monitoring

Participants: NGOs, Participating Department Staff, GP Representatives.

The BAPES branch office will be responsible for selection of suitable candidates for the training, and the expense will be borne by the overall project capacity building budget.

Schedule: The training will include an annual orientation workshop, one main and annual refresher training workshops on environmental and social management. The main and refresher training programs will be for duration of 2-3 days each, whereas the initial orientation workshop will be of one day duration. Considering that there are 10 districts in the project area, 1 main program for each two districts in the first year and 2 refresher programs for all districts per year during subsequent 4 years will be conducted. Including the main and refresher programs, the total T2 training programs will be about 13 for the project duration.

Table 36: List of T2 Training Programs		
S. No.	Topics	Number of Trainings
1	T1 – Orientation and Learning Training	6
1	T1 - Environmental and Social Management Framework	6
2	T2 - Environmental and Social Management	13
	Total	25

About 20 to 30 trainees would participate in each of the training programs. It is intended that these trained persons will in turn provide onsite training to Participating Departments' Staff, NGOs, resource persons, etc. onsite at district/ block level.

7.1.6 Training Budget

The total estimated cost of training on environmental and social management for members of BAPEPS, Participating Departments' Staff, NGOs, etc, under the proposed BKBDP is presented in the table below:

Table 37: Training Budget				
S. No.	Training	No. of Programs	Estimated Unit Cost in Rs.	Total Cost In Rs.
1	T1	6	1,50,000	9,00,000
2	T2	6	10,00,000	60,00,000
3	T3	13	5,00,000	65,00,000
4	Workshops (State)	6	2,00,000	12,00,000
5	Workshops (District)	13	1,00,000	13,00,000
6	Provision for other Training, Expenses, etc.			41,00,000
7	Total			2,00,00,000

8 Budget

The total administrative budget for environmental and social management activities under the proposed BKBDP has been worked out as Rs. 7.7 crore. The cost of implementing the proposed mitigation measures is not included in this costing. The cost of mitigating environmental and social impacts need to be included in the respective sub-projects' budgets. The detailed breakup of the administrative budget is presented in the table below.

Table 38: Total administrative budget for environmental and social management activities

S No.	Activity	Amount in Rs.
1	Training and workshops (as estimated)	**2,00,00,000**
2	NGO Partner Costs 1 Team Leader – Rs. 20,000 per month 5 Field Members – Rs. 10,000 per moth 2 Support Staff – Rs. 7,500 per month Travelling Costs – Rs. 50,000 per moth Office Expenses – Rs. 5,000 per month Admin Costs – Rs. 10,000 per month Total per month: Rs. 2,00,000 Costs per year: Rs. 24,00,000 Costs for 6 years: 1,86,00,000 (with annual 10% increase)	**1,86,00,000**
3	Quarterly Environmental Social Safeguards Monitoring by Independent Consultants for 6 Years @ Rs. 30 Lakhs per year	**1,80,00,000**
4	Preparation of specific environment and social related community awareness materials @ 10 lakh per district for 8 districts and 50 lakh at state level	**1,30,00,000**
5	Sub Total	**6,96,00,000**
6	Contingencies @ 10%	**69,60,000**
7	**Total** **Say**	**7,65,60,000** **Rs. 7.7 Crores**

9 Environment Impact Mitigation

9.1 Introduction

This guidance includes a section listing mitigation measures for the possible impacts caused by the sub-projects. This also includes the project phase, where each of the mitigation measures needs to be considered and also indicates the implementation responsibility.

9.2 How to use this Section

9.2.1 For Ea sub-projects

This category of sub-projects requires a full-fledged EA that is to be done by environmental consultants separate from design consultants. The impacts and mitigation measures given in this section should be used to identify the key issues.

9.2.2 For Eb sub-projects

For this category of sub-projects, the design consultants have to prepare an EMP. This mitigation measures section should be referred to develop the EMP by the design consultants to prepare a table of mitigation measures in the sub-project EMP. The subsequent guidance document provides sample EMP for a typical rural roads project.

9.3 Anticipated Environmental Impacts and Mitigation Measures

Environmental impacts should be assessed considering present environmental settingofthesub-projectarea, nature and extent of the proposed activities. Suitable approach and methodology should be adoptedto ascertain likely impacts both during design and construction and operation stage.

9.3.1 Climate Change

9.3.1.1 DesignandConstructionPhase

Cutting of trees will be encumbered at the sub-project sites will have minor to negligible impact on microclimate of the region. The compensatory plantation will rather improve the microclimate of the region. The effect of global climate change to the sub-project, particularly predicted extreme rainfall is recognized considering that majority of sub-project area is prone to flooding. However, there are no studies yet available about the effect of climate change on rainfall or flood pattern of the area which makes it difficult to recommend specific climate proofing measures.

9.3.1.2 Mitigation Measures

All efforts shall be made by the contractor to minimize cutting trees up to final stage of project implementation. The sub-projects envisage plantation of trees as a compensatory plantationas in compliance to prevailing guidelines of State's Forest

Departmenton 1:3 basis. The contractor will be responsible to coordinate compensatory plantation which will include meetings, actions and discussions with concerned authorities. Besides, additional plantation is recommended near sensitive locations, embankments andwherever additional land is availablewith participating department.

9.3.1.3 Operation Stage

Thesub-projectsaremostlylocatedinopenagriculturalland,whichwill provideadequatedispersion ofgaseousemissionsfromvehicles and equipment.Further, extensiveplantation will ameliorate/enhance the micro-climate. Noadverse climatic changes/impactsareanticipatedduringoperationstageotherthanCO_2 emissionfromvehicles and equipment.

9.3.2 Natural Hazards

Theareaislargelyprotectedfromflood afterconstructionofembankments alongKosi River.Thesub-projects runmostly paralleltothe river forsignificantlength.Hence no overtopping may take place. As per local people the embankments are used for safety during floods. Theseissuesneed to be takencareofinfinalizing theformationlevelfor roads and other assets and designofstructures.

TheprojectareaislocatedinseismiczoneIIIandIVthatishighto very high damageriskzone.Thismaycausefailureofcivilstructures inthe eventofearthquakeifdesignconsiderationrelatedtoseismicityisnot adequatelytaken intoconsideration.Allcivilstructuresespeciallybridges shallbeconstructedasperlatestseismiczonerequirement.

9.3.2.1 Mitigation Measures

- Provisions ofadequate crossdrainagestructures, likeculverts/balancing culverts/ causewaysandroadsidedrainagewithsuitableoutfallshallbe madetoavoidflooding/water logging.Formationlevels for roads and structuresshallbe decidedconsidering thesiltationrateoftheriver. Thedesigndischarge shallbeevaluatedforfloodof50 yearreturnperiodforcalculation of waterwayanddesignoffoundations.
- RelevantIScodesshallbeadoptedwhiledesigningthecivilstructures to sustaintheearthquakeofhighestmagnitudeinSeismiczone IIIandIV.

9.3.3 Air Quality

9.3.3.1 Designand ConstructionPhase

Thepotentialsourcesofairemissionduringtheconstructionphaseofthe projectare:(i)dustfromearthworks(duringsitepreparation), (ii) emissionsfromtheoperationofconstructionequipmentandmachines, (iii)fugitiveemissions fromvehiclesplyingontheroad,(iv)fugitive emissions duringthetransportofconstruction materials, (v)airemissions

otherthandustarisefromcombustionofhydrocarbons particularlyfrom thehotmixplants, and(iii)localisedincreasedtrafficcongestionin constructionareas.Mostoftheemissions willbeintheformofcoarse particulatematterandwillsettledowninclosevicinityofconstructionsite. Installation ofcrusherunitwillalsoleadtoairpollution.Hotmixplantwill generatecarbonmonoxide(CO),un-burnthydrocarbon, sulphurdioxide, particulatematters,andnitrogenoxides(NOx)emissions.Thismayaffect theairqualityofnearbyareasespecially duetoemissiondischarge from lowheightstack.However,thiswillbeatemporary phaseandhence,no significantimpactisenvisaged.

9.3.3.2 Mitigation Measures

- Thestoneaggregatewillbesourcedfromlicensedquarries.No new quarriesshallbeopenfortheproject.The pollution relatedaspects to thesequarriesareindependently compliedbythequarryowner.The aggregate willbetransportedin thecovered trucks throughexisting network of roads.
- Vehicles delivering loose and fine materials like sand and aggregatesshallbecovered
- Loadingandunloadingofconstructionmaterialsincoveredarea orprovisionsofwaterfoggingaroundtheselocations.
- Storageareasshouldbelocateddownwindofthehabitationarea.
- Watershallbesprayedonearthworksperiodically
- Regular maintenance of machinery and equipment. Vehicular pollution check shall be made mandatory.
- Mixing plants and asphalt (hot mix) plants shall be located at least 1 km downwind of the human settlements. The asphalt plants, crushers and the batching plants shall be sited at least 500 m in the downwind direction from the nearest settlement and that too only after receiving a No-Objection Certificate from the BSPCB. Hot mix plant shall be fitted with stack of adequate height as may be prescribed by SPCB to ensure enough dispersion of exit gases.
- Bitumen emulsion and bitumen heaters should be used to extent feasible.
- Only crushers licensed by BSPCB shall be used.
- LPG should be used as fuel source in construction camps instead of wood and tree cutting shall be restricted.
- Water sprinkling of unpaved haulage roads.
- Mask and other PPE shall be provided to the construction workers
- Diesel Generating (DG) sets shall be fitted with adequate height as per regulations (Height of stack = height of the building + 0.2 √KVA).
- Low sulphur diesel shall be used in DG sets as well as machineries.
- Air quality monitoring should be carried out during construction phase. If monitored parameters are above the prescribed limit, suitable control measures must be taken.

9.3.3.3 Operation Phase

Vehicularemissionandtransportofsandthroughuncoveredvehicleswill bethemainsourceofpollutionduringoperationstage.The sub-project is mostly located in open agricultural land which will provide adequate dispersion dynamics of gaseous pollutants. Moreover, majority of the traffic on the sub-projects will be diverted traffic from the existing roads.

9.3.3.4 Mitigation Measures

- Transportofsandthroughuncoveredvehiclesshallbe restricted.
- Plantationisoneofthepreferredsolutionstocheckairpollution. Plants serveasasinkforpollutants, reducetheflowofdust.Treeplantation along roadsides and other places shall include pollution absorbent species.
- Roadsignsshallbeprovidedremindingthemotoristtoproperlymaintain theirvehiclestoeconomizeonfuelconsumption andprotectthe environment.
- Freeflowofvehiclesandimprovedroadconditionswillrestricttheair pollutioninsettlementareas.Pavedshouldershallbemaintained.
- Theconcerned department shall continuetopromotetheproperoperationandmaintenanceof vehiclefleetsregardlessofsizeandtypeofvehicleconsistentwiththe manufacturer recommended engine maintenance programs. This will includeprovisionofroadsignsanddistribution offlyerstoreminddrivers onthebenefitsofawellmaintained engine.Promotionof ways toreduceemissionsthroughreplacementofoldwithnew and more efficient vehicles, converting to cleaner fuels, installing emissioncontroldevices,regularmaintenance andrepair,andavoiding overloadingoftrucks.
- Drivereducation willbepromotedonthebenefitsofdrivingpracticesthat canreducefuelconsumption andpromotesafetywhendrivingwithinthe speedlimitsandavoidingsuddenacceleration.

9.3.4 Noise

9.3.4.1 Design and Construction Phase

Ambientnoiselevelmayincreasetemporarilyin theclosevicinityof variousconstruction activities,maintenanceworkshopsandvehiclesand earthmovingequipment.Theseconstruction activitiesareexpectedto producenoise levelsintherangeof80–95dB(A)(atadistanceofabout5mfromthesource). Althoughthislevelofnoiseishigherthanthe permissiblelimitforambientnoiselevelforresidential/commercial levels butwilloccuronlyintermittently andtemporarily.Thisnoiselevelwill attenuate fastwithincreaseindistancefromnoisesource.Impactdueto noiseduringconstruction activitieswillbeminimaltoinhabitantssince mostofthebuilt-upareasaresmall villages and spaced at considerable distances from each other. However, theremight be somenoisessensitivelocationsespecially schoolsthat are closetothework sites

wherenoiselevelmay increaseduetouse of construction equipment and increasedtraffic.

9.3.4.2 Mitigation Measures

- Stationarynoisemakingequipmentsshallbeplaced at un-inhabited places,noise level willbeoneoftheconsiderationsin equipmentselectionwhichwillfavourlowersoundpowerlevels.
- Onareasnearschools,severalapproachestoreducenoisewill beemployedbytheContractortoensurecompliance withnoise standards. Theseapproaches includethetimingofnoisy constructionactivitiesduringnighttimeandweekendswhenthere arelimitedactivitiesbythesensitivereceptor,concurrent noisy operations maybeseparatedtoreducethetotalnoisegenerated, andifpossiblere-routetrafficduringconstruction toavoidthe accumulationofnoisebeyondstandards.
- If theabovementionedschemesproveto beinadequate,the provisionoftemporary noisebarriersshallbemadenearidentified sensitivelocationsornearthesourceduringconstruction. If temporary noisebarriersarenotfeasible thentimingfor constructionactivitiesshallberegulated.
- Protectiondevices(earplugsorearmuffs)shallbeprovidedto theworkersoperating inthevicinityofhighnoisegenerating machines.
- Construction equipment and machinery shall be fitted with silencersandmaintainedproperly.
- Noise measurements should be carried out to ensure the effectivenessofmitigationmeasures.
- Multilayeredplantationshallbeinitiatedduringconstructionnear thestructurescomingclosetothesub-project. Thiswillserveas mitigationforoperationphase.
- Developamechanismtorecordandrespondtocomplaintson noise.

9.3.4.3 Operation Phase

Duringthe operationalphase,movementof trafficwill be theprimesource ofnoise.Trafficcongestionandpedestrianinterferencesincreasetheuse ofhorns.Thenoiselevelatnearbyschools,religiousplacemaycause nuisanceandirritation.

9.3.4.4 Mitigation Measures

- Effectivetrafficmanagementandgoodridingconditionsshallbe maintainedtoreducethenoiselevelthroughoutthestretchand speedlimitationandhonkingrestrictions maybeenforcednear sensitivelocations.
- The effectiveness of the multilayered plantation should be monitoredandifneedbe,solidnoisebarriershallbeplaced.
- Createawarenessamongsttheresidentsaboutlikelynoiselevels fromroadoperationatdifferentdistances, thesafeambientnoise limitsandeasytoimplement noisereductionmeasures while

constructingabuildingclosetotheroad.

9.3.5 Impact on Land and Soil: Loss of Productive Soil and Land Use Change

9.3.5.1 Design and Construction Phase

The sub-projectsmight require conversion of some agriculturalland.Theexactrequirementoflandisyet to be assessedas thisESMF inbeingprepared.Noencroachmentto sensitiveareaslikeforestoranyothersensitivelandisinvolveddueto thesub-projects. Minorimpactsonagriculturalyieldisanticipatedduetothe sub-projects. But,thebenefitstotheindividualfarmersaccruedagainst reducedyieldmaygetcompensatedthroughenhancedflood protection and accessibilityto thecommercialmarket.

In addition to above, land may be required for access roadsand constructioncampfortheduration ofconstructionperiod.Thiswillalso resultinlossof soilproductivity.

9.3.5.2 Mitigation Measures

- Thetopsoilfromtheproductivelandshallbepreservedandreusedfor plantationpurposes.Itshallalsobeusedforembankmentslopetopcover forgrowingvegetationtoprotectsoilerosion.
- Tooffsetthelossofagriculturalland,effortsshallbemadetoprovide institutional supporttofarmersintermsofenhancingtheproductivityof theirland,improvingthecropping patternanduseofhighproductive seeds.
- Itshallbeensuredthatthelandtakenonleaseforaccessroadsand constructioncampsisrestored backtoitsoriginallandusebeforehanding itoverbacktolandowner.

9.3.5.3 Operation Phase

The better protection from floods and access can lead to conversion of agriculture land for residentialandcommercialpurposesclosetoroads.Thismayresultinlossofproductive landand agriculturalproduce.

9.3.5.4 Mitigation Measures

- TheEAmayexplorethefeasibilityofrestrictingabout50m-100marea eithersideoftheroadasnodevelopmentzoneonthelinerestrictionare imposedforNationalHighwaysinIndia.

9.3.6 Soil Erosion

Soilerosionismainlyanticipatednearembankments, bridgelocations,alongsteepand uncompactedembankment slope, earth stock-piles and wherever vegetationis cleared. Soil erosion may have cumulativeeffect that includesiltation,embankmentdamage,drainageproblemandthelike.
Theintensityofsoilerosionatdifferentlocations willbeinfluencedbythelithology,topography,soiltypeandclimaticcondition(mainlyrainfall)and drainagepattern.

9.3.6.1 Mitigation Measures

- Bankprotectionmeasuresshallbetakenaterosionproneareas.
- Theprotectionmeasuresmayincludeuseofgeo-textilesmatting.
- Provisionofsidedraintoguidethewatertonaturaloutfalls.
- Stonepitchingwherevernecessary.
- Whensoilisspreadonslopesforpermanentdisposal,itshallbe buttressedatthetoebyretainingwalls.
- Sideslopesoftheembankmentshallnotbesteeperthan2H:1V.
- Turfingofembankment slopesshallbedonealongthestretch. Provisionshallbemadeforslopeprotection frames,drystone pitching,andmasonryretainingwallsasmayberequired.
- Thoughterrainismostly flatin the project area.However,allsteep cutsshallbeflattenedandbenched.Retaining wallonbothsides shallbeprovided.Shrubsshallbeplantedimmediatelyinloose soilarea.
- Longitudinalsidedrainsshallbeinterceptedby 'mitre'drainsservingasoutletchannelstoreducetheerosion.
- IRC: 56-1974 recommended practice for treatment of embankment slopesforerosioncontrolshallbetakeninto consideration.
- Soil erosion shall be visually checked on slopes and high embankment areas.Incasesoilerosionisfound,suitable measures includingbio-turfing shallbetakentocontrolthesoil erosion.

9.3.6.2 OperationPhase

Soilofsteepslopesofembankmentandnearbridgeapproachesmay erodetheembankment formationduetounexpected heavyrainfall.Soil erosioncondition mayariseifborrowareasarenotstabilized/restored properly.Regularmonitoringforeffectivenessofsoilerosionmeasures liketurfingandstonepitching shallbecarried.Suitable strengthening measures shall be taken topreventreoccurrence of soil erosion at existingerosionpronelocationsandpreventerosionatnewerlocations.

9.3.7 Borrow Areas and Quarries

Theprojectareaisingeneralaflatterrainthough sloping.

Allborrowshould identified bytheconcerned departments. some localfarmersmight be readytoprovideearthfromtheirfieldonadequatecompensation.

However,itisrecommended that borrowingfromagriculturallandshall beminimisedtotheextentpossible. Further,noearthshallbeborrowed fromalreadylowlyingareas.The dredging anduseofdredged materialifinvolved mayhaveitsimpactin terms of localised sedimentation level increase and dispersion of pollutantspresentinthedredgedmaterialintheriverwater.

Borrowareasifleftun-rehabilitatedmayposerisktopeople, particularly childrenandanimalsofaccidentally fallingintoitaswellasbecome potentialbreedinggroundformosquitoesandvectorborndiseases.

Illegal quarrying may lead to unstable soil condition; destroy the landscapeoftheterrain,airandnoisepollution.Openingofnewquarries isnotenvisaged duetotheproposedsub-projects.Quarrymaterialwillbe sourcedfromexistingnearbyquarries.

9.3.7.1 Mitigation Measures

- Borrowpitsshallbeselectedfrombarrenland/wastelandtothe extentpossible. Borrowareasshouldnotbelocatedoncultivable landsexceptinthesituations wherelandownersdesirestolevel theland.Thetopsoilshallbepreserved anddepthshallbe restrictedtothedesiredlevel.
- Borrowareasshouldbeexcavatedaspertheintendedenduseby theowner.TheIndianRoadCongress(IRC):10-1961 guideline shouldbeusedforselectionofborrowpitsandamountthatcan beborrowed.
- Borrowpitsalongtheroadshallbeavoided.Accumulationofwateralongembankmen ttoreachup tocapillaryfringelevelshallbeprevented.
- The dredged material from the river bank shall be tested for presenceofheavymetalsandotherpollutantsbeforeitsreuse.
- Thedepthsinborrowpitstoberegulatedsothatthesidesshall notbesteeperthan25%.Totheextentborrowareasshallbe sitedawayfromhabitatedareas.Borrowareasshallbelevelled withsalvaged materialorotherfillingmaterials whichdonotpose contamination ofsoil.Else,itshallbeconvertedintofishpondin consultationwithfisherydepartmentandlandowner/community.

9.3.8 Compaction and Contamination of Soil

Soilintheadjoiningproductivelandsbeyondthe RoW,haulageroads, andconstruction campareamaygetcompactedduetomovementof constructionvehicles,machineries, andequipments,duetoconstruction camps and workshops.Approach road either paved or unpaved is availableformostofthebridgeapproaches as it is mostly old bridges being rehabilitated. However,forsomebridges approachroadhastobeconstructed.

Soilmaygetcontaminatedduetoinappropriatedisposalofliquidwaste, (lubricating oil and fuel spills, wasteoil and lubricant and vehicle/equipmentwashingeffluent)and solidwaste(fuel filters,oilyrags) likelytobegeneratedfromrepairandmaintenance oftransportvehicles, construction

equipmentandmachinery.Soilmayalsogetcontaminated duetoinappropriate disposalofdomesticsolidwasteandsewagefrom constructioncampsanduseofflyash.

9.3.8.1 Mitigation Measures

- Fuel and lubricantsshall be stored at the predefinedstorage location. Thestorageareashallbepavedwithgentleslopetoa cornerandconnected withachambertocollectanyspillsofthe oils.
- All efforts shall be made to minimize the waste generation.
- Unavoidablewasteshallbestoredatthedesignatedplace priorto disposal.Toavoidsoilcontaminationatthewash-downandre-fuellingareas,"oilinterceptors"shallbeprovided.Oilandgrease spillandoilsoakedmaterialsaretobecollectedandstoredin labelledcontainers(Labelled:WASTEOIL;andhazardoussignbe displayed)andsoldofftoSPCB/MoEFauthorizedre-refiners.
- To prevent soil compaction in the adjoining productive lands beyondtheRoW,themovementofconstruction vehicles, machineryandequipment shallberestricted tothedesignated haulageroute.
- Approachroadsshallbedesignedalongthebarrenandhardsoil areatoreducethecompactioninducedimpactonsoil.
- Theproductivelandshallbereclaimedafterconstructionactivity.
- Septictankormobiletoiletsfittedwithanaerobictreatmentfacility shallbeprovidedintheconstructioncamps.
- Domesticsolidwasteatconstructioncampshallbesegregated intobiodegradableandnon-biodegradable waste.Thenon-biodegradableandrecyclablewasteshallbesoldoff.Effortsshall bemadethatbio-degradable wasteshallbecompostedinthe mechanisedandmovablecomposterbythecontractor. Non-biodegradable andnon-saleablewasteshallbedisposedoffto authorisedlandfillsite.Iflandfillsitenotavailablethenburialof thewasteinasecuredmannershallbeensured.

9.3.8.2 OperationStage

Noimpactonsoilisanticipatedduringoperationphaseofthes u b - projects exceptnearlowlyingareas, embankmentsandnearbridgeapproaches where unexpectedrainfall may erode the embankment formation and deteriorationofborrowareasifnotrehabilitatedproperly.

9.3.8.3 Mitigationmeasures

- Monitoringofborrowareasrehabilitationplanintunewiththeproposed rehabilitationplan**.**
- Regularmonitoringofsidedrainsandcrossdrainagestructurestocheck blockade.

9.3.9 Groundwater

9.3.9.1 DesignandConstructionStage

Water will be mainly required for compactionof formation and for domesticpurposeintheworkerscamp.
Waterforconstructionpurposeanddomesticwaterrequirementforworkerscampwillbemainlysourced fromgroundwater. Groundwater resourcesarenotscarceintheproject area.Contractor mustensuresafedrinkingwatertotheworkers.Further, depthtowatertableinsomepartsisdepleting annually. Hence, uncontrolled abstractioncanfurtherdeterioratethesituation. Contamination ofgroundwaterisnotenvisagedsinceallconstruction campswill havesepticta nksormobiletoiletsdependingonthenumberof workersineachcamp.

9.3.10 Loss of Drinking water Sources

Thesub-projectsmaycauselossofseveralhandpumps/wellslocatedin theproposedRoW. Effortsshallbemadetoretainallthosestructures
locatedoutsidetheformationwidth.Anysuchimpactedstructuresshall
besuitablyrelocatedinclosecoordinationwithconcerned
department.Newgroundwaterabstractionstructuresshallbe
dugupconsideringthehydro-geologicalconditionofthearea after a proper surveys and studies.

9.3.10.1 Mitigation Measures

- Requisitepermissionshallbeobtainedforabstractionofgroundwaterby thecontractor.
- The contractor shall make arrangements for water required for constructioninsuchaway that thewateravailabilityand supplytonearby communitiesremainunaffected.
- Contractorshallarrangesafedrinkingwaterforworkers.
- Waterintensiveactivitiesshallnotbeundertakenduringsummerperiod totheextentfeasible.
- Groundwaterrechargestructuresshallbeincorporatedinthedesignor borrowareasshallberehabilitatedasfishpondwhichwillalsorecharge theaquifer.Otheroptionsmayincludeconstruction ofsomecheckdams etc.

9.3.10.2 OperationStage

Noimpactisanticipatedongroundwaterduringoperationphase.

9.3.11 Impact on Surface Water Bodies

9.3.11.1 DesignandConstructionStage

All the sub-projects are located in the close vicinity of Kosi River. However, nolossof anywaterbodyisenvisagedduetotheproject.

9.3.11.2 Mitigation Measures

- Althoughthereisnoimpactonwaterbodies,theprojectwillaugmentthe groundwaterscenarioand fish cultureaswell byrehabilitatingthe borrow areasforfishculture.

9.3.12 Siltation and Surface Water Quality of Rivers and other Water Bodies

9.3.12.1 DesignandConstructionStage

Thereare no majorbridgesproposedunder the project.Further,all proposed bridges are minor bridgesproposedareofopentypeandhence siltationduetobridgework willbeminimal. Bridgeworksonthewater courses wherewaterisfound onlyduringirrigation periodwillfurtheravoidsiltationifconstruction debris/other wasteare cleared immediately after construction. Soil erosionhasdirectbearingonsiltation.Thesiltationlikelytobecaused duetobankerosionhasalreadybeenaddressedaboveinsoilerosion section.But temporary pollution water course fromspillageof chemicals and oil at construction sites and waste from construction campsmayoccur.

Accidentaloilandchemicalsspillscancontaminatethewater

9.3.12.2 Mitigation Measure

- Requiredmitigationassuggestedinsoilerosionsectionshallbe takenintoconsideration.
- Bridgeconstructionactivityisnotrecommendedduring sowing andirrigationperiodofcrops.
- All chemicalsand oil shall be stored away from water and concretedplatformwithcatchmentpitforspillscollection.
- Allequipmentoperators,drivers,andwarehousepersonnelwillbe trainedinimmediateresponseforspillcontainment andeventual cleanup.Readilyavailable,simpletounderstand andpreferably writteninthelocallanguageemergency responseprocedure, includingreporting,willbeprovidedbythecontractors.
- Siltfencingand/orbrushbarriershallbeinstalledforcollecting sedimentsbeforelettingthemintothewaterbody.Silt/sediment shouldbecollectedandstockpiled forpossiblereuseassurfacing ofslopeswheretheyhavetobere-vegetated.
- Allwastesarisingfromtheconstructionshouldbedisposedinan environmentallyacceptedmannersoasnottoblocktheflowof water inthechannels.Thewastesshouldbecollected,storedand transportedtotheapproveddisposalsites.
- No vehiclesor equipmentshouldbe parkedor refuellednear water-bodies,

soastoavoidcontamination fromfueland lubricants.

- Theslopesofembankmentsleadingtowaterbodiesshouldbe modifiedandrechannelisedtoprevententryofcontaminants.
- Chutedrainsshallbeprovidedtodrainsurfacerunoffandprevent erosionfromslopes.
- Substructureconstructionshouldbelimitedtothedryseasonand cofferdamsmaybeconstructedandutilizedtoliftthespoildirectly outofitandcarriedtotheriverbankforlanddisposal.
- Largeconstructioncampsshallbeavoidedalongtheembankment and road alignments andlocatedawayfromhabitation andriver.Construction labourersshallbepreferablyfromlocalpopulation.Sewagefrom labourcampswillbetreatedthroughseptictanks.Nountreated sanitarywastewatershallbedischargedintosurfacewaterbodies.

9.3.12.3 OperationStage

No majororlong-termimpactisanticipatedduringthe operationphaseon thesurfacewaterbodiesduetotheprojectimplementationactivities.Oil- contaminated runofffromtheroadsduringmonsoonwillhaveminimal impactsconsideringtheirlowconcentration.However,sincetheproject areaispronetosiltationduetorecurring floods,regularchecksshallbe donealongthealignment toensurethatflowofwaterismaintained throughcrossdrainsandotherchannelstoavoidtheirblockade/choking. Regular visualchecks shall be made to observe any incidence of blockadeofdrains.Regularchecksshallbemadeforsoilerosionand turfingconditionsofrivertrainingstructuresforitseffectivemaintenance.

9.3.13 Hydrology and Drainage

9.3.13.1 DesignandConstructionStage

Diversion of water channels during construction of cross drainage structuresorotherwiseisnotenvisaged. However,asetofmeasures recommendedtomaintaingoodhydrologicalanddrainageconditionsare:

- Adequatecrossdrainagestructuresshallbeprovidedtoavoid naturalflow of water with smooth vertical geometry is recommended.
- Cross-drainagestructuresshallbedesignedcorrespondingtothe design discharge, highest flood level/ Full Supply Level (HFL/FSL),waterway,clearspan,scourdepth,velocity,afflux,etc.
- Provisionof roadsidedrain shall be designedconsideringthe presence ofcanalrunningalongside theprojectroadfora considerablelength.
- Elaboratedrainagesystemshallbeprovidedtodrainthestorm waterfromtheroadwayandembankmentandtoensure minimum disturbanceto naturaldrainageof surfaceandsubsurfacewaterof thearea.
- Thedesignofdrainagesystemsuchassurfaceandsub-surface drainageshallbecarried outasperIRC:SP:42andIRC:SP:50.

Surfacerunofffromthemainhighway,embankmentslopesand theserviceroadsshallbedischargedthroughlongitudinal drains, designedforadequatecross section,bedslopes,invert levelsand theoutfalls.Ifnecessary,thewallsofthedrainsshallbedesigned toretaintheadjoiningearth.

9.3.13.2 OperationStage

Regularremoval/cleaningofdepositedsiltfromdrainage channels/canals andoutletpointsbeforethemonsoonseason.Rejuvenation ofthe drainagesystembyremovingencroachments/ congestionsshallbe ensured.

9.3.14 Impact on Biological Environment

9.3.14.1 Terrestrial Ecology

Therearenonationalparks,wildlifesanctuaries,reservedforestsorany othersimilareco-sensitive areasinthesub-projects'area.However,thestate government hasnotifiedtheplantationalongtheroads,canals,and railwaysasprotected.Presently,theplantationalongthestatehighwayisunder protectedstatusandhencepermissionhastobeobtained for fellingoftrees.Theimpactandmitigationduetotreecuttinghasbeen discussedinfollowingparagraphs.

9.3.14.2 DesignandConstructionStage

Onemonthbeforetheconstructionstarts,clearingandgrubbingwillbe performed bythecontractor. AlltreeswithintheRoWwith300mm diameterat1mabovethegroundwillbecut,including theremovalof stumps.Allstumpsandrootsoftreesofgirthmorethan33mmatabove1mfromthegroundlev elwillbeculled.

Lossofanyrare,threatenedorendangeredspeciesisnotenvisageddue tothesub-projects.Thecuttingoftreeswillhaveminortonegligible impacton localenvironment.Moreover,thiswillbetemporarysincelargenumberof treeshavebeenplannedtobeplantedonboth sidesoftheroad.This will improvethelocalclimaticconditionsinlongterm.

9.3.14.3 Mitigation Measures

- Requisitepermissionfromforestdepartmentshallbeobtainedforcutting ofroadsidetrees.
- Theprojectenvisagedplantationalongboth sidesofroadshall be basedonIRCSP:21specifications.Thiswillincludethe compensatory plantationasperprevailingguidelinesofState'sforest department on1:3basis. Additionalplantationshallbedoneonembankments toenhancetheaesthetics

andchecksoilerosion.Alltree plantationswillbecarriedoutincloseconsultationwithforestdepartment.

- Alleffortsshallbemadetoavoidcuttingoffewlargesizesacredtrees locatedat sub-projects' sites.
- The removal from site and disposal of materials from clearing and grubbing whichareunusable orcannotbeauctionedwillbedisposed off-sitebytheContractorincompliancetolocalordinances.
- Arangeof10-15mcentretocentreisrecommendedforspacingoftrees (paralleltotheroad).Setbackdistanceoftreesindifferentsituationsshall bebasedonIRC:SP:21andIRC:66.Thedistance between thekerb,if any,andthenearest edgeoftreetrunkshallbeatleast2m.The plantation inmedianshallcompriseshrubswhoseheightwouldnormally notexceed1-1.5mandshallbeasperIRCSP:21.
- Forsafetrafficoperation,verticalclearancebetweenthecrownofthe carriageway andlowestpartoftheoverhangofthetreeavailableacross theroadwayshallconformtothestandardslaid downinIRC: SP: 21.The pitsize,fencing,wateringandmanuringrequirementsshallalsoconform totheabovestandard. Excessuseofpesticidesshallberestricted. Plantingshallbesuchthatitdoesnotobstruct thevisibilityoftrafficfrom anysideandshallbepleasing.

9.3.14.4 OperationStage

Positiveimpactsonterrestrialecologyareexpectedduringtheproject operationduetotheincreaseinvegetationandlandscaping.TheProjectwillcoordinatewitht helocalcommunities to maintainandenhance thetreesplanted alongtheroads."Noadverse impactisanticipatedduringoperationstageexceptaccidentaldamages orabsenceofpropertreemanagement".

9.3.14.5 Mitigation Measures

- Arrangementshallbemadetoensuresurvivabilityofthetreeplantation.
- TheSocialForestDepartment orDivisionalForestOfficesshallbe consultedorinvolvedinthisprogram. Thetreesurvivability auditshall alsobeconductedatleastonceinayeartoassesstheeffectiveness of theprogram.

9.3.15 Aquatic Ecology

9.3.15.1 DesignandConstructionStage

Thereisnoriverormajorwaterbodybeingcrossedbythesub-projects proposed exceptwater courses.Bridgesproposed onthewater courses areopentypeandhence no impact on aquatic life is envisaged due to bridge construction activities.Temporarysedimentationfollowedbyincreasedturbiditymay poseadverse impactonaquaticlifeduringthe constructionstage.

9.3.15.2 Mitigation Measures

- Construction of bridgesis not recommended duringsowingandirrigationperiodwhenwateris flowing inthewater courses.
- Goodconstructionpracticesshallbeadoptedtopreventincrease insiltationlevelofthewater.
- Borrowareasshallberehabilitatedasfishpondstopromotefisheriesactivitiesinthear ea.

9.3.15.3 OperationStage

Noimpactisenvisagedduringoperationphaseoftheprojectandhence nomitigation proposed. However, periodic surveillance shall be conductedtocheckerosionandsiltationinmajorwaterbodies.

9.3.16 Management of Silt/ Sediments from Dredging and Embankments

- To avoid impacts on aquatic/ river environment, the dredging/ work on river front including works on embankments shall not be carried out during the fish breading season (during the months of April and May) and during extreme weather conditions.
- Spillage of fuel / engine oil and lubricants from the construction site are a source of organic pollution which impacts aquatic life, particularly benthos. This should be prevented by suitable precautions and also by providing necessary mechanisms to trap the spillage.
- Temporary colonies of the construction workers should be established 500 m away from the bund and adequate sanitation and waste disposal facilities should be provided to avoid impacts on the river environment.
- The construction activities like dredging, berthing structure will be carried out in the confined manner to reduce the impacts on river environment.
- The construction of any facilities like sheds, garages, etc., near banks will be carried out in the confined manner to reduce the impacts on land environment.
- The construction waste including the debris shall be disposed safely in the designated areas and in no case shall be disposed in the river environment.
- Vessels operating during construction phase such as dredger shall be equipped with spill response kits.
- To assess the impacts on river environment river water and benthos, samples shall be analysed on a quarterly basis during construction phase and necessary mitigation measures shall be implemented, as directed by the engineer in charge.
- Suitable fences shall be erected for near water construction areas to minimise rock fall / spillage of construction waste into the river environment;
- Dredging and construction activities to be scheduled and planned to minimise impacts on fishermen and their livelihood activities;
- Total Suspended Solids (TSS) in river water to be monitored at various locations in and around the dredging/construction work areas in order to assess the sediment transport and the resultant impacts. River water quality is indicative

of impacts on river ecology and should be assessed as provided in the environmental management plan .

- Waste consignment shall be maintained to ensure that the dredged material is disposed at the designated site as per the procedures stipulated in the EIA / EMP of the project.
- Hazardous materials like diesel, LPG and paints, etc., required during various stages of construction should be stored as per the explosives act of GoI and necessary permissions / authorizations shall be secured prior to the deployment of such material.
- Disposal of dredge spoils shall be carried out the designated site as per the stipulated guide lines.
- Aqueous discharge in to river during dredging, shall be prevented
- disposal of sewage from the construction work area in to river, shall be prevented with suitable wastewater treatment measures
- Strict management of the aquatic environment should be followed during the construction phase through waste control, use of minimum disturbance techniques during construction for ensuring minimal changes to the aquatic environment.
- After completion of the construction activities adequate clean-up of the area should be undertaken and all discharged materials should be removed from the site. The aesthetic quality of the surroundings should be restored.
- Green belt shall be developed in the by planting of trees and plants along the entrance to the dredging areas and embankments.
- Implementation of necessary drainage facilities including catch pits or sedimentation tanks will be made for collection of wastewater prior to discharge. No stagnant pools shall be allowed to form in the construction site. ii) Treatment of wastewater shall follow applicable environmental regulations.
- The dredged material shall be used as fill material for the project site and the remaining material shall be disposed in the designated site identified for the purpose. The dumping and refilling sites need to be identified and clearly indicated in the dredging layout. The disposal shall be carried out in line with the guide lines provided for the purpose and shall avoid any impacts on soil, ground water and other environmental resources.

9.3.17 Management of Construction Debris/Waste

Debriswillgeneratedduetodismantlingofexisting structures insomesub-projects asdetermined bythe Contractorandapprovedbytheconcerned depaartments.Quarrydustandwasteiron bars or damaged support structures constitutes significant debris.

Mitigationforsolidwastemanagementfromconstructioncamphasbeen giveninconstructioncampsection.

9.3.17.1 Mitigationmeasures

- Theexistingbitumensurfacecanbeutilizedforpavingofcross roads,accessroads,andpavingworksinconstructionsitesand camps,temporarytrafficdiversions,andhaulageroutes.
- Allexcavatedmaterialsfromroadway,shoulders,verges,drains, crossdrainage andthelikewillbetheproperty oftheconcerned department and willbe used for backfilling embankments, filling pits, and landscaping.
- Unusabledebrismaterialshouldbesuitablydisposedoffatpre- designated disposallocations,withapprovaloftheconcerned authority. The bituminous wastes shall be disposed in secure landfillsitesonlyinenvironmentally acceptedmanner.Forremoval ofdebris,wastesanditsdisposalMOSRTHguidelinesshouldbe followed.
- Unusableandsurplusmaterials,asdeterminedbytheProjectEngineer, willberemovedanddisposedoff-site.
- The locations of dumping sites should be selected with following considerations.
    - Unproductive/wastelandsshallbeselectedfordumpingsites.
    - Awayfromresidentialareasandlocatedatleast1000mdownwind sideoftheselocations,
    - Dumpingsitesdonotcontaminateanywatersources,riversetc,
    - Dumpingsiteshaveadequatecapacityequalto theamountof debrisgenerated.
    - Publicperceptionandconsentfromthevillagepanchayatsabout thelocationofdebrisdisposalsitehastobeobtained before finalizingthelocation.
- Formworkswillbere-usedtotheextentpossible,morethan20timesas dictatedbygoodpractice.Allstrippedformworkswillbe examinedforany damageandrectifiedintheworkshopforre-use.Rectificationincludes pluggingholes,andstraighteningbentsteelprops.

9.3.18 Landscape Degradation

- Carry plantation work on open sites
- Do not dump waste along settlement or access route
- Frame muck disposal program and implement it
- Frame quarry & borrow area rehabilitation program and implement it
- Develop green belts along approach road
- On completion of the works all the temporary structures may be cleared away, all rubbish disposed, excreta and disposal pits or trenches filled in and effectively sealed off and the whole site.

9.3.19 Cultural Properties

The cultural properties located close to the sub-projects are likely to be impacted by Construction activities. Hence most of these properties need to be protected/saved during finalization of the sub-project itself.

9.3.19.1 Planning Stage – Mitigation Measures

Measures for mitigation of impacts on cultural properties during project preparation shall be asper the following steps:

- Identification of all significant cultural properties should be done
- Assessment of likely impacts on each cultural property due to project implementation
- The extent of impact on the identified culture property should be assessed and possible measures for avoidance should be devised based on the site investigation.
- In case impact is not avoidable, then identification of alternative routes or possibility of relocation of the culture property shall be assessed in consultation with the local public.
- In case relocation is unavoidable, the site for relocation should be identified in consultation with local people and the size of relocated structure should at least be equal to the original structure.
- A detailed design of the relocated structure and its site plan along with the necessary BoQ are to be presented DPR.
- The relocation shall be carried out before the start of the sub-project work.
- It must be ensured by the IA that the required BoQ is incorporated into the contract document.
- While doing investigation the following information needs to be collected on each of the identified cultural practices
    - Location
    - Direction with respect to sub-project or a common reference
    - Distance of the structure from sub-project activiteis
    - Type of Property eg: temple/mosque/shrine/dargah, etc
    - Plan of the structure
    - Importance of the structure – historical/social/archeological
    - Ownership of the property
    - Probable loss to the property
    - Specific periods/durations in which large congregations as festivals/mela take place causing hindrance to vehicular movement
    - Choice of community, issue of relocation

9.3.19.2 Construction Stage – Mitigation Measures

Major impacts on the properties during this stage are mainly due to movement of constructionmachinery as well as due to construction activity near the cultural property. Following areprecautionary measures that need to be undertaken by the contractor while working near thesestructures:

- Provision of temporary barricades to isolate the precincts of the cultural property from the construction site to avoid impacts.
- Restrict movement of heavy machinery near the structure.
- Avoid disposal or tipping of earth near the structure.
- Access to these properties shall be kept clear from dirt and grit.
- During earth excavation, if any property is unearthed and seems to be culturally significant or likely to have archeological significance, the same shall be intimated to the Engineer. Work shall be suspended until further orders from PIU. The State

Archeological Department shall be intimated of the chance find and the Engineer shall carry out a joint inspection with the department. Actions as appropriate shall be intimated to the Contractor along with the probable date for resuming the work.

- The IA must ensure that the contractor implements the precautionary measures as suggested.

9.3.19.3 Post Construction Stage – Mitigation Measures

- Immediately after completion of construction, the Contractor will affect clearance of the precincts of cultural properties.
- In case access to any of the cultural properties is severed during construction, it needs to be restored at the earliest.
- The IA shall certify relocated structure construction quality and restoration of access, as the case may be, before payment is made to the Contractor.

9.3.20 Socio-economic Impacts

9.3.20.1 Design and Construction Phase

Theonlyirreversibleimpactislossofagriculturalland.Otherlosseslike lossofcommonpropertyresources,probleminaccessibility and communitylinkage,healthandsafetyduringandafterconstruction, and temporarychangeindemographicconfigurationaremitigablewithminor tonegligibleresidualimpacts.

9.3.21 Impacts due to Construction Camp and Immigration of Workers

9.3.21.1 DesignandConstructionStage

Poorsitingandimpropermanagementofconstructioncampmayleadto severaladverseimpactsonenvironment viz.(i)lossofvegetationdueto useofwoodasfuelsourceforcooking(ii)deteriorationinnearbysurface waterbodies'quality(iii)compactionandcontamination ofsoildueto uncontrolled disposalofsolidwaste(iv)Poorsanitationmayresultto transmission ofcommunicablediseasesamongtheworkersandthehost communities. Thisincludethepossiblespreadofsexuallytransmitted disease, diseasesfromimproperhandlingandsupplyoffoodstuffs, poor watersupply,insect-bornediseases,andalcoholicanddrug.

9.3.21.2 Mitigationmeasures

- Constructioncampshallbesitedatsuchlocationssoastoutilisethe existinginfrastructure. Noproductivelandshouldbeutilisedfor construction camp.Allsitesmustbegraded,ditchedandrenderedfree fromdepressionsto avoidwaterstagnation.Accommodationandancillary

facilitiesincludingrecreational facilityforworkersshallbeerectedand maintainedtostandardsandscalesapprovedbytheresidentengineer. Allcampsshouldmaintainminimumdistanceof500mfromhabitation andwaterbodies.

- Allconstructioncampsshallbeprovidedsanitarylatrinesandurinalswith provisionofseptictanksattachedwithsoakpits.Stormwaterdrainsshall beprovided fortheflowofusedwateroutsidethecamp.Drainsand ditchesshall be treated with bleaching powder on a regular basis. Garbage binsmustbeprovided inthecampandregularly emptiedand disposedoffinahygienicmanner. LPGcylindersshallbeprovidedas fuelsourceforcookingtoavoidanytreecutting.
- Ateveryworkplace,theContactorwillensure,incollaborationwithlocal healthauthoritiesthatareadilyavailable first-aidunitincludingan adequatesupplyofsterilizeddressingmaterialsandappliances shallbe provided.Workplacesremoteandfarawayfromregularhospitalsshall haveindoorhealthunitswithonebedforevery250workers. Suitable transport shallbeprovidedtoapproach thenearesthospital.Atevery workplacean ambulance containing the prescribed equipment and nursingstaffshallbeprovided.
- TheContractorwillensurethegoodhealthandhygieneofallworkersto preventsicknessandepidemics. TheseincludetheHIV/AIDSprevention program toreducetheriskandtransferofHIVvirusbetween andamong theworkersandcommunity, promoteearlydiagnosisandassistaffected individuals. Activitiesundertheprogramincludemonthlyinformation, education, and consultation communication campaigns to workers, drivers,deliverycrew, andcommunitiesontherisk,dangers,andimpacts ofSTDandHIV/AIDS.
- The Contractor will ensure that sufficient supply of suitable and hygienicallypreparedfoodatreasonablepriceisavailabletotheworkers.
- TheContractorwillprovideadequateandsafe water supplyfortheuseof theworkers.
- The Contractorwillensurethat allprecautionstoprotecttheworkersfrom insectandpesttoreducetherisktohealth. Thisincludes theuseof insecticideswhichshouldcomplywithlocalregulations.
- Noalcoholicliquororprohibiteddrugswillbeimportedto,sell,giveand bartertotheworkersofhostcommunity.
- Migrantworkersmaybethepotentialcarriersofvariousdiseases.Local community maygetexposedtothediseases carriedbymigrantworkers. Regularhealthcheck-upandimmunizationcampsshallalsobe organized fortheworkersandnearbypopulation.
- Safety of Construction Workers and Health and Safety Risks to Local Community

9.3.21.3 DesignandConstructionStage

Thefollowingsafetyaspectsviz.(i)safetyofconstructionworkers,(ii) safetyofroad usersincludingpedestriansand cyclists(iii)safetytocattle; (iv)safetyoflocalcommunity(iv)unsafe/hazardoustraffic conditionsdue toconstructionvehiclemovementneedtobeconsideredduringdesign andconstructionstage,and(v)conductofsafetyaudit.

Childrenareoneofthemostvulnerabletoinjuryfromcollisionswith movingvehiclesduetotheirlackofunderstanding oftraffichazards, behaviour whileatplay,andtheirsmallsizemakesitdifficultforthe motoristtosee.

9.3.21.4 Mitigationmeasures

- Duringtheconstructionphase,contractorsshallberequiredto adoptand maintain safe working practices. Internationally acceptedandwidelyusedsafetyprocedures shouldbefollowed during(i) construction works(ii)handlingoflargeconstructionequipments andmachineries, (iii)handlingofchemicalsandhazardous materialsandinflammablesubstances(iii)welding(iv)electrical worksetc.
- ContractorshallarrangeallPPEsforworkers,firstaidandfire fightingequipmentsatconstructionsites.Anemergencyplanshall beprepareddulyapprovedbytheengineerinchargetorespond toanyinstanceofsafetyhazard.Thecontractorwillberequiredto appointanAccidentPrevention Officer(APO)whowillconduct regularsafetyinspectionsatconstructionsites.TheAPO willhave theauthoritytoissueinstructionsandtakeprotective measures to preventaccidents.
- To avoid disruption of the existing traffic due to construction activities,comprehensive trafficmanagementplanshallbedrawn upbytheconcessionaire.Trafficinconstructionzonesshallbe managedinaspertheprovisionsofIRCSP55.
- Provisionoftemporaryorpermanentbarrierslikefenceorplants toavoidpedestriancrossingexceptatdesignatedcrossingpoints
- Installationof speed bumpsto controlspeednear designated pedestriancrossingareas.
- Afterconstructioniscompletedinaparticularzone,itshallbe openedfornormaloperation. Priortothebeginning ofnormal operation, thosepartsofthediversions aswillnoteventually form partoftheProjectHighway shallbeclosed topreventany movements not permitted under thenormal operation of the ProjectHighway.
- Useof retro-reflectorizedtrafficsigns,thermoplastic roadmarkingpaints,delineators, trafficcones,emptybitumendrums,barricades,andflagmenwill beusedtoensuretrafficmanagement andsafety.Conductof regularsafety audit on safety measures adopted during construction. Theauditwillcovermanpowerandtheirsafety, machinery,temporaryworks,equipment andvehicles,materials storageandhandling,construction procedures, environment,site safetyguidelines,andmiscellaneousservices.

9.3.21.5 Operation phase

Other issuesrelatedduringoperationalphasearemonitoringofemergencies andestablishingprocedurestocarryoutrescuesduringaccidents andoil spillage.

9.3.21.6 Mitigation Measures

Itisproposedtoexplorethefeasibilityofprovidingthefollowingfacilities:

- Phoneboothsforaccidentalreportingandambulanceservices withminimumresponsetimeforrescueofanyaccidentvictims.
- Tow-awayfacilityforthebreakdownvehicles.

9.3.22 Obstruction and Disruption of Traffic

9.3.22.1 Construction Phase

Disruption of access to infrastructure or social resource due to constructionactivitywillcausenuisance andtoacertainextentadditional costtothepublicintermsoflongertravelperioddduetodiversion or heavier traffic.Itwillalsoposeriskofaccidenttomotoristatnightifthese blockagesanddisruptionarenotclearlydemarcated.

9.3.22.2 Mitigation Measures

- ThecontractorwillsubmitaTrafficPlantotheProjectEngineeratleast twoweeksbeforetheconstructionstartsthatwillresulttoobstruction. Theplanwillincludeadrawingoftemporarydiversions anddetailsof arrangement. AsectionoftheTrafficPlanwillbeaControlPlanthat detailshowthesafetyofthepedestriansandworkersanddelineation of theroadwayatnight.ThisPlanwillrecommendforapprovalthesafeand convenienttemporarydiversionoftrafficduringconstruction, designof barricades, delineators,signs,markings,lights,andflagmen,among others.
- For widening of existing carriagewayand part of it will be used for passage oftraffic,pavedshoulder willbeprovided ononesideofthe existingroadbythecontractorwiththefollowingminimumrequirements:
- Thesurface usedbythethrough trafficwillbefirmbituminous compactedsurfacefreeofdefect.
- Themaximumcontinuouslengthoverwhichconstructionunder trafficmaytakeplaceislimitedto750meters.
- Constructionactivity will be restricted to only one side of the existingroad.
- Onstretcheswhereitisnotpossibletopassthetrafficonthepartwidth ofexistingcarriageway,temporarypaveddiversionswillbeconstructed.
- Thesepaved diversionswill complywith standardson junctionsand temporarycrossdrainage.
- Transportationofquarrymaterialtothedumpingsitesthroughheavy vehicles shall be done through existing major roads to the extent possible. Thiswillrestrictwearandteartothevillage/minorroads. Small vehicles/unmotorisedvehicle can also be used for its further transportationtotheconstructionsitesfromdumpingsites.

9.3.23 Transports and Storage of Materials

The construction material primarily will consist of aggregate, sand, cement,bitumen,lubricating oilandfuelforvehicleandconstruction equipments. Thesewillbeprimarilystoredtemporarilyatconstruction camps.Theoils,fuelsandchemicalswillbestored onconcretedplatform withspillscollectionpits.Thecementwillbestoredundercover.Allthese temporarystorageareaswillbelocatedatleast150mawayfromthe habitat. Thelikelyimpactsduetotransportationandstorageincluding fugitive emission have already been covered under different section above.

9.3.24 Impact on Land and Private Properties

Theassessmentmadebytheresettlementexpertshallbereferredfor exact loss of private properties and measures to compensate such losses.Environmental screeningofresettlementsites,ifrequiredforthe project,shallbecarriedout.Besidesmonetarycompensationforanyloss ofprivatetrees,compensatory afforestationandextensiveplantationhas beenincorporatedintheEMPtohavelong-termenvironmentalbenefits.

Income restoration measures/livelihood options for vulnerable group/resource poor sections and other affected persons as recommendedbysocialdevelopment/resettlement expertshallbe implemented.

9.3.25 Impact on Common Property Resources

Adjustments to the designs havebeenmadeto minimizethelosstoanysuchfacilities.Anysuchstructures evenfalling withinRoWbutoutofrequiredformation widthshallbesaved.Alternate accesshastobeprovidedtothesestructuresduringconstruction stage. All community structures likely to be dismantled shall be suitably relocated.

10 Pest Management Plan

10.1 Introduction

Agriculturalproductivity has madeaquantum leapwiththe introduction of hybridseeds,chemical fertilizersand chemical pesticides. However, the field visits reveal that many of the farmersare poor and are not in a position to invest much in agriculture. Whatever resources the poor farmer has are going into buying the hybrid seeds, chemical fertilizers and chemical pesticides. The resource poor farmers are hit by the sand casting and changing nutrient quality of the soils, thus rendering the crops less productivecoupled with fewer inputs. The productivity is further affected by the impact ofdiseasesandinsectpests.However,realizationhasdawnednow thatexcessiveuse ofchemicalsinagriculturehas not onlyincreasedthecost of cultivation,buthas alsodamaged theverysoil, waterandaironwhich cropproductionisdependant. Theenvironmentalimpactofwidespreadandintenseuseofchemicalpesticides,poisons ofvaryinglethality,isthepoisoning oftheecosystemwhichnotonlyaffectshumansandfarm animals through thefood cycle,butalsothedestructionof numerouspredatory organismswhich in naturecheckandmaintainthe growthof croppests. Thus, ironically, repeated and continuous use of chemical pesticides not only increases the resistanceof thepesttothechemicalbutalsoregularlywipesoutpopulation ofpredators thereby providingan enemy freeenvironmentforthe growthof theverypeststhatonewants tocontrol. Specifically,excessiveuse of chemicals in agriculture has led to thefollowingimpacts:

- Developmentofresistanceintargetinsects/pestsandtheyarenolongereliminat ed with recommendeddoses.
- Resurgenceofpests,astheyarenotwipedoutandreappeartimeandagain.
- Destruction ofusefulinsectsthatwerenatural predators ofproblem insects duetocontinuoususeofchemicalinsecticides.
- Pollutionofsoilandwaterresourcesresultinginreducedsoilproductivity.
- Depositionofpesticide residuesintheenvironment thatultimatelyentersthehuman foodchainleadingtohealthhazardsintheformofseveredisorders suchas,cancer, miscarriage,infertility,birth-defects,kidneyproblems,etc.
- Outbreakofsecondarypestsduetolossofnaturalenemies.

Giventheobviousimportanceofchemicalpesticidesincontrollingpestsandtherebymanagi ng higherproductivityand alsogiven theclearlyadverseimpacts ofitsexcessiveuse,theBKBDPhas adoptedIntegratedPestManagement(IPM)asthe keystrategytocombatpests anddiseasesinthe project.IPMisakeycomponentoftheIntegrated CropManagementstrategybasedon "green agriculture"principlesthat BKBDP isseekingtopromoteintheproject.Thus,IPMhasbeen mainstreamed intheBKBDP for implementation.

10.2 Pest and Pesticide Management Screening framework

10.2.1 Introduction:

The project proposes to enhance agricultural productivity through intensification and diversification of Bihar's production systems and through the strengthening of agricultural value chains. This component would work with organized farmers to increase agricultural production (including livestock) and productivity by expanding their access to and adoption of innovative farm technologies and practices (including irrigation) and extending their linkages to market infrastructure. Active farmer participation in planning, implementing, and evaluating project interventions will enhance the relevance of crops/varieties selected for cultivation, increase technology adoption, and contribute to the sustainability of both technical interventions and the local institutions supporting farmers. This document has been prepared as a guide for initial screening of the activities of the project to enhance positive impacts (through the adoption of best agricultural practices) and to identify potential negative impacts which would require attention and mitigation prior to their implementation.

10.2.2 Screening

The sub-project screening process comprises analysing the pest and pesticide management profile of the sub-project influence through a Pest and Pesticide management screening and impacts associated with the sub-project. The sub-project Implementing Agency carries out the screening of respective sub-projects with the facilitation support of the BAPEPS field office duly identifying the pest and pesticide issues of concern. The pest and pesticide screening recommendations are attached to the sub-project proposal/ concept note. These include sub-projects with potentially significant pest and pesticide issues for detailed assessment. Based on the pest and pesticide information provided in the screening management measures are proposed for the sub-projects. This screening of sub-projects will be shared with the Bank team for its concurrence, before initiating pest and pesticide studies or the safeguard due-diligence process for the sub-projects. The screening tool is annexed to this report.

10.2.3 Pest Management plan

The screening process will help decide the need for a Pest Management Plan. A pest management plan is a comprehensive plan, developed when there are significant pest management issues such as:

- ✓ new land-use development or changed cultivation practices in an area,
- ✓ significant expansion into new areas,
- ✓ diversification into new crops in agriculture,
- ✓ intensification of existing low-technology systems,
- ✓ proposed procurement of relatively hazardous pest control products or methods, or

- ✓ specific environmental or health concerns (e.g., proximity of protected areas or important aquatic resources; worker safety).

In this project, component 2 is proposing to diversify and intensify agriculture, the screening process will hopefully help with characterizing that diversification and intensification and identify the potential implications for pest management (if any).

10.3 Integrated Pest Management Plan

What are the Pests?

- Insects
- Diseases
- Nematodes
- Harmfulanimals
- Harmfulbirds
- Weeds

Factorsincreasingpestpopulation

- Highhumidityandtemperature
- Excessiveanduntimelyuseofirrigationwater
- Highuseoffertilizer
- Highuseofpesticides
- Denseplantpopulation
- Monocropping
- Inappropriatecroppingsystem (Forimmediateprofitmotives)

10.3.1 Why IPM?

Pestmanagement isanecological matter andhasmuchrelevance inthecontext of flood ridden project area. The World over, in general, over dependence on the use of synthetic pesticidesin cropprotectionprogramshasresultedin disturbancesto theenvironment,pest resurgence, pest resistance to pesticides, and lethal and sub-lethal effects on non-target organisms,includinghuman'sworldover.Thesesideeffectshaveraisedpublicconcernabou t theroutineuseandsafetyof pesticides.Thereforethefarmersarerequiredtomanagetheirland withgreaterattentiontodirectandindirectoff-farmimpactsofvariousfarmingpracticeson water,soil,and flora and fauna.Thus,reducingdependenceonchemicalpesticidesinfavor ofecosystemmanipulationsisabetterstrategyforfarmersoftheregion. SuccessfulIPMis basedonsoundfarmer'sknowledgeoftheongoingagro-ecologicalprocessesofthefarming environment;suchfarmersshouldthereforebe technicallysoundto

makedecisionsonthemost appropriatemanagementstrategiestoapplyatthespecificperiodofcropdevelopment.

10.3.2 Objectives of Integrated Pest Management Plan

- Thepurposeof this document istodescribeaPlanbywhichtheprojectcanpromoteand supportsafe,effective,andenvironmentallysoundpestmanagement in agricultural interventions undertaken underBKBDP.Theplanfurther presents components tostrengthen suchcapacity.
- The Planpromotestheuseof biological andenvironmental controlmethods andthe reductionin relianceonsyntheticchemical pesticides.

Integrated Pest Managementistheapproachnowbeingadopted worldwidetoaddresstheissue of excessiveuse ofchemical pesticidesinagriculture. TheWorldBank'sOperationalPolicy 4.09defines integrated pestmanagementas amixof farmer-driven, ecologicallybased pestcontrolpracticesthat seeks toreducerelianceonsyntheticchemical pesticides. Itinvolves;

TherevisedInternationalCodeofConducto ntheDistributionandUseofPesticides,FAO (2002) definesIPMas follows:

"IPMmeansthecarefulconsideration ofallavailablepestcontroltechniquesand subsequent integration of appropriate measures that ***discourage the development of pest populationsandkeep pesticides andother interventionsto levelsthatareeconomicallyjustified*** *andreduceorminimizeriskstohuman healthandtheenvironment.IPMemphasizesthegro wthofahealthycropwith theleastpossibledisruption of agro-ecosystems and encouragesnaturalpest controlmechanisms."*

- Managingpests(keepingthembeloweconomicallydamaginglevels)ratherthanseeking to eradicatethem
- Relying, to theextentpossible, onnon-chemicalmeasurestokeeppestpopulations low;and
- Selectingandapplyingpesticides,whentheyhavetobeused,inawaythatminimizes adverseeffectsonbeneficial organisms, humans, andthe environment.

IPMisabroadecologicalapproach ofpestcontrol(insects,diseases, weeds,rodents,etc)employing all methods andtechniques viz. cultural, mechanical,genetic,regulatory, biological andchemical in a compatiblemannertokeeppestpopulationbeloweconomicthresholdlevel (ETL).

Currently,the major thrustareas ofplantprotectioninIndiarepromotionofIntegratedPest Management(IPM),ensuringavailability ofsafeand qualitypesticides,streamliningthequarantine measuresandforhuman

resourcedevelopmentincludingempowermentofwomeninplant protection skills. In India, IPM related activities are being implemented through 26 Central IntegratedPest ManagementCentres(CIPMCs)locatedin 23statesandUnionTerritories.Themajor activities under IPM approach include undertaking sample roving surveys for monitoring pest/diseasesituation on majorcrops,production and releaseofBio-controlagentsand conducting Farmers'FieldSchools(FFSs).

10.4 IPM Tools

IPMinvolvesarangeofmethodsto controlpests:

a) Reactiveoptions: Suchas—physical andmechanicalmethods,biologicalandchemicalcontrol.Asuddenwithdrawalofp esticides will invariably bring down the yields drastically which the farmer can ill afford. IPM recommends agradual withdrawal ofpesticides allowing timeforboththeplants(andthe farmers)to adjustandbuildupinternalstrength,reservesandresilience.
b) Proactive Options: Howeverthe longterm goalshouldbetopromoteproactiveoptionstogrowperfectlygoodcropswithoutthe help of chemical pesticides. Crop rotations and creation of habitatfor beneficial organisms permanentlylowerthecarryingcapacityof thefarmforthe pest.Culturalcontrolsarealso consideredasproactivestrategies,whichincludesmaintaininghealthy,biologically activesoil (increasingbelowgrounddiversity),maintaininghabitatfor beneficialorganisms(increasing abovegrounddiversity)andusingappropriateplantcultivars.Someofthewaysthat canbe usedtomaintainbiodiversityofthefarmwouldinclude,increasinggeneticdiversity, species diversity, crop rotations, multiple cropping, inter cropping, use of disease free seed and plantingmaterial, useofresistant varieties, sanitation, plantspacing, alteredplantingdates, optimumgrowingconditions,useofmulchmaterial,etc.

ThemaintoolsofIPMare:

10.4.1 Monitoring

KeyComponentsofIPM

- Identificationofmajorpests&diseasesfort hecropin thearea
- Identificationoftheminorpests&diseases forthe cropinthearea
- AssessmentofETLformajorpests/diseas es
- PestmonitoringbasedonAgroEcosystem Analysis (AESA)andconjunctiveuseofpheromon etraps,sticky traps,etc.
- IPMinaction
  - Identificationofpest&diseasetolerant /resistantvarieties
  - Culturalmethods
  - Physical/ mechanicalmethods
  - Biologicalmethods
  - Bio-pesticides
  - Chemicalmethods(preferablyuseche micals thatarelesstoxicand havea shorterlifeafter application

Cropmonitoring,thatkeepstrackofthepestsandtheirpotentialdamage,is the foundationofIPM.Thisprovidesknowledgeaboutthecurrentpestsandcropsituationandis helpfulinselectingthebestpossible combinations of the pest management methods. Pheromonetrapshaveanadvantageover other monitoring toolssuchaslightandstickytraps. Being selectivetospecificpests,theyhave proven theirusefulnessin largescaleIPM validationsin cotton,basmati rice,chickpeaandpigeonpea.

10.4.2 Pest Resistant Varieties

Breeding for pest resistance is a continuous process. At the same time the pests also, particularly the plant pathogens, co-evolve with their hosts. Thus, genetransfer technology is useful in developing cultivars resistantto insects,plant pathogens and herbicides. An example of this is the incorporation of genetic material from Bacillus thuringensis (Bt), a naturally occurring bacterium, in cotton, corn, and potatoes,which makes the plant tissues toxic to the insect pests. Scientific community is impressed by its huge potential in managing the pests, but is also concerned about the possibility of increased selection pressure for resistance against it and it s effects on non-target natural fauna. However, due to ethical, scientific and social considerations, this potential technology has been surrounded by controversies.

10.4.3 Cultural pest control

It includes crop production practices that make crop environment less susceptible to pests. Crop rotation, fallowing, manipulation of planting and harvesting dates, manipulation of plant and row spacing, and destruction of old crop debris are a few examples of cultural methods that are used to manage the pests. Planting of cover crops, nectar producing plants and inter-planting of different crops to provide habitat diversity to beneficial insects are important management techniques. Cover crops, often legume or grass species, prevent soil erosion and suppress weeds. A cover crop can also be used as a green manure, which is incorporated in the soil to provide nitrogen and organic matter to the subsequent crop. When incorporated in the soil, some cover crops of the Brassica family have the ability to suppress nematode pests and wilt diseases. Left in the field as residues, rye and wheat provide more than 90 percent weed suppression. Cultural controls are selected based on knowledge of pest biology and development.

10.4.4 Physical or mechanical controls

These are based on the knowledge of pest behaviour. Placing plastic lined trenches in potato fields to trap migrating Colorado potato beetles is one example of the physical control. Shaking of the pigeon pea plant to remove Helicoverpa larvae is a common

practice in pigeon pea growing areas. Hand picking of insect pests is perhaps the simplest pest control method. Installation of dead as well as live bird perches in cotton and chickpea fields has proved effective in checking the bollworm infestation. Using mulches to smother weeds and providing row covers to protect plants from insects are other examples.

10.4.5 Biological controls

These include augmentation and conservation of natural enemies of pests such as insect predators, parasitoids, parasitic nematodes, fungi and bacteria. In IPM programs, native natural enemy populations are conserved, and non-native agents may be released with utmost caution. Trichogramma spp. is the most popular parasitoids being applied on a number of host crops. A number of microorganisms such as Trichoderma spp., Verticillium spp., Aspergillus spp., Bacillus spp. and Pseudomonas spp. that attack and suppress the plant pathogens have been exploited as biological control agents.

10.4.6 Chemical controls

Pesticides are used to keep the pest populations below economically damaging levels when the pests cannot be controlled by other means. Pesticides include both the synthetic pesticides and plant derived pesticides. Synthetic pesticides include a wide range of man-made chemicals. These are easy to use, fast-acting and relatively inexpensive. Ideally, pesticides should be used as a last resort in IPM programs because of their potential negative effect on the environment. Pesticides with the least negative impacts on non-target organisms and the environment are most useful. Fortunately, new generation pesticides with novel modes of action and low environmental effects are being developed and registered for use. Pesticides that are short-lived or act on one or a few specific organisms fall in this class.

10.4.7 Assessment of Economic Threshold Level

This is based on the concept that most plants can tolerate at least some pest damage. In an IPM program where the economic threshold is known, chemical controls are applied only when the pest's damaging capacity is approaching the threshold, despite application of other alternative management practices.

10.4.8 Use of Botanical Pesticides

These can be prepared in various ways. They can be as simple as raw crushed plant leaves, extracts of plant parts or as complex as chemicals purified from the plants. Pyrethrum, neem, tobacco, garlic, and pongamia formulations are some examples of botanicals. Some botanicals are broad spectrum pesticides. Botanicals are generally less harmful to the environment, because of their quick degrading property. They are less

hazardous to transport. The major advantage is that these can be formulated on-farm by the farmers themselves.

10.5 Criteria for Pesticide Selection and Use

The procurement of any pesticide in aBank financed project is contingent on an assessmentofthenatureanddegreeofassociatedrisks,takingintoaccountthepropose duse and the intended users. With respect to the classification of pesticides and their specific formulations,inreferencetotheWorldHealthOrganization'sRecommendedClassification of Pesticides byHazard and Guidelines to Classification. The following criteria apply to the selectionanduseofpesticidesin,

- Theymusthavenegligibleadversehumanhealtheffects.
- Theymustbeshowntobeeffectiveagainstthetargetspecies.
- Theymusthaveminimaleffectonnontargetspeciesandthenaturalenvironment.
- Themethods,timing,andfrequencyofpesticideapplicationareaimedtominimize damageto naturalenemies.Pesticidesusedin publichealthprogramsmustbe demonstratedtobesafeforinhabitantsanddomesticanimalsinthetreatedareas,as wellasforpersonnelapplyingthem.
- Theirusemusttakeintoaccounttheneedtopreventthedevelopmentofresistance inpests.

Itisrequiredthatanypesticidesbemanufactured,packaged,labeled,handled,stored, disposedof,andappliedaccordingtostandardsacceptabletotheWHO.Formulatedprodu cts thatfallin WHOclassesIAandIB,or formulationsof productsin ClassII,if(a)lacksof restrictionsontheirdistributionanduse;or (b)theyarelikelyto be usedby,or be accessibleto,
laypersonnel,farmers,orotherswithouttraining,equipment,andfacilitiestohandle,storea nd applytheseproductsproperlyarenotpermissibleintheproject.

10.6 Operational Aspects of IPM

- Growing a healthy crop involves the right varietals selection; appropriate seed bed management,plantnutrition,and plantnutrition,and plantphysiology,waterand weed management.
- Optimize natural enemies recognize beneficial insects in the field, learning insect
  populationdynamics,lifecycles,andfoodwebs;understandingtheeffectsofpesticide son beneficial populations, promoting survivorship ofpredators throughhabitatmanagement andmakinglocalreferencecollections.
- Observefieldsweeklyfordamagesymptoms, changesininsectpopulations, toevaluate plant growth and physiology, relationship between plant stages and insect populations, effectsofweatherconditions,andwaterandnutrientmanagement.

- Farmers as experts: agro-system analysis and decision making based on information directly observed and collected leads to farmers to make sound conclusions crop managementdecisions.

10.6.1 The World Bank Operational Guidelines

TheWorldBank&IFCPesticideguidelinesaimstoensurethatthepesticide

- Musthavenegligibleadversehumanhealtheffects
- Shouldbeeffectiveagainsttargetpestsandminimaleffectonnontargetspecies
- Developmentofpestresistancetobekeptinview
- Publichealthpesticidesmustbesafeforinhabitantsandanimals

Integratedpesticidemanagementspecificallyidentifiesthefollowingasthekeyinpestcontrol.

- A categorical preference for bio control methods along with institutional and capacity buildingforthesame.
- ReducingrelianceonsyntheticchemicalpesticidesandonlyifapprovedbyIPMapproach.
- DoesnotpermitunderanycircumstancetheuseIA,IBandIIclassifiedpesticides.Listing ofthesechemicalsandprovidedby theWorldHealthOrganizationisgivenattheendofthe report.
- RecommendstheuseofParticipatoryIPMalongwithspecificinvestmentcomponentsfor thesame.
- PermitscategoryIIItypechemicalsandthesearelistedattheendofthereport.Buteven thesemustbeusedaspartoftheIPMstrategy.NotoallchemicalPesticidesifitislikelyto beusedwithouttrainingandsafety.

10.7 Safe Use of Pesticides:

Farmersarenottheonlyonesto beexposedtopesticides.Thelaborers,whetherit is the personsprayingor the personengagedin agricultureworkin thefield,alsofacesthreatsof pesticidepoisoning.Thetargetgroupoftheprojectisfocusedtowardalargenumberofthe landlessagriculturelabor,especiallywomenwhoaremostoftenusedinhazardousfieldwork. Hence protective measures such asgears andeducation becomes crucial toensure thatno negativehealthimpacts.Alistingofthefactorstobeborneinmindislistedunder:

- Avoid making cocktails of insecticides. If necessary, then each should be usedin recommendeddose.
- Usetwopieceprotectiveclothing,handgloves,acap,afullsleevedshirtandboots,and preferablyafaceshield.
- Sprayduringcoolerhoursoftheday-morning andafternoon.Sprayalongthewind,not againstit.
- Washthesprayequipmentattheendoftheday.
- Donoteat,drink,smoke,orchewtobaccoduringspraying.
- Nonotallowchildren,especiallyyounggirlstoworkinsuchfields.

- Afterhandlingorsprayingpesticideswashhands,face,legs,withsoapandwaterbefore eating,drinking,smokingorchewingtobacco.
- Sealcutsandwoundswithmedicatedwaterprooftapebeforespraying.Providefirst aidin caseofpoisoningaccordingtotheinstructionsgiveninthelabel.

10.7.1 Pesticide Management in water

Driftofpesticidesmustbeavoidedwhenspraying.Theyshouldnotbeappliedwhen rainisimminentandtheusersshouldfollowthedirectiongiveninthecontainerforpesticide handlingsafetyprecautions,applicationratesandproperdisposal.Toreducecontaminatio nof surfacewaterandgroundwaterfrompesticides:

Evaluatethepestproblems,previouspestcontrolmeasures,andcroppinghistory;
Useintegratedpestmanagement(IPM)strategiesthat:

- Applypesticidesonlywhenaneconomicbenefittotheproducerwillbeachieved
- Applypesticidesefficientlyandattimeswhenrunofflossesareunlikely
- Whenpesticideapplicationsarenecessaryandachoiceofregisteredmaterialsexists, considerthepersistence,toxicity,runoffpotential,andleachingpotentialofproducts inmakingaselection
- Nouseofpesticidebelongingtocategory1&2asclassifiedinthepesticide code

Thegoalof thismanagementmeasureis toreducecontaminationof surfacewaterand groundwaterfrompesticides.Thebasicconceptofthepesticidemanagementmeasureisto fostereffectiveandsafeuseofpesticideswithoutcausingdegradationto theenvironment. PesticideManagementPlans(PMP's)identify:

- Identifyareasvulnerabletopesticides;
- Monitorsourcewaterforpesticidecontamination;
- Preventpesticidesfromreachinggroundwater;
- Respondtopesticidedetection.

10.7.2 Use of Plastic

- Tominimizetheuseofpesticidesasseedtreatmenttoreducetheincidenceofdiseasein nurseries,useofspecificplasticsheetcanberecommendedforsoilsolarization.
- Plasticsheetswillalsobehelpfulinmoistureconservationasmulch.
- Use of plastic in the form of poly tunnels and poly houses under adverse climatic conditions.Thiswillalsohelpin growinginsectanddiseasefreeseedlings,offseason vegetablesandflowerstoimprovetheeconomyoffarmers.Thus minimizingthepesticide application.

10.8 Awareness building

Awareness building on safe use among farmers and agriculture workers is another instrument thatmustbeusedforimplementing thePMPintheproject. Thehighestexposuretopesticides is compelledbypovertytoworkinunsafeconditions.

Allsupportstopesticidesprayersandequipmentmustincludemakingavailableaprotecti ve gear.Pamphlets andpostersonsafeuseofpesticides whichdealfrompurchase, transport,
storage,applicationtodisposalmustbeprovidedtovillageorganizations.Inhighpesticide use areas,culturalexpressionslikefolksongsmustbeprovidedtovillageorganizations.

Amajorimpactofpesticideusageisonwater.Reducingpesticideusagebyadopting IPM/NPMandpermittingonlyclassIII
pesticides,whilesubstantiallyreducingpesticideusage,
thethreattowatercontaminationreductionispossible.Educatingthecommunitynottospr ay
pesticidesduringorjustbeforearainmustbeincludedintheawarenessmaterial.Monitori ng
thehealthonthepeople,especiallyworkers,onasamplebasisinhighpesticideuseareawou ld beanothertasktakenupbytheproject.

A multimediaapproach thatincludesKiosks, Print and e-media, Manuals, pamphlets,brochure,SMSoverMobilephonesandFarmersfairs/groupdiscussionswould beused tocreateawareness aboutIPMineachofthe districts.

TeachingIPMtoFarmers–FFSWay

TheFarmerFieldSchoolisaformofadulteducation, which evolved from theconcept that farmers learnoptimally from fieldobservationandexperimentation.
Itwas developed to help farmers tailor their Integrated Pest Management (IPM)practicestodiverseanddynamicecological conditions.
Inregularsessionsfromplanting tillharvest,groupsof neighbouringfarmersobserveanddiscuss dynamicsofthecrop's ecosystem.
Simpleexperimentation helpsfarmersfurther improve their understandingof functionalrelationships(e.g. pests-natural enemy populationdynamics and crop damage-yield relationships).
Inthiscyclicallearningprocess,farmersdeveloptheexpe rtise that enables them to make their own crop management decisions.
Specialgroupactivitiesencourage learningfrompeers,and
strengthencommunicativeskillsandgroupbuilding.

- EachvillageinaclusterwouldhaveaMasterFarmeronwhoseplottheentirepackageof practicesfora crop, includingIPMwouldbedemonstrated.
- Groupsofabout20farmers(bothmenandwomen)wouldbeattachedtoeachsuchMaster Farmerandhis/herplotfor meetingregularlyandlearningbyobservationand experimentation.

- AteverystageofthecropcycletheFFSgroupswouldmeettoobserveandevaluatethe impact of certain crop managementdecisions. Forexample,in IPM,theywould observethe relationship between climate and pest incidence, extent of pest attack and economic damage,etc.
- AFieldDaywouldbeorganizedatthetimeofharvestfortheFFSgrouptoevaluatethe successofthe packageof practices, includingIPM.
- BasedonthesuccessfulFFSgroupmemberwouldbeencouragedtoadopttheentire packageon theirown plotsandconductFFSwith asetof20farmerseach.
- Thus,anetworkofFFSplotsandtrainerswouldbecreatedwhichwouldensurethatthere is farmer-to-farmer disseminationof IPM.
- BAPEPS through Agriculture Department wouldprovidethetechnicalbackstoppingaswellasbyprovidinginputincentivestoFFS farmers.Itwouldalsoassistthe FFS farmersin procuringinputsneeded for implementingIPM.

10.9 Monitoring protocol

A protocolisproposedtobedevelopedinco-ordinationwith Agriculture Department. The followingprotocolmodel is proposed:

Table 39: Agriculture Monitoring Protocol Model

Monitoring	Responsibility	Methodology	Strategy
Whether banned list of pesticides and insecticides are circulated in vernacular language to all villages	BAPEPS Agriculture Dept NGO Partner	Periodic Field Visits to the villages and checking for the lists from villagers	If not circulated ask concerned to circulate with the help of NGOs to all GPs.
Purchasing of insecticides and pesticides	BAPEPS Agriculture Dept NGO Partner	From which source they are being purchased, quantity of purchase, etc.	To educate the villages about the need to reduce the consumption of pesticide/insecticide
Use of Bio-fertilizers and bio-pesticides vermi-compost/ bio-compost	BAPEPS Agriculture Dept NGO Partner	How many villages are using them, which are the villages not using them, etc. Data collected through field visits to villages	Declare all villages as bio villages in a phased manner but slowly and judiciously Provide training in bio composting vermi-compost Marketing tie up
Training and Awareness creation	BAPEPS Agriculture Dept NGO Partner	Collect data of untrained persons	A constant monitoring training tie up and exposure visits

10.10 Constraints in Implementing IPM

Despitetheplans forimplementingIPM,several constraintsexist.Thetable belowsummarizes theconstraintsinpromotingIPM onalargescale.

Table 40: Constraints in implementing IPM

Constraint/Risks	Mitigation
Availability of selectivepesticides, effective against crop pests but not againstnaturalenemiesofpests,is a problem.	Makeavailableselectivebio-pesticidesto farmers,aspertheirrequirements.
OneofthebasicpointsofIPMisETL, which have notbeenworked outforall thepestsand combinationofpestsfor differentvarietiesandregions.	Support participatory research programs with farmersandresearchorganizations to work outETLforvariouspestswithindifferent project districts
Potential of bio-control agents hasnot beenevaluatedfullyfor manyagents.	Donotintroducebio-control agentsthat have not beenworked out indetail and arestill in studystage.Useonlyreadyto releaseandduly approvedbio-controlagents.
Techniques of mass rearing of several bio-agentsarestillnotwelldeveloped.	Ensure timely breeding and supply of predators to farmers; improve linkages with relevantlinedepartmentsand otherinstitutions.
Farmers in many cases are aware of new technologies but are unable to access it leading to disillusionment and consequently non-adoption of the technology.	Ensure that demonstrations are alongside awareness building and that there is no gap between demonstration and supply of new technology, lest people lose interest.
Lack of adequate trained manpower at the field level to work with farmers to help them learn IPM.	Ensure that a cadre of IPM resource persons are created in every cluster, especially in the SP2 teams. Ensure that regular trainings and refresher courses are conducted for IPM resource persons before the beginning of each crop season. Organizations such as Agri Man Ecology (AME) Foundation, PRADAN, FES, ASA may be contacted to develop appropriate training manuals for promoting IPM through FFS approach.

10.11 Guidance on Proper Storage Handling and Disposal of Pesticides

General safety precautions while handling pesticides and guidelines forproper storage, transportation and safe disposal of pesticides and pesticidescontainers are mentioned below for further reference.

10.11.1General safety precautions while handling pesticides

Exposure to pesticides may occur when handling and spraying pesticides. Theexposures to pesticides may occur in following situations:

- When handling the pesticides product during

opening of the package, mixing and preparation of the spray.
- When spraying the pesticides.
- When disposing the pesticides solution and containers General precautions:

1. The operator should also wear a protective hat and face shield or goggles.
2. Do not eat, drink or smoke while working.
3. Wash hands and face with soap and water after spraying and before eating, smoking or drinking.
4. Shower or bath at the end of every day's work and wear new clean clothes.
5. Wash overalls and other protective clothing at the end of every working day in soap and water and keep them separate from the rest of the family's clothes.
6. If the insecticide touches the skin, wash off immediately with soap and water.
7. Change clothes immediately if they become contaminated with pesticides.
8. Inform the supervisor immediately if one feels unwell.

10.11.2Protective clothing and equipment

Absorption of pesticides occurs mainly through the skin, lungs and mouth. Specificprotective clothing and equipment given below must be worn in accordance with thesafety instructions on the product label.

- Broad-rimmed hat (protects head, face and neck from spray droplets).
- Face-shield or goggles (protects face and eyes against spray fall-out).
- Face mask (protects nose and mouth from airborne particles).
- Long-sleeved overalls (worn outside of boots).
- Rubber gloves.
- Boots

10.11.3Storage

1. Pesticides storehouses must be located away from areas where people or animals are housed and away from water sources, wells, and canals.
2. They should be located on high ground and fenced, with access only for authorized persons. However, there should be easy access for pesticides delivery vehicles and, ideally access on at least three sides of the building for fire-fighting vehicles and equipment in case of emergency.
3. Pesticides must NOT be kept where they would be exposed to sunlight, water, or moisture which could affect their stability.
4. Storehouses should be secure and well ventilated.

5. Containers, bags or boxes should be well stacked to avoid possibility of spillage. The principle of .first expiry first out. should be followed.
6. Stock and issue registers should be kept upto date. Access to the pesticides should be limited to authorized personnel only.
7. The store room should have a prominently displayed mark of caution used for poisonous or hazardous substances. It should be kept locked.
8. Containers should be arranged to minimize handling and thus avoid mechanical damage which could give rise to leaks. Containers and cartons should be stacked safely, with the height of stacks limited to ensure stability.

10.11.4Transportation

1. Pesticides should be transported in well sealed and labeled containers, boxes or bags.
2. Pesticides should be transported separately. It should NOT be transported in the same vehicle as items such as agricultural produce, food, clothing, drugs, toys, and cosmetics that could become hazardous if contaminated.
3. Pesticides containers should be loaded in such a way that they will not be damaged during transport, their labels will not be rubbed off and they will not shift and fall off the transport vehicle onto rough road surfaces.
4. Vehicles transporting pesticides should carry prominently displayed warning notices.
5. The pesticides load should be checked at intervals during transportation, and any leaks, spills, or other contamination should be cleaned up immediately using accepted standard procedures. In the event of leakage while the transport vehicle is moving, the vehicle should be brought to a halt immediately so that the leak can be stopped and the leaked product cleaned up. Containers should be inspected upon arrival at the receiving station. There should be official reports to the national level and follow-up enquiries in the event of fires, spills, poisonings, and other hazardous events.

10.11.5Disposal of remains of pesticides and empty packaging

1. At the end of the day's work, the inside of the spray pump should be washed and any residual pesticides should be flushed from the lance and nozzle.
2. The rinsing water should be collected and carefully contained in clearly marked drums with a tightly fitted lid. This should be used to dilute the next day's tank loads or disposed properly by the supervisor at disposal sites like pits or digs.
3. Never pour the remaining pesticides into rivers, pools or drinking-water sources.
4. Decontaminate containers where possible. For glass, plastic or metal containers this can be achieved by triple rinsing, i.e. part-filling the empty container with water three times and emptying into a bucket or sprayer for the next application.
5. All empty packaging should be returned to the supervisor for safe disposal according to national guidelines.
6. Never re-use empty insecticide containers.

7. It shall be the duty of manufacturers, formulators of pesticides and operators to dispose packages or surplus materials and washing in a safe manner so as to prevent environmental or water pollution.
8. The used packages shall not be left outside to prevent their re-use.
9. The packages shall be broken and buried away from habitation.

10.11.6Disposal of Expired Pesticides

1. Adequate measures should be undertaken to avoid expiry of stocks in storehouses.
2. First Expiry First Out principle should be strictly followed during stock movements.
3. The expired stock should be returned to manufacturer for disposal as per guidelines preferably through incineration process.
4. The chemical efficacy should be tested before disposal of expired pesticides to find out possibility of usage. The efficacy and active ingredient percentage of pesticides is tested and certified by the authorized testing laboratory.

10.11.7Health Monitoring

1. In case of accidental exposures or appearances of symptoms of poisoning, medical advice must be sought immediately.
2. In case of organophosphorus (Malathion), regular monitoring of cholinesterase (CHE) level should be carried out and spraymen showing decline in CHE to 50% should be withdrawn and given rest and if needed medical aid.

10.12 List of pesticides banned by Government of India

Table 41: List of pesticides banned by Government of India		
A.	PesticidesBannedfor manufacture,importanduse(28Nos.)	
	1.	Aldrin
	2.	BenzeneHexachloride
	3.	CalciumCyanide
	4.	Chlordane
	5.	CopperAcetoarsenite
	6.	CIbromochloropropane
	7.	Endrin
	8.	EthylMercuryChloride
	9.	EthylParathion
	10.	Heptachlor
	11.	Menazone
	12.	Nitrofen
	13.	ParaquatDimethylSulphate
	14.	PentachloroNitrobenzene
	15.	Pentachlorophenol
	16.	PhenylMercuryAcetate
	17.	SodiumMethaneArsonate
	18.	Tetradifon
	19.	Toxafen
	20.	Aldicarb
	21.	Chlorobenzilate
	22.	Dieldrine
	23.	MaleicHydrazide
	24.	EthyleneDibromide
	25.	TCA(Trichloroaceticacid)
	26.	Metoxuron
	27.	Chlorofenvinphos
	28.	Lindane(BannedvideGazetteNotificationNoS.O.637(E)Dated25/03/2011)-Banned forManufecture,ImportorFormulatew.e.f.25th March,2011andbannedforuse w.e.f. 25thMarch,2013.
B.	Pesticide /Pesticideformulationsbannedforusebuttheirmanufactureisallowedforexport (2Nos.)	
	29.	NicotinSulfate
	30.	Captafol80%Powder
C.	Pesticideformulationsbannedforimport,manufactureanduse(4Nos)	
	1.	Methomyl24%L

	2.	Methomyl12.5%L
	3.	Phosphamidon85%SL
	4.	Carbofuron50%SP
D.	PesticideWithdrawn(7Nos)	
	1.	Dalapon
	2.	Ferbam
	3.	Formothion
	4.	NickelChloride
	5.	Paradichlorobenzene(PDCB)
	6.	Simazine
	7.	Warfarin

10.12.1List Of Pesticides Refused Registration

Table 42: List of Pesticides Refused Registration

S.No.	NameofPesticides
1.	CalciumArsonate
2.	EPM
3.	AzinphosMethyl
4.	LeadArsonate
5.	Mevinphos(Phosdrin)
6.	2,4,5-T
7.	Carbophenothion
8.	Vamidothion
9.	Mephosfolan
10.	AzinphosEthyl
11.	Binapacryl
12.	Dicrotophos
13.	Thiodemeton/ Disulfoton
14.	FentinAcetate
15.	FentinHydroxide
16.	Chinomethionate(Morestan)
17.	AmmoniumSulphamate
18.	Leptophos(Phosvel)

10.12.2Pesticides Restricted For Use In India

Table 43: Pesticides Restricted for Use in India	
S.No.	NameofPesticides
1.	AluminiumPhosphide
2.	DDT
3.	Lindane
4.	MethylBromide
5.	MethylParathion
6.	SodiumCyanide
7.	MethoxyEthylMercuricChloride(MEMC)
8.	Monocrotophos
9.	Endosulfan
10.	Fenitrothion
11.	Diazinon
12.	Fenthion
13.	Dazomet

10.13 List of pesticides not permissible (WHO classes Ia, Ib and II)

10.13.11. Extremely hazardous (Class Ia):

Table 44: List of pesticides not permissible (WHO class Ia)	
Commonname	
Aldicarb	Ethoprophos
Brodifacoum	Flocoumafen
Bromadiolone	Hexachlorobenzene
Bromethalin	Mercuricchloride
Calciumcyanide	Mevinphos
Captafol	Parathion
Chlorethoxyfos	Parathion-methyl
Chlormephos	Phenylmercuryacetate
Chlorophacinone	Phorate
Difenacoum	Phosphamidon
Difethialone	Sodiumfluoroacetate
Diphacinone	Sulfotep

Disulfoton	Tebupirimfos
EPN	Terbufos

10.13.22. Highly hazardous (Class Ib):

Table 45: List of pesticides not permissible (WHO class Ib)	
Commonname	
Acrolein	Oxydemeton-methyl
Allyl alcohol	Paris green
Azinphos-ethyl	Pentachlorophenol
Azinphos-methyl	Propetamphos
Blasticidin-S	Sodiumarsenite
Butocarboxim	Sodiumcyanide
Butoxycarboxim	Strychnine
Cadusafos	Tefluthrin
Calciumarsenate	Thalliumsulfate
Carbofuran	Thiofanox
Chlorfenvinphos	Thiometon
3-Chloro-1,2-propanediol	Triazophos
Coumaphos	Vamidothion
Coumatetralyl	Warfarin
Zeta-cypermethrin	Zincphosphide
Demeton-S-methyl	Famphur
Dichlorvos	Fenamiphos
Dicrotophos	Flucythrinate
Dinoterb	Fluoroacetamide
DNOC	Formetanate
Edifenphos	Furathiocarb
Ethiofencarb	Heptenophos
Isoxathion	Methiocarb
Lead arsenate	Methomyl
Mecarbam	Monocrotophos
Mercuricoxide	Nicotine
Methamidophos	Omethoate
Methidathion	Oxamyl

10.13.33. Moderately hazardous (Class II):

Table 46: List of pesticides not permissible (Class II)	
Commonname	
Alanycarb	Endosulfan
Anilofos	Endothal-sodium
Azaconazole	EPTC
Azocyclotin	Esfenvalerate
Bendiocarb	Ethion
Benfuracarb	Fenazaquin
Bensulide	Fenitrothion
Bifenthrin	Fenobucarb
Bilanafos	Fenpropidin
Bioallethrin	Fenpropathrin
Bromoxynil	Fenthion
Bromuconazole	Fentin acetate
Bronopol	Fentin hydroxide
Butamifos	Fenvalerate
Butylamine	Fipronil
Carbaryl	Fluxofenim
Carbosulfan	Fuberidazole
Cartap	Gamma-HCH,Lindane
Chloralose	Guazatine
Chlorfenapyr	Haloxyfop
Chlordane	HCH
Chlorphoniumchloride	Imazalil
Chlorpyrifos	Imidacloprid
Clomazone	Iminoctadine
Coppersulfate	Ioxynil
Cuprous oxide	Ioxyniloctanoate
Cyanazine	Isoprocarb
Cyanophos	Lambda-cyhalothrin
Cyfluthrin	Mercurous chloride
Beta-cyfluthrin	Metaldehyde
Cyhalothrin	Metam-sodium
Cypermethrin	Methacrifos
Alpha-cypermethrin	Methasulfocarb
Cyphenothrin[(1R)-isomers]	Methyl isothiocyanate

2,4-D	Metolcarb
DDT	Metribuzin
Deltamethrin	Molinate
Diazinon	Nabam
Difenzoquat	Naled
Dimethoate	Paraquat
Dinobuton	Pebulate
Diquat	Permethrin
Phenthoate	Quizalofop-p-tefuryl
Phosalone	Rotenone
Phosmet	Spiroxamine
Phoxim	TCA [ISO](acid)
Piperophos	Terbumeton
Pirimicarb	Tetraconazole
Prallethrin	Thiacloprid
Profenofos	Thiobencarb
Propiconazole	Thiocyclam
Propoxur	Thiodicarb
Prosulfocarb	Tralomethrin
Prothiofos	Triazamate
Pyraclofos	Trichlorfon
Pyrazophos	Tricyclazole
Pyrethrins	Tridemorph
Pyroquilon	Xylylcarb
Quinalphos	

11 Resettlement Policy Framework

11.1 Introduction

This Resettlement Policy Framework for BKBDPis drawn in accordance with the World Bank's Safeguard Policy on Involuntary resettlement (OP 4.12). The framework comprises of the following sections:

- Land Requirement
- Usual Practice
- Options for BKBDP
- Categories of PAFs
- Legal Framework (described in detail in earlier chapter)
- Entitlement Matrix
- Grievance Redressal
- Consultation

The framework has been developed based on the following policies/ legislations:

- Bihar Land Acquisition and Resettlement and Rehabilitation Policy 2007
- The Land Acquisition Act 1894
- The Asian Development Bank funded Bihar State Highways-II Project – Additional Financing, November 2011

This framework will act as guide for mitigating the social impacts that would be triggered by the sub-projects under BKBDP.

11.1.1 Objective of RPF

The primary objective of this RPF is to mitigate for all land and related impacts and to provide better standard of living to the project affected persons or at least restore their standard of living to that of before project. If the affected persons belong to Below Poverty Line (BPL) category before the project, then this RPF aims to bring them Above Poverty Line (APL). The other objectives of this RPF are to

- Avoid or minimize involuntary resettlement where feasible, exploring all viable alternative project designs.
- Assist displaced persons in improving their former living standards, income earning capacity, and production levels, or at least in restoring them.
- Encourage community participation in planning and implementing resettlement.
- Provide assistance to affected people regardless of the legality of land tenure.

The following guidelines will be followed during implementation:

- Compensation and Rehabilitation assistance will be paid before displacement.
- Compensation will be at replacement cost.
- No civil works will be initiated unless compensation for land and assets and rehabilitation assistance is provided to all eligible PAPs.
- Livelihood assistance will be given in form of Income Generation Assets (IGA) to be chosen by the PAPs.
- NGO will provide information to the PAPs on alternative income generation activities suitable for the area and help them in making choices.
- The NGO and BAPEPS will monitor the provision of the IGA.
- The NGO will monitor the performance of the IGA and report to BAPEPS.

11.2 Definitions of Terms Used in RPF

1. **Agricultural land** means lands being used for the purpose of :(i) agriculture or horticulture; (ii) raising of crops, grass or garden produce; and (iii) land used by an agriculturist for the grazing of cattle, but does not include land used for cutting of wood only;

2. **Assistance** refers to the support provided to PAPs in the form of ex-gratia payments, loans, asset services, etc. in order to improve the standard of living and reduce the negative impacts of the project.

3. **Below poverty line or BPL Family** means below poverty line families as defined by the Planning Commission of India, from time to time, and those included in the State BPL list in force; for the purpose of monitoring the impacts of the project on the living standards of the project affected persons BPL cut-off of Rs.36,000 has been used.

4. **Compensation** refers to the amount paid for private property, structures and other assets acquired for the project.

5. **Cut off Date:** the date of Notification will be the cut off date where the land acquisition will be required. In case of squatters and encroachers and unauthorized occupants the date of socio-economic survey will be considered as the cut off date for entitlements under the project.

6. **Encroachers** are those persons who have extended their building, business premises or work places into government lands. Assistance will be provided to these persons, based on their loss.

7. **Family** includes a person, his or her spouse, minor sons, unmarried daughters, minor brothers, unmarried sisters, father, mother and other relatives residing with him or her and dependent on him or her for their livelihood; and includes "nuclear family" consisting of a person, his or her spouse and minor children;

8. **Government** refers to the Government of Bihar

9. **Land acquisition or acquisition of land** means acquisition of land under the Land Acquisition Act, 1894 or the latest Act there of

10. **Marginal farmer** means a cultivator with an unirrigated land holding up to one hectare or irrigated land holding up to half hectare;

11. **Major Impacts**: are those persons who loose their total house or livelihood, or those whobecome marginal farmers

12. **Minor Impact:** all other impacts which will belimited to one-time payment of cash or giving advance notice.

13. **Minimum Wages:** The wage of a person for his/her services/labour as fixed by the Labour Bureau, Department of Labour, GoB.

14. **Non-Perennial Crop:** Any plant species, either grown naturally or through cultivation that lives for a season and perishes with harvesting of its yields has been considered as a non-perennial crop in the project. For example, paddy, sugarcane, groundnut, etc.

15. **Notification** means a notification published in the Gazette of India, or as the case may be, the Gazette of State;

16. **Perennial Crop:** Any plant species that live for years and yields its products after a certain age of maturity is a perennial crop. Generally trees, either grown naturally or by horticultural and yield fruits or timber have been considered as perennial crop in the project. For example, tamarind, coconut, mango, teak, neem etc. are perennial crops.

17. **Project Affected Family (PAFs)** means- (i) a family whose primary place of residence or other property or source of livelihood is adversely affected by the acquisition of land for a project or involuntary displacement due to any other reason; (ii) any tenure holder, tenant, lessee or owner of other property, who on account of acquisition of land (including bagar Hukum or other property) in the affected area of otherwise, has been involuntary displaced from such land or other property; (iii) any agricultural of non-agricultural labourer, landless person (not having homestead land, agricultural land, or either homestead or agricultural land), rural artisan, small trader or self-employed person; who has been residing or engaged in any trade, business, occupation or vocation continuously for a period of not less than five years in the affected area, and who has been deprived of earning his livelihood or alienated wholly or substantially from the main source of his trade, business, occupation or vocation because of the acquisition of land in the affected area or being involuntarily displaced for any other reason;

18. **Project-Affected Persons (PAPs),** any persons who have economic interests or residence within the project impact corridor and who may be adversely affected directly by the project. Project-affected persons include those displaced, those losing commercial or residential structures in whole or part, those losing agricultural land or homesteads in whole or part, and those losing income sources as a result of project action.

19. **Replacement Cost** of the acquired assets and property is the amount required for the affected house hold to replace/reconstruct the lost assets through purchase in the open market. Replacement cost will be calculated at PWDs current Schedule of Rates without depreciation. Replacement cost will be in line with the provisos of the Entitlement Matrix of the project.

20. **Small farmer** means a cultivator with an un-irrigated land holding up to two hectares or with an irrigated land holding up to one hectare, but more than the holding of a marginal farmer.

21. **Squatter** means those persons who have illegally occupied government lands for residential, business and or other purposes. They are not eligible for compensation but will qualify for assistance from the project.

22. **Tenants** are those persons having *bonafide* tenancy agreements, written or unwritten, with a private property owner with clear property titles, to occupy a structure or land for residence, business or other purposes. They are eligible for certain compensation or assistance as per the existing norms and practice.

23. **Vulnerable groups**: persons such as disabled, widows, or persons above sixty years of age, who are not provided or cannot immediately be provided with alternative livelihood and who are not otherwise covered as part of a family.

24. **Women Headed Household:** A household that is headed by a woman and does not have a male earning member is a Woman Headed Household. This woman may be a widowed, separated or deserted person.

11.3 Land Requirement

BKBDP proposes various types of sub-projects to be taken up. These sub-projects will require land depending on their type and size. The land requirement would vary across sub-projects and locations.

The type and size of the sub-projects dictate the land requirement. The extent of land required would vary across the sub-projects and can't be estimated at this stage.

An indication of the type of sub-projects by project component and their additional land requirements are given in the table below:

Table 47: Type of sub-projects by project component and their additional land requirements

Component	Type of Physical Works to be undertaken/ hardware to be provided	Land Requirement	Need for Private Land Acquisition
1. Improving Flood Risk Management	1.1. Reinforcements of Flood control Infrastructure 1.1.a. Easter Embankments (75 km), associated embankments (25 km), closing gaps in embankments 1.1.b. Procurement of 12 No. Dredgers 1.2. Support to Strengthen Institutional Capacity to Manage Floods 1.3. Flood Mitigation Works (to be identified)	Sub-projects to be taken up under 1.1.a will not require any additional land as these are not Greenfield projects but improvements/ strengthening / restoration of existing works. Subprojects under 1.1.b are only procurement of dredging equipment and would require any land. Subprojects under 1.2does not require any land and under 1.3 are yet to be identified.	Flood protection works like spears are built on the riverside of the embankment and may not necessitate any private land acquisition. Flood moderation works like linking of rivers/ streams, drainage schemes, if take up, might require private land acquisition, in some cases.
2. Strengthening Irrigation Capacity	2.1. Private Tube Well Development 2.2. Solar Electrification of Government Tube Wells 2.3. Support to Irrigation Schemes in Kosi (investments to be identified) 2.4. Water Table Monitoring and Technical Assistance to MWRD	The sub-projects to be taken up under 2.1 may not require any additional land. Under component 2.2 investment are yet to identified. Sub-projects under component 2.2 and 2.4. does not require any land.	May not require of private land acquisition.
3. Augmenting Connectivity	3.a. Upgrading of rural roads 3.b. Construction of small and medium bridges	Sub-projects under this component would require additional land. The sub-projects under 3.a. envisage upgrading of the present roads to better roads. Presently the rural roads have a carriage width of about 3 m and this would be upgraded to 3.75 m. This may required some additional land, particularly in stretches where the road is in embankment. In case of rebuilding/ replacing the existing old/ collapsed bridges under 3.b., additional land may not required, unless the size of the bridges is modified. Construction new of bridges would need land on both sides of the stream/ river.	When widening the roads, replacing old dysfunctional bridges and construction of new bridges, private land might be required.

Component	Type of Physical Works to be undertaken/ hardware to be provided	Land Requirement	Need for Private Land Acquisition
4. Financing Agricultural Production	4.a. Multiple Cropping Cycles 4.b.Reviving Heavily Sedimented Areas 4.c. Alternate Livelihoods Promotion	Sub-projects under 4.a. and 4.b. will not require any land. Sub-projects under 4.c. might require additional land for enhancing community level assets and establishment of local agro-enterprises.	For sub-projects under 4.c., private land might be required.
5 – Contingent Emergency Response	Procurement of goods, works, and consultant services required to support the immediate emergency response and recovery needs, in case of a major disaster	Land is not required on permanent basis	Not required
6 – Implementation Support	No Physical Works	Land not required	Not required

11.4 Usual Practice

GoB is implementing similar projects on a regular basis, which require land, of which the ownership could be either public or private. Accessing public land is easier, but arrangements will have to be made for securing privately owned land. When additional lands are required, GoB, as a first step, would try and secure public lands where feasible and available. If private lands are required, then GoB would resort to, either through voluntary donation or by outright purchase or through using LA Act.

11.4.1 Voluntary Donation for Rural Roads

Wherever there is requirement of additional land for rural roads, the Rural Works Department has procured these lands through voluntary donations. As there is good demand for reasonable rural roads, many times the Gram Panchayat and the villages have come forward to donate any additional land. As the demand outstrips supply, cases of hindrance to rural roads construction for want of additional land were not heard.

In the case of Rural Roads under the present project, it is rather simple for the GoB, as the requirements are not only minimal but also that:

- almost all villages do have an existing road (sometimes in bad condition and not properly motor-able) and the project intervention will be restricted to improving/strengthening the existing road which would mean land requirement will be nil or limited;
- most of these rural roads do have sufficient RoW; and
- in case, it becomes inevitable, the local communities will secure lands either through voluntary donations subject to fulfillment of certain conditions or outright purchase or acquisition using LA Act.

Most community members of the en-route villages, along the rural roads to be taken up under the project, welcome inclusion of their road in the project and are upbeat about the up-coming road. Their expression of their pent-up jubilation was justified as a new good road would put an end to the following:

- Presently the roads are too bad to traverse. Since the roads are not in motorable condition, no buses ply on these roads, the villagers are left to fend for themselves.
- The journeysare tortoise like taking considerable amounts of time to traverse just a few kilometres, making them rethink, whether it is sending children to school or visiting a hospital.
- The roads are very dusty, whenever vehicles ply on these road, dust flies around making people to cover their mouths, noses and sometime eyes to avoid dust which is a serious health hazard.

- Villagers say they suffer crop loss due to settlement of dust upto about 50 m on both sides of the roads and the crop loss could be upto 20%

With several benefits to accrue due to the proposed roads, the villagers are ready to remove any encroachments and even donate land if necessary. As such there are not many encroachments along these roads. Even if there are some, they are not permanent or pucca structures but mostly bamboo poles erected to provide shade for the animals or bamboo fencings. There are very few kiosks along these roads and these are mostly movable. These encroachments took place mostly for the simple reason that the villagers did not foresee any attempt to rehabilitate the roads. These structures are either movable or could be disbanded and reassembled. Hence, there may not be much of a problem in procuring/ acquiring the additional land required for rural roads.

11.4.2 Direct Purchase

During the earlier phase of BKFRP, there are instances, where for house construction for landless families, GoB has also purchased private lands and transferred these to the beneficiaries. In one such case, the entire transaction of identification of land and transferring it to the beneficiary took 15 days.

11.5 Options for BKBDP

However, keeping in mind any eventuality, the following options are proposed for procuring/ acquiring private lands:

- Voluntary Land Donation
- Land acquisition using LA Act 1894 and BLARRP 2007

11.5.1 Voluntary Land Donation

BKBDP will leave no stone unturned to completely avoid or at least minimize land acquisition. Whenever there is additional land requirement, BKBDP will interact with the land owners and facilitate voluntary donation of land required for taking up sub-projects under the project. This use of voluntary donation option will be limited to small strips of land for rural roads and small plots of land for other sub-projects. Under no circumstances, the titleholder will be subjected to any pressure, directly or indirectly, to part with the land. These actions are expected to minimize adverse impacts on the local population and help in project benefits reaching all sections of community.

BKBDP will ensure that the process of voluntary donation of land will be meticulously documented at all levels to avoid confusions, misunderstandings, litigations, etc. at a later stage. A format for this purpose is enclosed in the Annexures. This process will be taken up mainly at three levels as described below:

Table 48: Process of voluntary donation of land			
Level	**Process**	**Output**	**Responsibility**
GP/ Village Level	Based on the revenue survey, lands will be identified and the list of titleholders will be prepared. This will be done by GP with the help of Social Worker (SW)of NGO and GP Secretary. GPmotivates the title holders for voluntary land donation required for the project. The SW will help in this process and will document the willingness to donate land by the titleholders in the presence of the Sarpanch and GP Secretary in the form of a Willingness Letter. The list of such persons will be displayed at the Gram Panchyat Office.	Willingness Letters	Sarpanch, GP, SW, GPSecretary, and affected persons (Titleholder/ Encroachers)
Block Level	BDO or concerned Revenue Official surveys the land and demarcates the extent of area required. The survey will identify if the land is public, private or encroachment. Based on the survey, maps are prepared. The entire process will be carried out along with GP, SW, and GP Secretary. The maps will be signed by Sarpanch, GPSecretary, and concerned Revenue Officer.	Survey map signed by relevant persons indicating the extent of land required.	BDO, Surveyor, Sarpanch, GP Secretary, SW
District Level	Formalize relinquishment of land rights where concerned local people voluntarily donate their private land for the project for public purpose.	Effect Changes in Land Revenue Records	District Collector, BDO

Original copies of all documentation of voluntary donation of land will be kept with the Block Development Officer with copies at GP. Complete documentation along with a copy of the final document will be sent to BAPEPS for records and for inspection at a later date. In order to make this process transparent, the following rules are prescribed:

- The Titleholder should not belong to the vulnerable sections/ BPL category.
- Identification of vulnerable PAPs: The vulnerability shall be assessed by the project based on the census of the affected persons. The following categories of PAFs/ PAPs shall be entitled for support as vulnerable groups:
    - BPL households (with a valid proof), as per the State poverty line for rural areas;
    - BPL households without a proof of the same and belonging to the following social categories (i) Women headed households with women as sole earner (ii) Scheduled Caste/Scheduled Tribe and (iii) Handicapped person, and is subject to any of the following impacts;
        - Loses land holding,
        - Loses shelter and
        - Loses source of livelihood.
- The project provides for targeted support/ assistance to the vulnerable groups.
- The Titleholdershould be holding more than the minimum prescribed land, i.e., 1 hectare of wet land and 2 hectares of dry land after donation.

- The impacts must be minor. The voluntary donation should not be more than 10 percent of the area of that particular holding of the Titleholderin that category of land (dry, wet or commercial/ residential). This should not require any physical relocation of the Titleholder. The land donated should not be more than 1 acre in case of dry land, 0.5 acre in case of wet land and 0.25 acre in case of commercial/ residential.
- The land must be jointly identified by the GP, and SW and BAPEPS Representative or other implementing agencies or project authorities. However the project technical authorities should ensure that the land is appropriate for sub-project purposes and that the sub-project will not invite any adverse social, health, environmental, safety, etc.related impacts by procuring this land.
- The land in question must be free of squatters, encroachers, or other claims or encumbrances.
- Verification of the voluntary nature of land donations must be obtained from each of the persons donating land. This should be in the form of notarized witnessed statements.
- In case of any loss of income or physical displacement is envisaged, verification of voluntary acceptance of community-devised mitigatory measures must be obtained from those expected to be adversely affected.
- The land title must be vested in the GPand appropriate guarantees of public access to services must be given by the private titleholder.
- The Titleholder donating land should be provided access on priority basis, subject to eligibility, to the Government housing/ poverty reduction/ livelihoods/ etc. programs operating in the area.
- The Titleholder donating land should made to understand that they will have equal access to the infrastructure built on the donated land like any other community member and that they cannot claim for any priority treatment.
- Grievance mechanisms must be available.

11.5.2 Land Acquisition using LA Act 1894 and BLARRP 2007

Thelandacquisition to be done under this projectwillbeaccording to theLandAcquisition Act1894,asamendedin1984alongwithadditionalprovisionsmadeunderBiharLand AcquisitionResettlementandRehabilitationPolicy-2007(BLARRP-2007). Theprocess forland acquisition for this projectwill be asfollows:

- Allthelandidentifiedforthesub-projectswillbeplacedunderSection4ofthe LAA-1984andanotificationwithGovernment'sintensionto acquireland willbe issued bythe District Collector (DC).
- ObjectionsifanymustbemadewithIn30daystotheDistrictCollectorbythe landowners.
- ThelandwillbethenplacedunderSection6oftheLAAwhereadeclaration will be madebytheGovernmentforacquisitionoflandforpublicpurpose.

- TheDCwilltakestepsfortheacquisition,andthelandisplaced under Section9 and notice will be issuedbythe DC inthe name of persons interested.
- OncethelandisplacedunderSection-9,theBAPEPS and the Implementing Agency withthehelpofNGO, through Gram Panchayatwilltry for anegotiatedsettlementwithPAPsoncompensationandalsotoensurepay ment ofadditional 50%registration costand30% as solatium. All the consenting PAPs will 60%solatium.
- Under Section 11, the DC will make declaration of award and disburse the compensationtothePAPs.

11.5.2.1 Consent Award

The system of consent award is in-built into the BLARRP 2007 as 60% solatium is paid to the consenting titleholders, whereas only 30% solatium is paid for titleholders under compulsory land acquisition.

11.5.3 Compensation for Land, Structures and other Assets

Land: Since the land value differs from place to place depending on location, use, fertility, water source, etc. the replacement value has to be market value as in open market, on a willing seller and willing buyer basis. The guidance value of land will be fixed based on the open market enquiries. The concerned Land Acquisition officer will call for a meeting of land losers in each village for price negotiations. Dates for price negotiation meetings will be given village wise. Negotiation will be conducted village wise calling all the land losers together for negotiation. This is to ensure transparency.

Structures: The compensation for structures includes market price of the assets to build/ procure a replacement asset, or to repair, if affected partially. In determining the replacement cost, depreciation of the asset and the value of salvage materials are not taken into account. Compensation for trees, crops and other assets will be based on the replacement value using existing prices prepared by relevant agencies, taking into account their productivity and/or local market prices. An addition of 30% is made to the replacement value.

Common Property Resources: Grazing lands, places of worship, places of heritage value, burial grounds, water points, community wells, bore wells for drinking water, roads, path ways, community meeting places, wood lots, etc. are categorized under this heading. These resources will be restored to an acceptable level at an appropriate place as agreed with the community. Community will be fully involved in their replacement.

11.6 Categories of Project Affected People

GoB has implemented several projects similar to the sub-projects proposed under BKBDP in the past. From this experience, it is established that lands acquired will normally be rural agricultural lands. Residential and commercial lands may not be required to be acquired. In any case, project need not acquire any structures. Taking these into account, and given that a generic framework is being developed, following broad categories of Project Affected People (PAPs) are identified:

1. Titleholders
    a. Agricultural
    b. Residential
    c. Commercial
2. Encroachers/ Squatters with no valid title
    a. Agricultural
    b. Residential
    c. Commercial

11.6.1 Cut-Off Date

For preparing a list of PAPs, a Socio-economic survey of the affected families done during the planning phase of a sub-project. The list will be appended to the sub-project DPR. This date on which the socio-economic survey is conducted will serve as the cut-off date. No additions to this list will be made unless authorized with concrete proof by Project Director, BAPEPS.

11.6.2 Identification of PAPs

BKBDP proposed community participation through participation of Gram Panchayats, to shoulder some responsibilities such as identification of PAPs, mobilizing community for voluntary land donations, implementing RAPs (if any), grievance redressal. The following process will be adopted to identify PAPs:

- GP identifies the affected area at the village level along with NGO duly involving Gram Panchayat members, Panchayat Secretary, in identifying affected area.
- Once the land required is identified, it is classified as either government land or encroached land and/or private land based on ownership status
- GP with the Implementing Agency announces a cut-off date as the Base line Socio-Economic survey date for identification of affected people.
- GPidentifies the encroachers and titleholders as per the ownership status with the help of community members.
- Based on this information arrive at the number of PAPs

A detailed census based socio-economic survey will be conducted and extensive consultations will be held with the project affected families, i.e. the land losers. Each target community will be identified and differentiated on the basis of their source and level of income. The survey will focus on land and various productive assets

including wages. This information will be used to determine the nature and extent of livelihood support/assistance (over and above the provision made for compensation) required to restore adequate income levels. All these measures will be taken only after consulting the affected families and wider community. This approach will help the project in achieving its objective of ensuring that no affected household becomes poorer with the intervention.

11.6.3 Valuation of Structures and Assets

BAPEPS or the concerned Department shall deploy its expert in civil engineering/ geology/ agriculture/ horticulture as required or alternatively hire the services of government-approved valuer for valuation of structures and other immovable assets.The objective of this exercise is to establish the extent of loss and estimation of replacement cost. The major tasks are as follows:

1. Measurement of affected structure/ immovable assets
2. Establishing construction typology
3. Establishing extent of loss
4. Estimation of replacement cost

Measurement provides required information for valuation. For valuation the latest Schedules of Rates (SR) applicable to assets being valued need to be used. This SR provides the consolidated unit rates for permanent, semi permanent and temporary construction. Details as to how such consolidated unit rates have been arrived at is also explained in the SR. Using the analysis as guide, the expert/ valuer can arrive at the compensation value of a structure/ asset. Various SRs also provides rates for hand pumps, dug-wells, tube wells etc including installation charges. Extent of loss would be determined primarily in terms of the portion of the structure affected. While calculating replacement cost the following principles shall be kept in mind:

- If a structure/ asset is affected 50% or more, then consider the whole structure as affected.
- Do not depreciate the cost of the structure/ asset for its age.
- Add 30% extra over and above estimated cost to arrive at replacement value
- Allow the PAPs to salvage and carry, for free, any materials for their use. Do include the cost of salvaged material in the replacement cost.

11.7 Entitlement Matrix

As mentioned earlier there are different categories of PAPs. This Entitlement Matrix is developed giving various entitlements for all categories of PAPs. This Matrix can be used as a guide for designing Resettlement Action Plans for sub-projects. All the families will be entitled to two broad categories of assistance- one, compensation for land loss; and two, livelihood (rehabilitation) assistance for starting some income generation activity, which may include the purchase of lands, as decided by the PAF. The livelihood assistance in the matrix are rather indicative (as they are average figures), whereas, the actual assistance will relate to, at the minimum

restoring, if not enhancing the pre-land loss income levels. It may also be noted that livelihood assistance figures have been worked out such as to yield an annual income of Rs 24,000 per family, an income level corresponding to the initial ladder of the Above Poverty Line. Details related to the entitlements are presented in the matrix below.

Table 49: Entitlement Matrix

Impact Type	Entitled Entity	Entitlement as per BLARRP 2007
1. Loss of Land (Titleholders)		
1A. Loss of Agricultural Land	Affected Family (Titleholder)	• Cash compensation at replacement cost as determined according to BLARRP 2007 or replacement of land if available. Since the land value differs from place to place depending on location, use, fertility, water source, etc. the replacement value has to be market value as in open market on a willing seller and willing buyer basis. • If the residual plot is not viable and PAP becomes a marginal farmer, then any of the following three options are to be given to the PAP, subject to PAP's acceptance: o Acquire the required land and pay compensation and assistance for the same. o If PAP so wishes acquire the remaining portion of the plot and pay compensation and assistance for the entire plot including residual part. o If PAP is from vulnerable group, compensation for the entire land by means of land for-land will be provided, if PAP wants so, provided that land of equal productive value is available. • All fees, stamp duties, taxes and other charges, as applicable under the relevant laws, incurred in the relocation and rehabilitation process, are to be borne by the IA.
1B. Loss of Residential/ Commercial land	Affected Family (Titleholder)	• Cash compensation at replacement cost as determined according to BLARRP 2007 or replacement of land if available, only if the land acquired is a maximum of 5 Decimal. • All fees, stamp duties, taxes and other charges, as applicable under the relevant laws, incurred in the relocation and rehabilitation process, are to be borne by the IA.
2. Loss of Structures (Titleholders)		
2A. Loss of Residential Structures	Affected Family (Titleholder)	• Compensation of structure will be paid at the replacement cost to be calculated as per latest prevailing Basic Scheduleof Rates (BSR) without depreciation. • Assistance of Rs. 10,000/- towards temporary accommodation • Transportation assistance of Rs. 5000/- • Right to salvage material from demolished structure and frontage etc. • Rental assistance as per the prevalent rate in the form of grant to cover maximum three month rentals
2B. Loss of Rental Accommodation (Residential/ Commercial	Tenants	• Rental assistance for both residential & commercial tenantsas per the prevalent rate in the form of grant to cover maximum three month rentals. • Additional structures erected by tenants will also be compensated and deducted from owner's compensationamount. • Shifting assistance based on type of house and household assets. • Any advance deposited by the tenants will be refunded from owners total compensation package to the tenant onsubmission of documentary evidence.

Impact Type	Entitled Entity	Entitlement as per BLARRP 2007
		• Right to salvage material from demolished structure and frontage etc. erected by tenants.
3. Loss of Structures Residential/ Commercial (Non-Titleholders)		
3A. Loss of Immovable and Pucca Structures (Residential/ Commercial)	Squatters/ Encroachers	• Squatters and Encroachers will be notified and given one month time to remove their assets or harvest their crops. • Compensation for loss of structure at replacement cost for Squatters • Compensation for loss of structure at replacement cost for only the vulnerable households among Encroachers • Shifting assistance of Rs. 10,000/- for Squatters. • For Squatters and Encroachers right to salvage material from the demolished structure.
4. Loss of Crops and Trees	Titleholders Share Croppers Lease Holders	• Advance notice to all to harvest crops, fruits and remove trees. • In case of standing crops, cash compensation at current market prices for mature crops based on average production. • For fruit bearing trees compensation at average fruit production for next 15 years to be computed at market value. • For timber trees compensation at market price based on kind of trees.
5. Loss of Livelihood		
5A. Loss of Primary Source of Income	Titleholders Non-Titleholders Agricultural Labourers Share Croppers	• Employment opportunity for PAPS in the sub-project construction work, if available and if so desired by them. • National/State level job card under National RuralEmployment Guarantee Program. • Income generation skill upgrading vocational training of their choice at a rate of Rs. 5,000/- • For Agricultural Labourers and Share Croppers an assistance of 200 days of wages at minimum wage rate
6. Common Property Resources		
6A. Loss of Common Property Resources	Community	• Reconstruction, Commissioning and handing over to concerned departments/ community of all affected community property resources with community consultation and participation.
7A. Vulnerable PAPs	Women headed households, Widows, STs, Chronically ill,Old persons,etc.	• A one time assistance of Rs. 20,000/- over and above other entitlements. • Handholding for ensured access to other government subsidies, schemes and services
8. Other Unforeseen/ Unanticipated Impacts		
8A. Unforeseen/ Unanticipated Impacts		• Any unforeseen/ unanticipated impacts due to the sub-projects will be documented and mitigated based on the spirit of theprinciple agreed upon in this framework.

Notes:

1. The above rates are of 2007. These will be appreciated at the rate of 10% a year to the year of payment.
2. The ESMF is prepared using the NRRP 2007 and The Bihar Land Acquisition Resettlement and Rehabilitation Policy 2007. Whenever there is a new LA and R&R Policy, the ESMF will be revised in light of that Policy.

11.8 Grievance Redressal

This section deals with the Dispute Redressal Mechanism, the Grievance Redressal Cell and the legal options available to the PAPs.

11.8.1 R&R Committee (RRC)

In order to address grievances related to land acquisition and resettlement and rehabilitation implementation, two bodies are to be established; R&R Committee at the state level and Grievance Redressal Committee at the district level. The former will be established under the chairmanship of Principal Secretary, Planning, to monitor and review the progress of implementation of resettlement, in his capacity as Chairman.Project Director, BAPEPS will be convener of this committee. The composition of the committee will be with the following members:-

1. Heads of Participating Departments (ex. RWD, RCD, WRD, Agriculture, etc.)
2. A senior representative, one each from BC&EBC Welfare and SC&ST Welfare
3. A senior representative of the Revenue Department
4. A senior representative of Disaster Management Department
5. A representative of the PRIs
6. AProminent Academician (Social Scientist)
7. A prominent woman development professional
8. A representative of a prominent voluntary organization
9. A representative of PAPs who can articulate well

This committee should meet every quarter to review the progress made in the implementation of the RAPs and to solve any grievances of the PAPs. This committee will also provide policy related direction to the Grievance Redressal Cell and the participating departments with regard to Land Acquisition and Resettlement and Rehabilitation.

11.8.2 Grievance Redressal Committee (GRC)

The Grievance Redressal Committee will be established at each district under the chairmanship of District Collector for redressal of grievances of the PAPs. The Superintending Engineer, WRD shall be the convener of these committees.At the district level, the NGO contracted by the project will provide support to thesecommittees. District level head of all participating departments will be members along with a PAPs representative, NGO Chairperson and a prominent Social Worker of the district.

Thus, grievance mechanism will be available at two levels: (i) state level, and (ii) district level.

Macro level issues, at the village level, beyond the purview of the 'District' shall be addressed by the GP, NGO and the project staff.

It is proposed that the PAPs first registers the grievances with the NGO. After receipt of grievance, the NGO should take them to the committee to take up the matter during the next immediate meeting and initiate measures for redressal. No grievance can be kept pending for more than a month which means the committee has to meet every month. Implementation of the redressal rests with the BAPEPS. In case the aggrieved party is not satisfied with the proposed redressal measures, it can take approach the state level committee. If the aggrieved party is not satisfied with the decision of state level committee, it can approach the court of law.

Table 50: Grievance Redressal Mechanism

Level	Agency	Time period for redressal of grievances	Issues likely to emerge	Responsibility
Village	Gram Panchayat	Maximum of one week	▪ Encroachment ▪ Land acquisition ▪ Livelihood Assistance ▪ Compensation ▪ Inclusion of households	GP, NGO, Project Staff
District	Grievance Redressal Committee	Maximum of one month		District Collector as Chairperson and Superintending Engineer, WRD as Convener in charge of the subject
State	R&R Committee	Maximum of three months		Principal Secretary, Planning as Chairman, Project Director, BAPEPS as Convener

11.8.3 Legal Options to PAPs

The PAPs will have two kinds of options for addressing their grievance s relating to the Land Appropriation. One is the grievance redressed mechanism incorporate in this framework as above. The other is the general legal environment consisting of court of law to address their grievance. These options will be disclosed to the PAPs during the public consultation process.

11.9 Consultation

BKBDPwill ensure the participation of the PAPs and other stakeholders through periodic consultations for planning and monitoring project activities. Consultations will be held at regular intervals with Project Affected Persons, GP members, Women, etc. The following consultations will be carried out during the project cycle.

- Estimation of land requirement; Title holder, extent, location, etc.
- Identification and verification of Encroachers/ Squatters
- Socio-economic survey for preparing the baseline of the displaced/affected families
- Motivation of titleholders and encroachers to facilitate the Land Acquisition process and voluntary land donations

- Implementation of the IEC/ Communication plan for awareness creation about project activities
- Identifying livelihood support programs for PAPs

In order to keep the momentum of consultation, activity specific consultations and a quarterly consultation will be held with all stakeholder groups.

11.9.1 Stakeholder Participation

BKBDPrecognizes the fact that PAPs are important stakeholders of the project. Hence, the GPs would ensure that these stakeholders are consulted on issues and they participate in all the sub-project activities including planning and implementation of RAP (if any). The GPs would address the PAPs legitimate concerns and provide opportunities and avenues for consultation and their participation. In order to provide a sense of ownership and ensure sustainability, the PAPs would be a part of the decision making process, where appropriate. The project has a commitment for community participation in each of the sub-projects taken up. Participation of affected community is ensured through a number of mechanisms such as:

- The PAPs as members of the GPs will be involved in the identification of R&R issues and affected people.
- The preparation and implementation of the RAPs will be done with the active involvement of PAPs.
- PAPs with grievances have opportunities to approach GRC and RRC if required for their redressal
- The list of PAPs will be displayed at the Village level.

11.10 Special Attention to Women and Other Vulnerable Groups

The vulnerable groups include Scheduled Castes, Women Headed Households, Destitutes, Below Poverty Line families, Old Aged, Chronically Ill and Orphans. It is envisaged that in the course of conducting Social Assessment and preparing and implementing Resettlement Action Plans, interests of these vulnerable groups would be adequately addressed and protected.Information on Vulnerable Groups

As per the available experience, like in other projects, in these sub-projects as well, women are likely to experience differential socio-economic setbacks due to their disadvantaged positioning within socio-economic structures and processes. This is likely to be manifested most in the loss of common property resources as a result of their displacement. In order to mitigate such impacts the NGO during verification and socio-economic survey shall collect information on the following:

- Number of women headed households and Scheduled Caste households and other vulnerables
- Socio-demographic characteristics of affected womenand tribals and other vulnerables
- Health status including number of children per woman
- Women's role in household economy by collecting information on usual activity; occupation; etc
- Time Disposition
- Decision making power among women PAPs

As women are often the worst victims of transition between displacement and resettlement, they have to be integrated in the project as full-fledged participants taking part in all the stages of the project starting from planning through implementation and on to the post-project stages. This is the only way to make sure that the process of resettlement and rehabilitation an exercise in equitable distribution of resources and benefits in a gender sensitive manner.

11.10.1Actions to be taken

NGO has to perform following tasks:

- Ensure participation of vulnerable in project activities
- Ensuring facilities in construction camps
- Carrying out other responsibilities towards vulnerable groups

Participation

Participation and engagement of women and other vulnerable can be ensured specifically in the following ways:

- Allow women to take part in the consultation process.
- Ensure that the women are consulted and invited to participate in group-based activities, to gain access and control over the resources. Compensation for land and assets lost, being same for all the affected or displaced families, special care needs to be taken by the NGOs for women groups, while implementing the process of acquisition and compensation as well.
- Ensure that women are actually taking part in issuance of identify cards, opening accounts in the bank, receiving compensation amounts through cheques in their name etc. This will further widen the perspective of participation by the women in the project implementation. While registering properties make sure they are registered in both the spouses names.
- Provide separate trainings to women groups for upgrading the skill in the alternative livelihoods and assist throughout till the beneficiaries start up with production and business.

- Initiate women's participation through Self-Help Group formation in each of the villages affected by the project. These groups can then be linked to special development schemes of the Government.
- Encourage women to evaluate the project outputs from their point of view and their useful suggestions should be noted for taking necessary actions for further modifications in the project creating better and congenial situation for increasing participation from women.
- Devise ways to make other vulnerable to participate in the project activities.

All these done in a participatory manner might bring sustainable results in terms of income restoration of women as a vulnerable group.

Involvement during Construction

Wherever possible, women's involvement in construction activities should be encouraged in order to help them have access to benefits of project activities. The construction works starts after the R&R activities are over and sites are clear of any encroachment and other encumbrances. The construction contractors set up their construction camps on identified locations, where labour force required for the construction activities will be provided with temporary residential accommodation and other necessary infrastructure facilities. The labour force required for the construction activities has to be of a highly skilled nature, as there is a lot of mechanised work in construction of sub-projects. In addition, there is also a requirement of unskilled labour, where women can certainly contribute.

Apart from this, women as family members of the skilled and semi-skilled labourers, will also stay in the construction camps and will be indirectly involved during the construction phase. The families of labourer will include their children also. The construction contractors are expected to bring along skilled labour where as local labour available will be used for unskilled activities. The labour force, both migratory as well as local will have male as well as female members.

Ensuring Facilities in Construction Camps

Foreseeing the involvement of women, both direct and indirect in the construction activities, NGO shall ensure certain measures that are required to be taken by the construction contractor towards welfare and wellbeing of women and children during the construction phase such as:

(a) **Temporary Housing:** During the construction the families of labourers/workers should be provided with residential accommodation suitable to nuclear families.

(b) **Health Centre:** Health problems of the workers should be taken care of by providing basic health care facilities through health centres temporarily set up for the construction camp. The health centre should have at least a doctor, nurses, General Duty staff, medicines and minimum medical facilities to tackle first-aid requirements or minor accidental cases, linkage with nearest higher order hospital to refer

patients of major illnesses or critical cases. The health centre should have MCW (Mother and Child Welfare) units for treating mothers and children in the camp. Apart from this, the health centre should provide with regular vaccinations required for children.

(c) **Day Crèche Facilities :**It is expected that among the women workers there will be mothers with infants and small children. Provision of a day crèche may solve the problems of such women, who can leave behind their children in such a crèche and work for the day in the construction activities. If the construction work involves women in its day-night schedules, the provision of such a crèche should be made available on a 24-hour basis.

The crèche should be provided with at least a trained ICDS (Integrated Child Development Scheme) worker with '*Ayahs*' to look after the children. The ICDS worker, preferably women, may take care of the children in a better way and can manage to provide nutritional food (as prescribed in ICDS and provided free of cost by the government) to them. In cases of emergency, a trained ICDS worker can tackle the health problems of the children much more efficiently and effectively and can organise treatment linking the nearest health centre.

(d) **Proper Scheduling Of Construction Works:** Owing to the demand of a fast construction work, it is expected that a 24 hours-long work-schedule would be in operation. Women, especially the mothers with infants, should to be exempted from night shifts as far as possible. If unavoidable, crèche facilities in the construction camps must be extended to them in the night shifts too.

(e) **Education Facilities:** The construction workers are mainly mobile groups of people. They are found to move from one place to another taking along their families with them. Thus, there is a need for educating their children at the place of their work. Wherever feasible, day crèche facilities may be extended with primary educational facilities or some kind of informal education facilities could be created at the construction camp.

(f) **Control on Child Labour**: Minors, i.e. persons below the age of 14 years, should be restricted from getting involved in the constructional activities. It will be the responsibility of NGO and social and environmental officers of BAPEPS to ensure that no child labourer is engaged in the activities. Exploitation of women is very common in such camps. NGO shall keep strong vigilance to ensure cessation of such exploitation.

(g) **Special Measures For Controlling STD, AIDS:** Solitary adult males usually dominate the labour force of construction camps. They play a significant role in spreading sexually transmitted diseases. In the construction camps as well as in the neighbouring areas, they are found to indulge in high-risk behaviour giving rise to STDs and AIDS.

While it is difficult to stop such activities, it is wiser to make provisions for means of controlling the spread of such diseases. NGO shall conduct

awareness camps for the target people, both in the construction camp and neighbouring villages as well. NGO shall have to tie up SACS for awareness and IEC materials, and supply of condoms at concessional rate to the male workers may help to a large extent in this respect.

Other Actions

- Cases of compensation to vulnerable should be handled with care and concern considering their inhibited nature of interaction.
- All compensations and assistances would be paid in a joint account in the name of both the spouses; except in the case of women headed households and women wage earners.
- NGO shall prepare a list of able bodied and willing women PAPs for constructional activities and hand over the same to IAs to be forwarded to contractor.
- At least one third of the NGO staff should be woman. The proposed women personnel shall be available to work at site for at least 50% of the duration of the contract.
- Women may be replaced during the period of contract, only with women persons of equivalent qualifications and experience.
- Same wage rate for men and women ensured
- Scheduled tribe population identified and they should be given first preference in selection for any project benefit, viz., agriculture demonstration plots, shared tube wells, rehabilitation of silted lands, livelihoods, etc.
- The petty contracts arising out of the sub-project should considered entrusting to SHGs on community contract basis
- While selecting community members for training at lease one-third of them should be women and vulnerables.

11.11 Means of Disclosure

This RPF will be kept at the District Library, District Collector's Office and Block Development Office for interested persons to read and copy. This RPF will be made available at the project web site as well. A summary of each RAP prepared under the project, will be displayed at the Gram Panchayat Offices of the concerned villages. This summary will include the details such as names of titleholders and/or encroachers, voluntary donations made, detail of acquisition, land rate, rehabilitation assistance, etc. This summary will be displayed at the Block Development Offices and at the District Collectors offices too. Apart from this, all the RAPs will be placed on the project web site.

12 Annexures

12.1 Annexure 1: Environmental and Social Screening Checklist - Embankments

A. Environmental Screening

Part a: General Information

1. Location of the sub-project	
• Name of Sub-Project	
• Name of the State	**Bihar**
• District	
• Block	
• Village	
2. Implementing Agency Details (sub-project level)	
• Name of the Department/Agency	
• Name of the designated contact person	
• Designation	
• Contact Number	
• E-mail Id	

Part b: Environment Screening

Question	Yes	No	Details
1. Is the sub-project located in whole or part within a radius of 1 km from any of the following environmentally sensitive areas?			
a. Biosphere Reserve			If yes, mention name and distance.
b. National Park			If yes, mention name and distance.
c. Wildlife/Bird Sanctuary			If yes, mention name and distance.
d. Game Reserve			If yes, mention name and distance.
e. Tiger Reserve/Elephant Reserve			If yes, mention name and distance.
f. Wetland			If yes, mention name and distance.
g. Natural Lake			If yes, mention name and distance.
h. Swamps/Mudflats			If yes, mention name and distance.
i. World Heritage Sites			If yes, mention name and distance.
j. Archaeological monuments/sites (under ASI's central/state list)			If yes, mention name and distance.
k. Reservoirs/Dams			If yes, mention name and distance.
2. Is the sub-project located in whole or part within a radius of 500 m from the following features?			
a. Reserved/Protected Forest			If yes, mention name and distance
b. Migratory Route of Wild Animals/Birds			If yes, mention name and distance
c. Area with threatened/rare/ endangered fauna (outside protected areas)			If yes, mention name and distance

d. Area with threatened/rare/ endangered flora (outside protected areas)			If yes, mention name and distance
e. Habitat of migratory birds (outside protected areas)			If yes, mention name and distance
f. Historic Places (not listed under ASI – central or state list)			If yes, mention name and distance
g. Regionally Important Religious Places			If yes, mention name and distance
h. Public Water Supply Areas from Rivers/Surface Water Bodies/ Ground Water Sources			If yes, mention name and distance
3. Information related to sub-project impacts: **Will the construction, operation or decommissioning of this sub-project cause changes to or have impacts on the following?**			
1. Land Use			If yes, give full details.
2. Water			If yes, give full details.
3. Air			If yes, give full details.
Will the construction, operation or decommissioning of this sub-project produce, cause or release any of the following?			
4. Solid waste			If yes, give full details.
5. Noise/ vibration/ light/ heat energy/ electromagnetic radiation			If yes, give full details.
6. Accidents			If yes, give full details.
Other			
7. Are there any areas around the project location which are used by protected, important or sensitive species of fauna or flora e.g. for breeding, nesting, foraging, resting, overwintering, migration, which could be affected by the sub-project?			If yes, give full details.
8. Any other impacts?			If yes, give full details.

Part c: Transect Walk Map

While filling in this data sheet, the implementing agency should hold a consultation with the local community through the Gram Panchayat in order to determine and sort out issues of land availability (including forest land), moderate any adverse social and environmental impacts and elicit necessary community participation in the programme. For this purpose the implementing agency should organise an informal 'Transect Walk' and prepare a map (Not To Scale) of this and attach the same to this data sheet. The following points should be borne in mind while preparing this map.

- The Transect walk shall be undertaken by the Officer filling in this data sheet, accompanied by the Sarpanch of the Panchayat/ Ward Member and other community members after adequate advance publicity. The local Forest official may also be associated if forest land is involved.
- During the Transect Walk, issues relating to land requirements for the embankment and its impact on landowners, encroachers, squatters, etc. need to be discussed with members of the local community present. Collect all land related revenue records, maps and gazettes for supporting the claims and attach to this report. To this check list attach a typical cross section of the structure at its widest and note the land required.
- Environmental impact on vegetation, land, soil and water etc. shall be identified and noted for resolution.

- During the walk, due opportunity shall be given to interested persons to put forward their points of view.
- At the end of the walk and after recording the issues that arose during the walk, the action taken/ proposed to resolve the issues be noted. This shall be recorded by the Secretary of the Panchayat and countersigned by the Sarpanch/ Ward Member. A copy of this document shall be attached to the data sheet.
- During or after (as convenient) the Transect Walk, a map (Not To Scale) with the embankment alignment, the environmental features along the embankment, ownership of land need to be prepared. Identify all structures, viz., places of worship, schools, hospitals and other common property resources, forest land, etc. and locate on this Transect Walk Map.
- To this map attach some (a minimum of four on right side and four on left side and one each at the beginning and ending) photographs showing and highlighting the most critical places.

Part d : Result/Outcome of Environmental Screening Exercise		
1.	No EIA Required	
2.	EIA Required	
3.	Regulatory Clearance Required	If yes, mention type of clearance required.

B. Social Screening

Part a: Social Impacts Information

1. Land Requirement for the sub-project:

Details	**Unit**	**Quantity**
Government Land	Acres	
Private Land	Acres	
Title Holders	Number	
Non-Titleholders – Encroachers	Number	
Non-Titleholders – Squatters	Number	

2. Agricultural Land affected due to sub-project:

Details	**Unit**	**Quantity**
Total Affected	Number	
Title Holders	Number	
Non-Titleholders – Encroachers	Number	
Non-Titleholders – Squatters	Number	
BPL Families losing Agricultural Land	Number	

3. Dwellings affected due to sub-project:

Details	**Unit**	**Quantity**
Total Affected	Number	
Title Holders	Number	
Non-Titleholders – Encroachers	Number	
Non-Titleholders – Squatters	Number	
BPL Families losing Dwellings	Number	

4. Commercial properties affected due to sub-project:

Details	Unit	Quantity
Total Affected	Number	
Title Holders	Number	
Non-Titleholders – Encroachers	Number	
Non-Titleholders – Squatters	Number	
BPL Families losing Commercial Properties	Number	

5. Common Property Resources Affected: (Please give each type by number)

Type	Unit	Quantity
	Number	
	Number	
	Number	
	Number	
	Number	

S No	Items	Results
1.	Total no of HH affected due to proposed project activity (Single or multiple impacts)	
2.	Total no of vulnerable HH affected due to proposed project activity (Single or multiple impacts)	
3.	Total number of Community Property Resources affected	

Part b: Right of Way Table (A table giving the availability of government land on both sides of centre line of the embankment need to be presented at every 100 m interval for the entire embankment and certified by the concerned Superintending Engineer)

S.No.	Chainage, km	Government Land from Centre line of Embankment		Proposed Embankment Base Width		Additional Land Requirement		Remarks
		Left	Right	Left	Right	Left	Right	
1	0.000							
2	0.100							
3	0.200							
4	0.300							

Part c : Result/Outcome of Social Screening Exercise		
1.	No SA Required	
2.	SA Required	

12.2 Environmental Social Checklist – Roads and Bridges

A. Environmental Screening

Part a: General Information

1. Location of the sub-project	
• Name of Sub-Project	
• Name of the State	**Bihar**
• District	
• Block	
• Village	
2. Implementing Agency Details (sub-project level)	
• Name of the Department/Agency	
• Name of the designated contact person	
• Designation	
• Contact Number	
• E-mail Id	

Part b: Environment Screening

Question	Yes	No	Details
1. Is the sub-project located in whole or part within a radius of 1 km from any of the following environmentally sensitive areas?			
l. Biosphere Reserve			If yes, mention name and distance.
m. National Park			If yes, mention name and distance.
n. Wildlife/Bird Sanctuary			If yes, mention name and distance.
o. Game Reserve			If yes, mention name and distance.
p. Tiger Reserve/Elephant Reserve			If yes, mention name and distance.
q. Wetland			If yes, mention name and distance.
r. Natural Lake			If yes, mention name and distance.
s. Swamps/Mudflats			If yes, mention name and distance.
t. World Heritage Sites			If yes, mention name and distance.
u. Archaeological monuments/sites (under ASI's central/state list)			If yes, mention name and distance.
v. Reservoirs/Dams			If yes, mention name and distance.
2. Is the sub-project located in whole or part within a radius of 500 m from the following features?			
i. Reserved/Protected Forest			If yes, mention name and distance
j. Migratory Route of Wild Animals/Birds			If yes, mention name and distance

k. Area with threatened/rare/ endangered fauna (outside protected areas)			If yes, mention name and distance
l. Area with threatened/rare/ endangered flora (outside protected areas)			If yes, mention name and distance
m. Habitat of migratory birds (outside protected areas)			If yes, mention name and distance
n. Historic Places (not listed under ASI – central or state list)			If yes, mention name and distance
o. Regionally Important Religious Places			If yes, mention name and distance
p. Public Water Supply Areas from Rivers/Surface Water Bodies/ Ground Water Sources			If yes, mention name and distance
3. Information related to sub-project impacts: **Will the construction, operation or decommissioning of this sub-project cause changes to or have impacts on the following?**			
1. Land Use			If yes, give full details.
2. Water			If yes, give full details.
3. Air			If yes, give full details.
Will the construction, operation or decommissioning of this sub-project produce, cause or release any of the following?			
4. Solid waste			If yes, give full details.
5. Noise/ vibration/ light/ heat energy/ electromagnetic radiation			If yes, give full details.
6. Accidents			If yes, give full details.
Other			
7. Any other impacts?			If yes, give full details.

Part c: Transect Walk Map

While filling in this data sheet, the implementing agency should hold a consultation with the local community through the Gram Panchayat in order to determine the most suitable alignment, sort out issues of land availability (including forest land), moderate any adverse social and environmental impacts and elicit necessary community participation in the programme. For this purpose the implementing agency should organise an informal 'Transect Walk' and prepare a map (Not To Scale) of this and attach the same to this data sheet. The following points should be borne in mind while preparing this map.

- The Transect walk shall be undertaken by the Officer filling in this data sheet, accompanied by the Sarpanch of the Panchayat/ Ward Member and other community members after adequate advance publicity. The local Forest official may also be associated if forest land is involved.
- During the Transect Walk, issues relating to land requirements for the road/ bridges and its impact on landowners, encroachers, squatters, etc. need to be discussed with members of the local community present. Collect all land related revenue records, maps and gazettes for supporting the claims and attach to this report. To this check list attach a typical cross section of the structure at its widest and note the land required.
- Environmental impact on vegetation, land, soil and water etc. shall be identified and noted for resolution.

- During the walk, due opportunity shall be given to interested persons to put forward their points of view.
- At the end of the walk and after recording the issues that arose during the walk, the action taken/ proposed to resolve the issues be noted. This shall be recorded by the Secretary of the Panchayat and countersigned by the Sarpanch/ Ward Member. A copy of this document shall be attached to the data sheet.
- During or after (as convenient) the Transect Walk, a map (Not To Scale) with the road/ bridges alignment, the environmental features along the road/ bridges, ownership of land need to be prepared. Identify all structures, viz., places of workship, schools, hospitals and other common property resources, forest land, etc. and locate on this Transect Walk Map.
- To this map attach some (a minimum of four on right side and four on left side and one each at the beginning and ending) photographs showing and highlighting the most critical places.

Part d : Result/Outcome of Environmental Screening Exercise		
1.	No EIA Required	
2.	EIA Required	
3.	Regulatory Clearance Required	If yes, mention type of clearance required.

B.Social Screening

Part a: Social Impacts Information

1. Land Requirement for the sub-project:

Details	**Unit**	**Quantity**
Government Land	Acres	
Private Land	Acres	
Title Holders	Number	
Non-Titleholders – Encroachers	Number	
Non-Titleholders – Squatters	Number	

3. Agricultural Land affected due to sub-project:

Details	**Unit**	**Quantity**
Total Affected	Number	
Title Holders	Number	
Non-Titleholders – Encroachers	Number	
Non-Titleholders – Squatters	Number	
BPL Families losing Agricultural Land	Number	

4. Dwellings affected due to sub-project:

Details	**Unit**	**Quantity**
Total Affected	Number	
Title Holders	Number	
Non-Titleholders – Encroachers	Number	
Non-Titleholders – Squatters	Number	
BPL Families losing Dwellings	Number	

5. Commercial properties affected due to sub-project:

Details	Unit	Quantity
Total Affected	Number	
Title Holders	Number	
Non-Titleholders – Encroachers	Number	
Non-Titleholders – Squatters	Number	
BPL Families losing Commercial Properties	Number	

6. Common Property Resources Affected: (Please give each type by number)

Type	Unit	Quantity
	Number	
	Number	
	Number	
	Number	
	Number	

S No	Items	Results
6.	Total no of HH affected due to proposed project activity (Single or multiple impacts)	
7.	Total no of vulnerable HH affected due to proposed project activity (Single or multiple impacts)	
8.	Total number of Community Property Resources affected	

Part b: Right of Way Table (A table giving the availability of government land on both sides of centre line of the road need to be presented at every 100 m interval for the entire road and certified by the concerned Superintending Engineer)

S.No.	Chainage, km	Government Land from Centre line of Road		Proposed Road Base Width		Additional Land Requirement		Remarks
		Left	Right	Left	Right	Left	Right	
1	0.000							
2	0.100							
3	0.200							
4	0.300							

Part c : Result/Outcome of Social Screening Exercise		
1.	No SA Required	
2.	SA Required	

12.3 Pest and Pesticide Screening Tool

Pesticide Use Screening Questionnaire

YEAR:	
Interviewer:	Date:
Comments:	

General information for the farmer		
Name:	**Age**	**Occupation:**
GPS Coordinates:	**Cluster ID**	**Dist. to Homestead:**
District:	**Division:**	**Group name:**
Location:	**Sub-location:**	**Village:**

1) **Pest Control practices**

a) Do you use any pesticides to control pests (insects, diseases, weeds) of crops/livestock?

Yes ☐ No ☐

If yes, complete the table below

CROP/ LIVESTOCK	**PESTS (**insects, diseases, weeds**) Stage of Pest**	**PESTICIDE USED (Brand, common and chemical names)**	**GROWTH STAGE**	**No. OF TIMES USED**	**DATES WHEN USED**	**QUANTITY USED**

If Not applying why?

……
……..

b) If you use any of the above pesticide, do you keep records of the;

Application location / area / animals (sprayed) Yes ☐ No ☐

Pesticide product trade name: Yes ☐ No ☐

Operator name: Yes ☐ No ☐

If not why?
……
…….

c) When do you decide to use the pesticides (tick all that apply)?

☐ Use pesticides at regular intervals throughout the season (calendar)

☐ Use pesticides when pests are seen in the field/on livestock (control)

☐ Use pesticides after field sampling and finding a certain number of pests or a certain level of damage (scouting)

☐ Told by someone to apply (Verify who?)

……

Others (specify) _____

d**) Do you use a sprayer?** Yes ☐ No ☐

- If yes, do you own it? Yes ☐ No ☐
- Do you rent **it?** Yes ☐ No ☐

Do you borrow it? Yes ☐ No ☐

Was there any pesticide(s) which was not effective at all after spraying?

- Yes / No
- If yes, name the pesticide(s): _____

- **e) From your experience, are there any negative effects of using pesticides?**

Yes ☐ No ☐

If yes, list the negative effects:

1_____

2 _____

3 _____

4 _____

5 _____

f**) Do you use any kind of protective clothing while applying or handling pesticides?**

Yes ☐ No ☐

If no why? _____

If YES, what kind? _____

2. Knowledge of pesticide handling and storage (tick one in each row)

Activity	Sometimes	Always	Never
Do you read labels on the pesticide container before using?			
How often do you wear protective clothing and other accessories like nasal mask, hand gloves, eye goggles and boots while applying pesticides?			
Do you mix pesticides with your hands? Where do you mix pesticides? Where do you rinse your sprayer and mixing equipments?			
Do you observe pre- harvest intervals and pre- entry intervals (Waiting periods after applying pesticides)			
Do you wash your hands after spraying? Yes / No If yes, with: water only / use soap / use soil			

e) What do you do with the pesticide container after the pesticide is finished?

☐ Burn

☐ Burry

☐ Dispose in Latrine

☐ Wash and use e.g drinking water, storing salt.

☐ Use to make tin lamps

12.4 Draft Terms of Reference for Environmental Assessment of Restoring Kosi River Embankments

1.0 INTRODUCTION

1. Bihar is India's most flood-prone state, with 76 percent of the total population of Bihar and 73 percent of total landmass north of the Ganges living under a recurring threat of floods. The plains of Bihar are drained by a number of rivers that have their catchments in the steep Himalayas. As a result, North Bihar has recorded the highest number of floods in India during the last 30 years, and cause serious damages to the economy and population.

2. Kosi River, known as "the sorrow of Bihar," due to frequent floods, affects sizable populations and destroys swaths of crops regularly. On August 18, 2008, the Kosi River breached a portion of the Kosi embankment system in Nepal that is managed by the GoI. The breach led to severe flooding that affected over 3.3 million people and caused over $1.2 billion in damage. According to official estimates, more than 330,000 houses, 1,800 km of paved and unpaved roads, and 1,100 bridges were destroyed. Approximately 600,000 acres of crops were ruined, impacting close to 500,000 farmers. Over one million people were evacuated, and about 440,000 people received accommodations in 360 relief camps.

3. Following this flood, the GoB requested financial assistance from the World Bank to address the emergency needs of the population, as well as the longer term challenges of flood risk management, vulnerability reduction, connectivity, and agriculture productivity. The Bank and the GoB agreed on a phased approach to recovery and reconstruction: first phase to provide timely and focused support for reconstruction efforts, and later phase(s) to focus on a long-term program to support the GoB's development objectives. The first project, the Bihar Kosi Flood Recovery Project (BKFRP) is currently under implementation and focuses on emergency recovery needs through the: (i) reconstruction of damaged houses, (ii) rehabilitation of transport infrastructure, (iii) strengthening of the flood control measures in the Kosi River Basin; and, (iv) livelihood restoration and enhancement of affected population.

4. In the second project,which is now being developed, involves multi-sector engagement focused on reducing risk and vulnerability by improving flood risk management capacity in order to unlock the agricultural potential of the State. This approach involves reinforcement of flood control infrastructure, the kosi embankments and their management. Considering the nature of these investment and possible impacts on the natural environment (physical and aquatic), the implementing agency Bihar Apada Punarwas Evam Punarnirman Society (BAPEPS) intends to carry out a comprehensive Environmental Assessment (EA) of the proposed restoration of embankments, develop and implement a suitable Environmental Management Plan (EMP) to mitigate the identified impacts.

2.0 OBJECTIVES

5. The objectives of the proposed EA for the restoration of Kosi Embankments will be to
   - Identify potential environmental impacts due to the proposed restoration of Kosi Embankments and recommend specific measures to avoid / mitigate the impacts
   - Formulate an implementable Environmental Management Plan (EMP) integrating the measures to avoid the identified impacts and an appropriate monitoring and supervision mechanism to ensure EMP implementation.

6. The specific EMP developed as part of the EA will be fully integrated into the respective contractsand BOQs for the construction and maintenance of Kosi Embankments.

3.0 AN OUTLINE OF TASKS TO BE CARRIED OUT

7. As outlined in the project objectives, the scope of the study essentially comprises of carrying out an Environmental Assessment and preparation of Environmental Management Plan for the proposed restoration of kosi embankments. The EA will be carried out addressing all the environmental aspects associated with the restoration of embankments, fully complying with the Environmental and Social Management Framework (ESMF) of BKRFP and Safeguard Policies (OP 4.01 and others)[1] The World Bank. The scope of carrying out the EA for will include but not limited to the following:

i) **Brief Description of the proposed Restoration of Kosi Embankments** comprising the alignment, details of restoration proposals, implementation plans and other related information.

ii) **Detailed Environmental Profile of the Project Influence Area** (within 5 km on either side of the alignment of the embankments) with details of all the environmental features such as Reserve Forests, Sanctuaries / National Parks, Rivers, Lakes / Ponds, Religious Structures, Archeological monuments, Natural Habitats, Schools, Irrigation Canals, Utility Lines, other sensitive receptors, etc. The environmental profile shall be presented on a suitable map clearly indicating the location of each of features in relation to the alignment of the embankments.

iii) **Detailed Field Reconnaissance of the Proposed Alignment**, with strip maps presenting all the environmental features and sensitive receptors (trees and structures in the ROW of the embankments, Structures Reserve Forests, Sanctuaries / National Parks, Rivers, Lakes / Ponds, Religious Structures, Archeological monuments, Natural Habitats, Schools, Irrigation Canals, Utility Lines, other sensitive structures) along the corridor of the embankments. The environmental features shall be clearly recorded on the strip maps indicating their distance from the centre line of the proposed alignment. The methodology proposed for presenting the environmental profile and preparation of strip maps shall be clearly detailed out by the consultant in his technical proposal.

iv) **Detailed Base Line Environmental Monitoring** of various Environmental Attributes such as ambient air quality, noise levels, water quality (surface & groundwater), ecological profile, etc. The monitoring surveys shall be carried out for one or two seasons depending on the sensitivity of the environmental attribute (such as settlements, schools, cultural/ heritage sites, etc.) and the possible impacts of the project on the same. Base line surveys should specifically focus on the ecological and environmental features of the project area and the investigations should be carried out in such a way that the complete profile of the project area is developed for assessing the future impacts due to the proposed project. The approach to developing the environmental profile of the project area shall be detailed out in the technical proposal of the consultant and actual survey program shall be submitted in the inception report of the study.

v) **Assessment of Environmental Impacts** of the project, **including analysis of alternatives** shall be carried out for both 'with the project' and 'without the project' scenarios.

[1] The safeguard policies of The World Bank can be accessed at http://www.worldbank.org/safeguard

The assessment should clearly focus on various construction activities of restoring the embankments and their impacts on physical, ecological and socio-economic environment. The impacts shall be predicted for all the alternative scenarios using analytical / modeling tools of impact prediction and ensure that they are comprehensive in their coverage.

This task should also evaluate the impacts during construction phase of the project, such as development of borrow areas, quarry sites, material storage yards, plant / equipment sites, debris disposal sites, construction / labor camps, health and safety aspects, etc. While evaluating the impacts, the consultant will also prioritize environmental issues by establishing linkages with the activities during both design and implementation stage.

vi) **Measures for the Mitigation of Environmental Impacts and opportunities for enhancement, with associated detailed cost estimates** (wherever applicable), for all the impacts identified. The measures for the mitigation of impacts should consider options such as modifications in alignment, reduction of RoW and engineering measures to avoid impacts on the natural environment, conservation of archeological / heritage structures, etc. Opportunities for enhancement of environmental resources, cultural properties or common property resources shall also be explored and appropriate measures shall be recommended for implementation. All the recommended mitigation and enhancement measures shall be supported by detailed cost estimates, bill of quantities and necessary drawings for the implementation of the same.

vii) **Public Consultation and Disclosure**of the project and its impacts shall be carried out as per the operational policies (OP 4.01 and others) of The World Bank. This shall include conducting public consultation with all stake holders immediately after commencing the project to identify the environmental concerns in the project area. Inputs from these consultation shall be considered in assessing the environmental impacts, designing EMP and associated monitoring mechanisms. After the draft EA report, another consultation shall be carried out to ensure that all the critical environmental concerns are adequately addressed in the EA and share how stake holders concerns have been incorporated in the project design or addressed in the EMP. The consultation should take place at appropriate places, so as to ensure that all the stake holders in the project area have reasonable opportunity to attend such consultations. All the consultations shall be documented in detail with information on minutes of the consultation, details of people attended the consultation, issues raised and shall be supported by photographs.

viii) **Environmental Management and Monitoring Plan**, comprising a set of remedial (prevention, mitigation and compensation) measures shall be developed by the consultant and ensure that these are commensurate with nature, scale and potential of the anticipated environmental impacts. The components of EMP shall be supported by detailed cost estimates, bill of quantities and necessary drawings (wherever necessary) for implementation The EMP should also include a monitoring and supervision plan for the implementation of EMP and shall clearly identify the responsibilities of the contractors and BAPEPS.

ix) **Institutional Mechanism** for the implementation and monitoring of EMP, shall also be formulated in the EA study and the mechanism should clearly identify the role of all the agencies involved in the project implementation

4.0 STUDY OUT PUTS AND TIME LINES

8. The study is expected to be carried out over a period of 20 weeks and shall comprise the following out puts.

- **Inception Report** to be submitted within two weeks of commencement of the assignment, out lining the detailed approach and methodology, schedule of monitoring surveys and field activities
- **Interim Report** to be submitted within eight weeks of the commencement of the project, summarizing the details of field surveys carried out and the progress of various activities
- **Draft Environmental Assessment Report**, to be submitted within sixteen weeks of commencement of the project, with a detailed assessment of environmental impacts and the proposed Environmental Management Plan
- **Final EA Report** to be submitted within twenty weeks of commencement of the project, duly incorporating the comments and suggestions of the BAPEPS/ The World Bank.

5.0 CONSULTANT QUALIFICATIONS AND STUDY TEAM

9. The consultants should have adequate experience in Environmental Assessment of water resources projects, especially with regard to flood protection and embankment construction activities.

10. The consultant's team should comprise the following specialists in their team.

- **Team Leader** with about 15 years of experience in conducting EA studies for water resources projects with focus on flood control and embankment construction.
- **Senior Environmental Engineer** with about 10 years of experience in conducting EA studies for water resources projects with focus on flood control and embankment construction and with skills sets of working on various modeling / analytical tools.
- **Environmental Scientist / Ecologist** with about 7 years of experiences in conducting environmental and ecological surveys / investigations.

Depending on the project area profile, the consultant should draw necessary inputs from bio diversity specialist, hydrologist and social development specialists.

12.5 Annexure 3: Format for Voluntary Land Donation

Voluntary Donation of Land
On a Rs. 10/- Stamp Paper

1. This deed of voluntary donation is made and executed on ..... day of .....…… between Sri/Smt .....S/o W/o…….. Age…… Occupation ……. resident of ..... herein after called the "Title holder" on one part. This expression shall mean and include his legal representatives, successors – in-interest, heirs, assignees, nominees etc.

AND

Sri. ……..……. S/o W/o …….. Aged…… Designation……. herein after called the "Recipient" which term denotes to "for and on behalf of Bihar Aapada Punarwas Evam Punarnirman Society, Government of Bihar" on the other part and shall mean and include his successors –in-office, nominees and assignees etc.

2. Whereas, the details of the Location of the, land are given below:

Location Details	
Village	
Gram Panchayat	
Block	
District	
Title Holder/ Encroacher Details	
Name of Title Holder	
Father/ Husband's Name of Title Holder	
Status:	Title Holder
Age:occupation: Residence:	
Gender:	
Schedule -Land Details/Structure	
Land in Question	
Area	
Location	
North Boundary	
East Boundary	
West Boundary	
South Boundary	

Note: Detailed Map to the scale is appended.

3. Where as the Title Holder is presently using/ holds the transferable right of the above mentioned piece of land in the village mentioned above.

4. Whereas the Title Holder testifies that the land is free of encumbrances and not subject to other claims/ claimants.

5. Whereas the Title Holder hereby voluntarily surrenders the land/structure without any type of pressure, influence or coercion what so ever directly or indirectly and hereby surrender all his/her subsisting rights in the said land with free will and intention.

6. Whereas the Recipient shall construct and develop infrastructure facilities under the project, Bihar Kosi Flood Recovery Project-II, and take all possible precautions to avoid damage to adjacent land/structure/other assets.

7. Whereas both the parties agree that the infrastructure so constructed/developed shall be for the public purpose.

8. Whereas the provisions of this agreement will come into force from the date of signing of this agreement.

Signature of Title Holder		Signature of BDO	
Name of Title Holder		Name of BDO	
Date		Date	
Identified by			
1. Name:	Signature:		
2. Name:	Signature:		
Witnesses			

Signature of Gram Panchayat President	
Gram Panchayat President Name	
Signature of GP Secretary	
Name of GP Secretary	
Signature of BAPEPS Representative	
Name of BAPEPS Representative	
Designation of BAPEPS Representative	

12.6 Annexure 4: Format for Preparation of Resettlement Action Plan

1. Introduction

1. Brief Introduction of the sub-project
2. Description of Component(s) that cause land acquisition/alienation and resettlement
3. Overall Estimates of Land Acquisition and R&R

2. Measures to Minimise Resettlement

1. Description of Efforts Made for Minimizing Displacement
2. Description of the Results of these Efforts
3. Description of Mechanisms to Minimize Displacement and Loss of Livelihood/Income during Implementation

3. Census and Socio-Economic Surveys

1. Provide the results of the census and socio-economic surveys
2. Identify all categories of impacts and the extent of impact on each affected

4. Consultation and involvement of PAPs

1. Describe various Stakeholders
2. Summarize process of consultation on the results of socio-economic surveys
3. Describe the need and mechanisms to conduct updates to socio-economic surveys
4. Describe how this process of consultation would be continued through implementation and monitoring
5. Describe the plan for disseminating information to Project Affected Persons

5. Entitlement Framework

1. Provide a definition of PAFs and PAPs together with their categorization based on impacts
2. Describe R&R entitlements for each category of impact
3. Describe method of valuation used for affected land, structures and other assets
4. UsingEntitlementMatrix, present a table of all PAFs/PAPs and their losses/ impacts and entitlements

6. Relocation (if applicable)

1. Does the Project need community relocation sites? If yes, have they been inspected and accepted by PAPs?
2. Have the Project Affected Persons agreed to the strategy for housing replacement? Will new housing be constructed/allocated? If PAPs are to construct houses, explain if compensation entitlement for housing is sufficient to help them construct houses.
3. List of proposed sites along with number of affected families to be relocated
4. Describe respective mechanisms for (i) procuring/acquiring/alienating ; (ii) developing and (iii) allotting resettlement sites

5. Provide detailed description of arrangements for development of resettlement sites including provision of social infrastructure
6. Describe the feasibility studies conducted to determine the suitability of the development of sites.

7. Income Restoration

1. Are the compensation entitlements sufficient to restore income streams for each category of impact. If not, what additional economic rehabilitation measures are necessary.
2. Briefly spell out the restoration strategies for each category of impacts, and describe institutional, financial and technical arrangements/aspects involved
3. Describe the process of consultation with PAPs to finalize strategies for income restoration
4. How do strategies for restoration vary with the area/locality of impact
5. If income restoration involves change in livelihoods or other economic activities allow substantial amount of time for capacity building, accessing institutional funds/credits/markets, preparation and implementation. Work out the rate of returns for each of the economic activities opted by the entitled person.
6. How are the risks of impoverishment proposed to be addressed?
7. Explain the main institutional and other risks for effective implementation of plans for restoration of livelihood
8. Describe the process for monitoring the effectiveness of income restoration activities

8. Institutional Arrangements

1. Describe institution(s) responsible for: (a) delivery of each item/activity in the entitlement policy; (b) implementation of resettlement and rehabilitation programs and (c) coordination of all other activities as described in the Rehabilitation Action Plan
2. State how coordination issues will be addressed in cases where resettlement and rehabilitation are spread over a number of institutional/departmental jurisdictions
3. Indicate the agency that will coordinate all implementing agencies – do they have the necessary mandate and the resources
4. Describe the external (non-Project) institutions/departments involved in the process of resettlement and restoration of income such as land development, land allocation, credit, training for capacity building and the mechanisms in place to ensure adequate cooperation and performance of these institutions/departments
5. Describe the results of the institutional capacity assessment and give the institutional development plans including staffing schedule and training requirements
6. Discuss institutional capacity for, and commitment to, resettlement and rehabilitation

9. Monitoring and Evaluation

1. Describe the internal monitoring process
2. Define key monitoring indicators for resettlement, rehabilitation and participation and provide a list of these indicators which would be used for internal monitoring
3. Describe institutional (including financial) arrangement
4. Describe frequency of reporting and contents of reports

5. Describe the process for integrating feedback from internal monitoring into implementation
6. Describe financial arrangements for external monitoring including process for awarding and maintenance of contracts for the entire duration of R&R
7. Describe the methodology for external monitoring
8. Describe frequency of external reporting and its contents

10. Redressal of Grievances

1. Describe the structure and process of grievances mechanisms at various levels including step-by-step process for registering and addressing grievances and provide specific details regarding registering complaints, discussing them with PAPs, response time, communication modes etc.
2. Describe the mechanism for appeal
3. Describe the provision, if any, to enable PAPs to approach civil courts in case these provisions fail.

11. Implementation Schedule

1. List the chronological steps in implementation of R&R Action Plan including identification of agencies responsible for each activity along with a brief explanation of each activity
2. A month-wise implementation schedule (Gantt chart) of activities to be taken as part of R&R Action Plan
3. Description of the linkage between R&R implementation and initiation of civil works for each of the Project component

12. Costs and Budgets

1. Clear statement of financial responsibility and authority
2. List the sources of funds for R&R and describe the flow of funds
3. Indicate if costs of R&R are included in the overall Project costs
4. Identify R&R costs, if any, to be funded by the WB
5. Provide a cost-wise, item-wise budget estimate for the entire R&R costs including administrative expenses, monitoring and evaluation and contingencies
6. Describe the specific mechanisms to adjust cost estimates by *inflation* factor
7. Describe provisions to account for different types of contingencies

12.7 Annexure 5: Format for Preparation of Abbreviated Resettlement Action Plan

1. Introduction

1. Brief Introduction of the sub-project
2. Description of Component(s) that cause land acquisition/alienation and resettlement
3. Overall Estimates of Land Acquisition and R&R

2. Census and Socio-Economic Surveys

1. Provide the results of the census and socio-economic surveys
2. Identify all categories of impacts and the extent of impact on each affected

4. Consultation and involvement of PAPs

1. Describe various Stakeholders
2. Summarize process of consultation on the results of socio-economic surveys
3. Describe the plan for disseminating information to Project Affected Persons

5. Entitlement Framework

1. Describe R&R entitlements for each category of impact
2. Describe method of valuation used for affected land, structures and other assets
3. UsingEntitlementMatrix, present a table of all PAFs/PAPs and their losses/ impacts and entitlements

6. Income Restoration

1. Are the compensation entitlements sufficient to restore income streams for each category of impact. If not, what additional economic rehabilitation measures are necessary.
2. Briefly spell out the restoration strategies for each category of impacts, and describe institutional, financial and technical arrangements/aspects involved
3. Describe the process of consultation with PAPs to finalize strategies for income restoration
4. If income restoration involves change in livelihoods or other economic activities allow substantial amount of time for capacity building, accessing institutional funds/credits/markets, preparation and implementation. Work out the rate of returns for each of the economic activities opted by the entitled person.
5. How are the risks of impoverishment proposed to be addressed?

7. Institutional Arrangements

1. Describe institution(s) responsible for: (a) delivery of each item/activity in the entitlement policy; (b) implementation of resettlement and rehabilitation programs and (c) coordination of all other activities as described in the Rehabilitation Action Plan

8. Monitoring and Evaluation

1. Describe the internal monitoring process

9. Redressal of Grievances

1. Describe the structure and process of grievances mechanisms at various levels including step-by-step process for registering and addressing grievances and provide specific details regarding registering complaints, discussing them with PAPs, response time, communication modes etc.
2. Describe the mechanism for appeal
3. Describe the provision, if any, to enable PAPs to approach civil courts in case these provisions fail.

10. Implementation Schedule

1. List the chronological steps in implementation of R&R Action Plan including identification of agencies responsible for each activity along with a brief explanation of each activity

11. Costs and Budgets

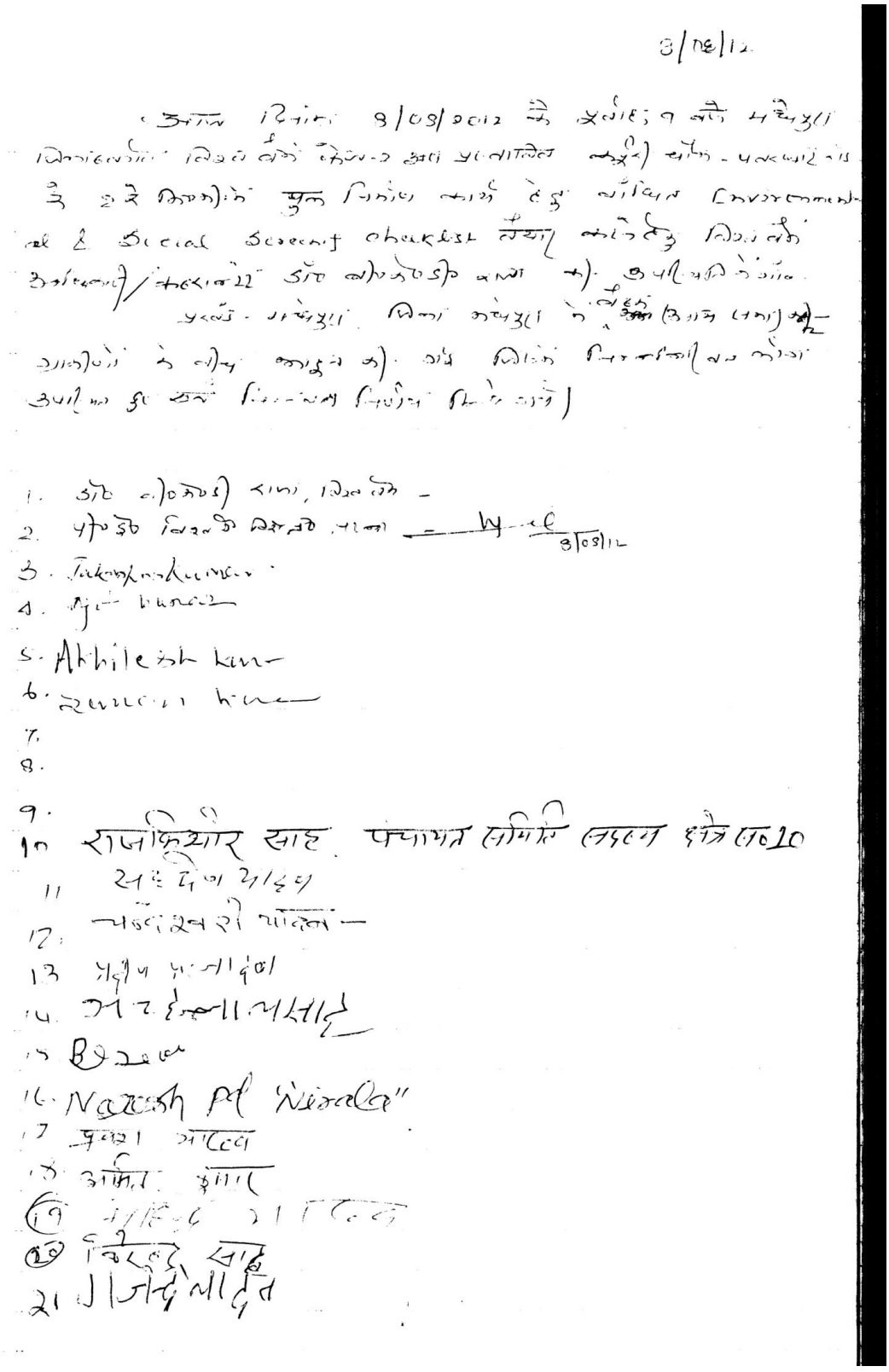
1. Clear statement of financial responsibility and authority
2. List the sources of funds for R&R and describe the flow of funds
3. Indicate if costs of R&R are included in the overall Project costs
4. Identify R&R costs, if any, to be funded by the WB
5. Describe the specific mechanisms to adjust cost estimates by *inflation* factor
6. Describe provisions to account for different types of contingencies

12.8 Annexure 6: Consultations: Participants and Photographs

Consultations in the field

Date	14 Feb 2012	14 Feb 2012	18 Feb 2012
Village	Morsand Kumhra Tola	Kankar Ghat	Telihar
Participants	Mr. Mahendra Giri Mrs. Mahendra Giri Mr Arjun Singh Mr. Rambrij Paswan Mrs. Bimla Devi Mr. Barun Kumar Mr. Vijay Kumar Singh Mrs. Gita Devi Mrs. Shanti Devi Mrs. Manita Devi Mrs. Sohadia Devi Mrs. Shobha Devi Mrs. Munna Devi Mrs. Raju Kumar Mrs. Dileep Kumar Mr. Mahender Mahato	Mr. Lal Babu Yadav Mr. Saibal Sada Mr. Vijay Mahato Mr. Dasarath Sani Mr. Rajender Sani Mrs. Laxmi Devi Mrs. Vakil Devi Mr. Chandra Bhushan Sharma Mr. Ravindra Jadav Mr. Ram Binod Mahato Mr. Viajay Kanth Yadav Mr. Raj Kumar Sani Mr. Dinesh Sani Mr. Jagadish Sani Mr. Mahaveer Sani Mr. Jagdhar Sadar Mr. Siya Charan Mathur Mr. Syam Sundar Jadhav Mr. Phuloo Thakur Mr. Bhajani Pandit Mr. Hardeo Pashma Mr. Ram Sunder Yadav Mr. Ram Babu Jadav	Mr. Suman Kumar Mr. Bahadur Singh Mr. Shankar Thakur Mr. Chhattru Thakur Mr. Bilas Thakur Mr. Narain Singh Mr. Khochal Singh Mr. Suresh Singh Mr. Umesh Singh Mr. Ganesh Singh

Consultation on 08 August 2012 in the Field by NGO



Consultation at Patna on 10 April 2012 at WRD

Participants:
Mr. Shanker Jha, APD, BAPEPS
Mr. Shambhu Prasad Singh, DD, BAPEPS
Mr. Sunil Kumar, PE, BRPNNL
Mr. SK. Singh, EE, RWD
Mr. BN. Singh, AE, RWD
Mr. Yogendra Kumar, DPE, BRPNNL
Mr. Anil Kumar Jha, Agriculture Specialist
Mr. Vijay Kumar Sinha, EE, Flood Monitoring
Mr Jawahar Lal, AE, Flood Monitoring
Mr. S.K. Tiwari, AE, Flood Monitoring
Mr. Puneshwar Rajak, EE, RWD
Mr. Devanand Jha, AE, RWD
Mr. Ravindra Paswan, AE, BRPNNL
Mr. Sahajanand, EE, WRD
Mr. Parth Pratim Ghosh, EE, RWD
Mr. Bhola Prasad, ES, BAPEPS
Ms. Pinky Kumari, SS, BAPEPS
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