Environment Management Framework
Final (Modified) Version-01/May’2011

Bihar Panchayat Strengthening Project

Bihar Gram Swaraj Yojana Society
Department of Panchayati Raj
Government of Bihar
# Table of Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbreviations</td>
<td>1</td>
</tr>
<tr>
<td><strong>Chapter 1</strong></td>
<td>2-4</td>
</tr>
<tr>
<td>1 Introduction</td>
<td>2</td>
</tr>
<tr>
<td>1.1 Objective of EMF document</td>
<td>2</td>
</tr>
<tr>
<td>1.2 Project component</td>
<td>2</td>
</tr>
<tr>
<td>1.3 Purpose of Environment Management Framework</td>
<td>2</td>
</tr>
<tr>
<td>1.4 Applicability</td>
<td>3</td>
</tr>
<tr>
<td>1.5 Environment Assessment Study and its scope</td>
<td>3</td>
</tr>
<tr>
<td>1.6 Methodology adopted by CEE</td>
<td>3</td>
</tr>
<tr>
<td>1.7 Environmental study by CEE</td>
<td>4</td>
</tr>
<tr>
<td><strong>Chapter 2</strong></td>
<td>5-5</td>
</tr>
<tr>
<td>2.1 Guiding Principles</td>
<td>5</td>
</tr>
<tr>
<td>2.2 Negative list of activities</td>
<td>5</td>
</tr>
<tr>
<td>2.3 Environmental Guidelines</td>
<td>5</td>
</tr>
<tr>
<td>2.4 Environmental friendly measures</td>
<td>5</td>
</tr>
<tr>
<td><strong>Chapter 3: Environment Management Framework</strong></td>
<td>6-11</td>
</tr>
<tr>
<td>3.1 Incorporation of NRM into GP planning</td>
<td>6</td>
</tr>
<tr>
<td>3.2 EA and EMP for Panchayat Sarkar Bhavans, Sub-projects under Panchayat Performance Award And other activities of GPs</td>
<td>6</td>
</tr>
<tr>
<td>3.3 Steps involved in EMF process</td>
<td>6</td>
</tr>
<tr>
<td>3.4 EA of Panchayat Sarkar Bhawan and sub – projects under Panchayat Performance Award</td>
<td>7</td>
</tr>
<tr>
<td>3.5 Environment Management Plan</td>
<td>8</td>
</tr>
<tr>
<td>3.6 EMF arrangements for works</td>
<td>9</td>
</tr>
<tr>
<td>3.7 Promotion of Environment Friendly Activities</td>
<td>9</td>
</tr>
<tr>
<td>3.8 Implementation Arrangement</td>
<td>9</td>
</tr>
<tr>
<td>3.9 Internal monitoring</td>
<td>10</td>
</tr>
<tr>
<td>3.10 External monitoring</td>
<td>11</td>
</tr>
<tr>
<td>3.11 Capacity Building &amp; IEC Plan</td>
<td>11</td>
</tr>
<tr>
<td><strong>Table 1 Environment Appraisal: Screening Checklist for Identifying potential Environmental Issue</strong></td>
<td>7</td>
</tr>
<tr>
<td><strong>Table 2. Level of Assessment as for Environmental Approval</strong></td>
<td>8</td>
</tr>
<tr>
<td><strong>Annexure: 1 Negative List of Activities</strong></td>
<td>12-14</td>
</tr>
<tr>
<td><strong>Annexure: 2 Environmental Guidelines</strong></td>
<td>15-54</td>
</tr>
<tr>
<td><strong>Annexure: 3 Environment Friendly Measures</strong></td>
<td>55-85</td>
</tr>
<tr>
<td><strong>Annexure: 4 Tool to Incorporate NRM Aspects in to GP Planning</strong></td>
<td>86-87</td>
</tr>
<tr>
<td><strong>Addendum-1 (Annexure: 5) Report of Stakeholders Workshop</strong></td>
<td>88-93</td>
</tr>
<tr>
<td><strong>Addendum- 2 Details of Monitoring Strategy and CB-IEC Plan</strong></td>
<td>94-99</td>
</tr>
<tr>
<td><strong>Addendum- 3(Annexure: 6) Details of environmental due diligence requirement</strong></td>
<td>100-104</td>
</tr>
<tr>
<td><strong>Addendum- 4(Annexure: 7) Details on monitoring of performance of contractors</strong></td>
<td>105</td>
</tr>
</tbody>
</table>
Abbreviations
BPMU....................................................... Block Project Management Unit
BGSYS..................................................... Bihar Gram Swaraj Yojna Society
BPSP....................................................... Bihar Panchayat Strengthening Project
BRGF....................................................... Backward Region Grant Fund
CEO....................................................... Chief Executive Officer
CEE........................................................ Centre for Environment & Education
C.B........................................................ Capacity Building
DLCC....................................................... District Level Coordination Committee
DPMU....................................................... District Project Management Unit
DRMP....................................................... Disaster Risk Management Programme
EA........................................................ Environmental Appraisal
EMF....................................................... Environmental Management Frame work
EMP....................................................... Environment Management Plan
ENRM..................................................... Environment & Natural Resource Management
GoB....................................................... Government of Bihar
GoI....................................................... Government of India
GP........................................................ Gram Panchayats
IEC........................................................ Information Education and Communication
M&E........................................................ Monitoring & Evaluation
NREGS................................................... National Rural Employment Guarantee Scheme
NGO....................................................... Non Government Organization
NRM....................................................... Natural Resource Management
PIP........................................................ Project Implementation Plan
PRI........................................................ Panchayati Raj Institutions
PPA....................................................... Panchayat Performance Award
RGSY..................................................... Rastriya Gram Swaraj Yojana
SPM....................................................... State Project Manager
S.O........................................................ Support Organization
SPMU.................................................... State Project Management Unit
TRP........................................................ Technical Resource Person
UNDP................................................... United Nation Development Program
WB........................................................ World Bank
Chapter 1 - Introduction:

1.1 Objective of EMF document

This document shall be a reference tool for the project implementation by the stakeholders, Project authorities, related agencies and contractors about the environmental guidelines to be incorporated in their activities to minimize any adverse affect on the environment and compliance with environmental laws & rules of Government of Bihar, Government of India and environmental safeguard policy of the World Bank.

This document will essentially guide the Project implementation Plan (PIP), but will also aim at developing an overall commitment of PRIs to plan and implement environmentally sustainable development activities.

The Environment management framework is a live document and may be amended as and when required (after seeking approval of competent authorities, as the case may be) as experience and learning accumulate with the evolution of the project. All participants in BGSYS are encouraged to share their learning from their experiences of the project implementation, so as to improve the arrangement defined in this document (similarly in other manuals/documents) envisaged for implementation of BPSP to attain its mission and objectives.

1.2 Project component

BGSYS an autonomous institution registered as Society under the Society Registration Act, 1860 and established under Panchayati Raj Department, GoB is presently implementing Bihar Panchayat Strengthening Project (BPSP) supported by World Bank in six Districts Patna, Nalanda, Bhojpur, Saharsa, Supaul, & Madhepura. The objective of the Project is to strengthen State Government capacity in promoting inclusive, responsive and accountable Panchayati Raj Institutions. The project has following five components:-

- Panchayat Sarkar Bhavans
- Gram Panchayat Capacity Building
  - Institutional Strengthening
  - Strengthening Development Capacity of Panchayats
- State-level Policy Environment for Decentralization
- Panchayat Performance Award
- Project Management and coordination [including M & E]

1.3 Purpose of Environment Management Framework (EMF)
The EMF for The Bihar Panchayat strengthening Project is an integral part of the implementation arrangements related to activities concerned with environmental implication under those sub –projects financed by BPSP. The purpose of EMF is that the interventions of Project are environmentally sustainable, complying with all the regulatory requirements (Rules and Regulations of Government of Bihar, Government of India and safeguard policy of World Bank).

1.4 Applicability

This is a comprehensive document prepared with desirable objective of development with care for environment. It attempts to lay out the Environmental Appraisal process and environmental guidelines aiming at:

- Any Planning done by Gram Panchayats (GP) for Developmental activities are responsive towards Local Environment situation
- It offers scope for choosing environment friendly alternatives which lead to protection and enhancement of local environment
- Environmental Appraisal (EA) & Environment Management Plan (EMP) will be mandatory for all Project supported activities including Panchayat Sarkar Bhawans and activities under Panchayat performance award.

1.5 Environment Assessment Study and its scope:

This framework is based on a study conducted by centre for environment (CEE) which was hired as consultants by Panchayati Raj Department, GoB under PHRD grants. The scope of the study included the following –

- **Environmental Analysis:** History of PRI system in Bihar, current capacities of GPs with specific focus on NRM aspects, current activities by Panchayats and impact on environment and mitigation, development of legal and regulatory framework for the project and identification of scope for promotion of environment friendly activities in GPs.
- **Environmental Management Framework (EMF):** which included development of tools for integrating NRM aspects into GP planning process, procedures for environmental appraisal of the GP plans and Panchayat Sarkar bhawans, institutional arrangements, capacity building and monitoring strategies.

1.6 Methodology adopted by CEE:

- Secondary data collection and literature review
- **Review of policy and regulatory systems:** A review of the existing policies of Government of India, Government of Bihar and WB safeguard policy that have relevance to EMF was done.
- **Stakeholder consultations:** Consultations with various stakeholders including Officials of Department of Panchayat Raj, Relevant line departments, Academic and Research
Institutions, NGOs, etc. were conducted to understand the current systems of functioning of PRIs and line departments, local environmental issues etc. 33 villages were visited and detailed discussions were held with Mukhiyas, Standing committees, Ward members, Community etc. to understand the current activities of panchayats and NRM aspects.

**Workshop:** A stakeholder consultation workshop was organized on 15th November 2010 involving concerned Government Departments, NGOs, Panchayat representatives, BRGF Resource Persons etc. to obtain suggestions and inputs for strengthening the EMF.

### 1.7 Environmental study by CEE: The brief aspects covered under this study are summarized below:

- **History and evolution of Panchayati Raj Institutions (PRI) Systems in Bihar:**
- **Capacity Assessment of PRIs:** including capacity building measures undertaken under BRGF, RGSY, UNDP & DRMP.
- **Types of Rural works undertaken by PRIs:** The information on source of funds for GPs, current activities being undertaken by GPs while highlighting the NRM related works have been analyzed. NRM related works are found to occupy major percentage among the activities taken up under Backward Region Grant Fund, 12th Finance Commission as well as under NREGS.
- **Overview of the Environmental Situation in the Project Area:** It presents an overview of the natural resource status along with current use and issues. Baseline information regarding geographical features, rainfall and water resources, land use pattern, agro-climatic zones, agriculture, horticulture, animal husbandry, forestry, fisheries, and biodiversity of wetlands etc. along with field observations and implications for EMF. Status of sector specific activities like water and sanitation, housing, road construction, non-conventional energy and village industries etc. is also presented. Government’s (Central and State) initiatives under each sector in the form of schemes and programmes is also detailed. It indicates that Bihar is highly rich in natural resources especially fertile soils, abundant water resources but lack scientific ways of management which needs focus through this project for Capacity Building of PRIs.
- **Legal and Regulatory Framework**
- **Environmental Impact of PRI Activities and Mitigation Measures**
- **Environment friendly interventions that can be implemented and promoted by GPs under NRM sub component, Construction of Panchayat Sarkar Bhavans & Panchayat performance award**

The Environment Management framework suggested by CEE on basis of above study has been adapted by BGSYS with suitable modifications.
Chapter 2: Guiding Principles

2.1 The CEE study has reviewed various Environmental Acts, Rules, Polices of Government of Bihar, Government of India & safeguard policy of World Bank which form guiding principles for the EMF. On this basis the following measures have been incorporated in this document:

- Negative list of activities
- Environmental Guidelines - mitigation measures for possible adverse environmental impacts of various activities
- Environmental friendly measures

2.2 Negative list of activities:

These activities will not be supported by the project due to non conformance to local environmental legislations and due to major environmental implications. This list is enclosed as **Annexure – 1** to this document. Besides this, an effort will be made to generate awareness in GPs for avoiding these activities supported from other sources.

2.3 Environmental Guidelines - mitigation measures for possible adverse environmental impacts of various activities:

These environmental guidelines will be mandatory for Project interventions especially with regard to construction of Panchayat Sarkar Bhawans & subcomponent under Performance Award. Besides this, an effort will be made to generate awareness in GPs for avoiding these activities supported from other sources. Detail list of impact and mitigation measures is enclosed as **Annexure – 2** to this document.

2.4 Environmental friendly measures:

Environment friendly interventions that can be implemented and promoted by PRIs with respect to agriculture, animal husbandry, fisheries, social forestry, water & sanitation, housing and sustainable energy technology. An effort will be made to integrate these in Project activities and GP planning. Detail list of these measures is enclosed as **Annexure – 3** to this document.
Chapter – 3: Environment Management Framework

This chapter provides details of processes required of environment appraisal, environment management plan, arrangements for its implementation & monitoring.

3.1 Incorporation of Natural Resource Management\(^1\) into GP planning:
The Gram Panchayats (GP) develops an integrated plan for Natural Resource management activities that are supported through existing Government sources such as the NREGS, BRGF, 13th finance etc. Integration of natural resource management into the GP plans ensures that the plans are responsive to the local environmental situation. The tool which guides incorporation of NRM aspect into GP planning define areas related to water bodies, land & other flora and fauna. The purpose is to answer the extent of their current use, associated problems, nessecery action; specific action that can be taken up by GPs. The format for this is enclosed as Annexure – 4.

The responsibility of integration of NRM aspects into the GP plans lies with Mukhiya and the concerned Standing Committees (e.g.: Production; Public Works etc). Under this Project Block facilitator – ENRM & Technical Resource Person (TRP) with the help of Support organization hired for NRM activity will facilitate this integration.

3.2 Environmental Appraisal and Environment Management Plan for Panchayat Sarkar Bhavans, sub-projects under Panchayat Performance Award and other activities of GPs:

EA & EMP will be mandatory for all project-supported activities including GP Bhavans and activities under Panchayat Performance Award. This will not be mandatory for other activities of GPs, however, the capacity building efforts of the project will promote the use of environmental appraisal as a good practice for all GP activities irrespective of the source of funding.

Environment appraisal involves filling of screening checklist to assess the environmentally negative issues and level of assessment. The environment negative list (Annexure – 1) will form basis for the assessment.

Environment Management Plan – It will be prepared on the basis of Environmental Appraisal with reference to environmental guidelines (Annexure – 2) for identifying mitigation measures.

3.3 Steps involved in EMF process:

- Detailed Environment appraisal (EA)
- Preparation of Environmental Management Plan(EMP)
- Approval of EMP by District Level Coordination committee (DLCC)
- Approval of EMP by SPMU
- Integration of EMP in Implementation Plan/ bidding document
- Implementation of EMP
- Monitoring

\(^1\) a scientific principle that forms a basis for sustainable global land management and environmental governance to conserve and preserve natural resources
The aforesaid steps will be integrated with similar steps required for resettlement Policy framework in such a way that repetition are avoided for Panchayat Sarkar bhawan and sub-projects under Panchayat performance awards. This has incorporated in PIP.

3.4 Environment Appraisal of Panchayat Sarkar Bhawan and sub-projects under Panchayat Performance Award:

This will involve screening of activities related to construction of Panchayat Sarkar Bhawan and other sub-projects. The purpose of screening is to ensure that every activity under BPSP is in compliance with the laws and regulation of GoB, GoI and safeguard policy of WB. An indicative screening checklist for Panchayat Sarkar Bhawan is given in table – 1, similar checklist can be prepared for other activities of GPs. On the basis of screening checklist of the sub-project the same can be categorized into three levels of assessments as detailed in Table -2.

Table 1: Environmental appraisal: Screening checklist for identifying potential Environmental issues

<table>
<thead>
<tr>
<th>Name of the District -</th>
<th>Block -</th>
<th>Panchayat -</th>
</tr>
</thead>
<tbody>
<tr>
<td>Village -</td>
<td>Thana/ Khata/ Khesra No.-</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sn.</th>
<th>Item</th>
<th>Yes</th>
<th>No</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Does the proposed site require soil filling to avoid water logging?</td>
<td>Yes</td>
<td>No</td>
<td>Remarks</td>
</tr>
<tr>
<td>2.</td>
<td>Does the proposed site involve forest land or protected area or notified natural habitat such as wetlands and does it require permission from the Forest Department?</td>
<td>Yes</td>
<td>No</td>
<td>Remarks</td>
</tr>
<tr>
<td>3.</td>
<td>Will the construction of Panchayat Sarkar Bhawan at proposed site involve felling of trees? If yes then mention no. of trees to be felled in remarks column.</td>
<td>Yes</td>
<td>No</td>
<td>Remarks</td>
</tr>
<tr>
<td>4.</td>
<td>In case any ‘chance finds’ (objects with archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance) are encountered during excavation, will they be deposited with the appropriate Government authority (District Collector)?</td>
<td>Yes</td>
<td>No</td>
<td>Remarks</td>
</tr>
<tr>
<td>5.</td>
<td>Is the proposed site located in or in the close vicinity of any object of physical or cultural significance? (objects or sites with archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance)</td>
<td>Yes</td>
<td>No</td>
<td>Remarks</td>
</tr>
<tr>
<td>6.</td>
<td>Will the construction activity (including disposal of rubble) not lead to pollution or obstruction of the flow of any water body?</td>
<td>Yes</td>
<td>No</td>
<td>Remarks</td>
</tr>
<tr>
<td>7.</td>
<td>Have the legal sources for Construction material (stone, timber, etc.) been identified (Government authorized quarries, depots, etc.) – and no illegal quarrying or felling or extraction is expected?</td>
<td>Yes</td>
<td>No</td>
<td>Remarks</td>
</tr>
<tr>
<td>8.</td>
<td>Is the proposed site in a notified area, (relevant only for areas notified for regulation of groundwater exploitation)</td>
<td>Yes</td>
<td>No</td>
<td>Remarks</td>
</tr>
</tbody>
</table>
### Table 2: Level of assessment as per Environmental appraisal

<table>
<thead>
<tr>
<th>Level</th>
<th>Criteria</th>
<th>Relevant activities (Indicative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level E0</td>
<td>No use of natural resources and no impact on surrounding environment</td>
<td>• Organising Gram Sabha, Capacity Building Programmes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Awareness programs etc.</td>
</tr>
<tr>
<td>Level E1</td>
<td>Natural resources are used. Short term negative impact or positive impact on the environment</td>
<td>• Agriculture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Development of grazing lands</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Maintenance of grazing lands</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fish culture</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Makhana cultivation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Social forestry and plantations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Provision of electricity</td>
</tr>
<tr>
<td>Level E2</td>
<td>Natural resources are used. Long term, severe negative impact</td>
<td>• Land development and earth works</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Irrigation works (small canals construction, desiltation etc.),</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction of Ahars and farm ponds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction of tube wells, hand pumps for drinking water</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction of toilets</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction of houses</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction of roads</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Construction of GP Bhavans</td>
</tr>
</tbody>
</table>

### 3.5 Environment Management Plan

It will be prepared on the basis of potential environmental issues identified under EA and with reference to mitigation measures provided in environmental guidelines (Annex-2). This will cover the steps required for obtaining permission from competent authorities as per provision of environmental laws and rules. It will also provide specific mitigation measures to be executed at the time of implementation of sub-projects and inclusion of these in bidding documents in case of implementation through contractors.

The results of environmental appraisal will be disclosed to the community. The potential impacts, mitigation measures identified and any environmentally proactive interventions planned will be shared with the community. A report of the community consultation will be part of the Environment Management Plan for the Panchayat Sarkar Bhawans and sub projects under Panchayat award. It will record the key concerns raised and how they have been addressed/integrated into the Environment Management Plan.

### 3.6 EMF arrangements for works that are outsourced by the GPs (Other than Project interventions)

The application of EMF will be optional for works other than Project interventions and a decision in this regard will be taken by Gram Sabha. In case it is decided to apply EMF, in such cases,
where certain activities (e.g.: construction of roads, drains, toilets, etc.) are outsourced to the external agencies or contractors, appraisal and EMP will be done by the Block facilitator – ENRM in consultation with the relevant standing committee and the mitigation measures should be made part of the contract document so that the external agency follows the mitigation measures contained in EMP. The contractors must be oriented by the Block facilitator – ENRM /District Environment and NRM coordinator on EMF implementation requirements.

3.7 Promotion of Environment Friendly Activities

Environment friendly activities (Annex -3) can be directly implemented by GPs (e.g.: pasture land development, plantations in wastelands) or can be promoted by the Panchayats for adoption by respective user groups or the community (e.g.: organic farming, improved cook stoves). The facilitation of implementation of environment friendly activities by GPs in the project is primarily through the NRM sub component and the details are incorporated in PIP.

3.8 Implementation arrangements

<table>
<thead>
<tr>
<th>Responsible person/Agency/group</th>
<th>EMF activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GP level</strong></td>
<td></td>
</tr>
<tr>
<td>Standing Committees</td>
<td>Integrating EMF aspects into GP planning</td>
</tr>
<tr>
<td>Mukhia</td>
<td>• Convensing gram sabha meeting for application of EMF arrangements for works outsourced by GPs (other than Project intervention).</td>
</tr>
<tr>
<td></td>
<td>• Ensuring EA &amp; preparing of EMP for PSB and other activities planned under Panchayat Performance Award as well as for other activities as decided by GS.</td>
</tr>
<tr>
<td></td>
<td>• Ensuring that mitigation measures identified through EA &amp; included in EMP are followed.</td>
</tr>
<tr>
<td></td>
<td>• Adoption of suitable environment friendly activities with the help of concerned line departments.</td>
</tr>
<tr>
<td></td>
<td>• Coordinate with Project staff in Conducting environmental awareness campaigns in the villages.</td>
</tr>
<tr>
<td></td>
<td>• Support in organising community consultation to disclose the EA &amp; EMP for GP Bhavans and other project components.</td>
</tr>
<tr>
<td><strong>Block Level</strong></td>
<td></td>
</tr>
<tr>
<td>Block Facilitator - ENRM</td>
<td>• Conducting environmental appraisal with the help of production committee and other relevant committees and documenting the outputs in relevant forms.</td>
</tr>
<tr>
<td></td>
<td>• Consolidating the environmental appraisal outputs at block level and sourcing support from the line departments for implementation.</td>
</tr>
<tr>
<td></td>
<td>• Promoting environment friendly activities by providing information and implementation support through liasoning.</td>
</tr>
<tr>
<td></td>
<td>• Support in organising community consultation to disclose the outputs of environmental appraisal of GP Bhavans.</td>
</tr>
<tr>
<td></td>
<td>• Distribution of IEC material.</td>
</tr>
</tbody>
</table>
### District level

<table>
<thead>
<tr>
<th>District Project Manager</th>
<th>• Overall responsibility of integration of EMF into project cycle/process</th>
</tr>
</thead>
</table>
| District Environment and NRM coordinator | • Coordination with S.O for C.B of staff & GPs.  
• Support BF-ENRM in EA & preparation of EMP  
• Overall responsibility for EMF arrangements at district level  
• Identification and promotion of suitable environment friendly activities  
• Consolidation of EA & EMP at district level, liaising with the departments for support in implementation  
• Monitoring the implementation of EMP at district level.  
• Ensuring the distribution of EMF related documents and IEC material to all the GPs  
• Organising community consultation to disclose the outputs of environmental appraisal of GP Bhavans |
| DLCC | • Approval of EMP prepared by DPMU |

### State level

| Project Director in overall supervision of CEO | • Get approval from EC through CEO for hiring support organization and external audit agency.  
• Overall monitoring of EMP implementation  
• Taking approval of EMP from Executive committee through CEO  
• Coordination with other departments for effective implementation of EMP |
| SPM - Environment and NRM | • Overall coordination for integration of EMP in the project  
• Coordination with the resource agencies appointed for conducting training and developing IEC material  
• Monitoring the implementation of EMP through cross checking the consolidated outputs and action taken reports assisted by field visits  
• Conducting external audit by hiring appropriate agency |
| SPM – Civil/Architect Engineer | • Ensure that all GP Bhavans are in compliance with the requirements of the EMF (EA is conducted, EMP is prepared and integrated in bid document and executed) |
| SPM - Capacity Building, Communication & IEC | • Ensuring that capacity building requirement of EMF is integrated into the capacity building strategy and ensuring the implementation on continuous basis  
• Coordination and support to the agency hired for training and IEC on the EMF |
| SPM - Monitoring and evaluation | • Ensuring that monitoring and evaluation requirement of EMF is integrated into the monitoring and evaluation strategy/plan and ensuring the implementation of the same on continuous basis |
3.9 Internal monitoring:

During the implementation, the activities will be monitored for integration of mitigation measures suggested and included in EMP. The monitoring will also focus on the systems and the capacities in the GPs for environmental management. Monitoring of GPs at the block level will be done by Block facilitator - ENRM, at the district level by District coordinator - ENRM and at state level by SPM - Environment and NRM. The monitoring will cover GP Bhavans, GP activities under Performance Awards.

3.10 External monitoring:

External audits will be conducted by hiring an external agency during 3rd year and 5th year of the project implementation. The process can be a combination of desk reviews (to check the management aspects) and field visits (to check on technical aspects) and stakeholder interactions.

3.11 Capacity Building & IEC Plan:

Capacity building is required for the project staffs and elected representatives of GPs to enable them to execute the functions pertaining to the EMF in an efficient manner. The capacity building programme, development of training modules, hiring of support agency and development of IEC material has been incorporated in PIP.
NEGATIVE LIST OF ACTIVITIES

The activities contained in this list will not be supported by the project due to non conformance to local environmental legislations and due to major environmental implications.

Due to non conformance with Rules and regulations of Government of Bihar, Government of India:

- Use of any forest land or any portion of it for any non forest purposes is not allowed without prior approval of the Central Government - The Forest Conservation Act 1930
- Activities like clearing, kindling fire, damaging trees (felling, girdling, lopping, topping, burning, stripping bark and leaves), quarrying stone, etc in reserved and protected forests is not allowed - Indian Forest (Bihar Amendment) Act, 1939
- No person other than Government or an Officer or agent authorized by the Government or agent shall purchase or transport or import specified forest produce in and from such area unit constituted by state government.
- Any person desiring to sell the specified forest produce should sell to concern Government Officer or Agent at any Depot situated within the said area/unit.
- The mukhiya of the concern GP can issue transit permit for transportation of timber from farmers land to any place within the district.
- The divisional forest officer can issue transit permit for transportation of timber from farmers land to any place outside the district
- No permission is needed for transportation of 10 species namely (Mango, Tamarind, Jamun, Kathal, Mahua, Bamboo, Peepal, Banyan, Paakad, Badhara)
- Water flow in to or from any wild life sanctuary should not be stopped or diverted - Wild Life (Protection) Act1972
- Destruction, exploitation or removal of any wild life including specified plants\(^2\) and forest produce from a sanctuary or the destruction or diversification of habitat of any wild animal, or diversion, stoppage or enhancement of the flow of water into or outside the sanctuary, cultivation of specified plants is prohibited without a permit granted by the Chief Wildlife Warden - Wild Life (Protection) Act1972
- Do not permit activities like cattle grazing in sanctuaries with out vaccination - Wild Life (Protection) Act 1972

\(^2\) The specified plants include Acotinum spp, Atropa spp, Acorus spp etc.

Source: [http://jharenvis.nic.in/files/Medicinal_Survey_Hazaribgah_4.pdf](http://jharenvis.nic.in/files/Medicinal_Survey_Hazaribgah_4.pdf), accessed on 14\(^{th}\) October 2010)
Do not allow stocking, exhibiting for sale, sell, offer for sale, stock or exhibit for sale or distribute any fertilizer which is not of prescribed standard – fertilizer (control) order 1935
Do not cause or permit any poisonous, noxious or polluting matter into stream or well or sewer or on land. – Water (Prevention and control of pollution) Act, 1974.
Do not permit stream any other matter which may impede the proper flow of the water of the stream should not be allowed- Water (Prevention and Control of Pollution) Act, 1974
Fishing in rivers is prohibited from 15th June to 15th August - Bihar Jalkar Management Act 2007
Fishing net or Gill net with less than 4 cm. Mesh size is prohibited in rivers.- Bihar Jalkar Management Act 2007
Fishing of fingerlings of culturable fishes of any species is prohibited. - Bihar Jalkar Management Act 2007
Putting of fence or any obstruction restricting the movement of fish in rivers and reservoirs is prohibited - Bihar Jalkar Management Act 2007
Use of dynamite or explosives, poison and poisonous chemicals for fishing is prohibited - Bihar Jalkar Management Act 2007
Drawing water from tanks, reservoirs and mauns for irrigation is prohibited - Bihar Jalkar Management Act 2007
Disfiguration or modifications to jalkars is not allowed (such as flood proof or flow control measures) without permission from District Forest Officers - Bihar Jalkar Management Act 2007
No wells should be sunk in the notified areas without permission from Ground water Department except those fitted with manual (hand operated) pumps - Bihar Ground Water (Regulation & Control of Development and Management) Act, 2006
Excavation of wells for domestic use on personal or community basis should not be done beyond the distance specified by the State Government from time to time - Bihar Ground Water (Regulation & Control of Development and Management) Act, 2006
Without the previous sanction of the collector, construction of any new irrigation channel from any river or stream (existing within the limits specified in the notification by State Government) is not allowed - Bihar Irrigation Laws 1922
Loud speakers should not be used without written permission from concerned authority (Local Police Station) - The Noise Pollution (Regulation And Control) Rules 2000
Do not allow activities like curing, tanning of skins and hides near residential areas or water bodies.

a. Tanning units should be 5 kms away from ecologically sensitive areas
b. Preferably half km away from flood plains affected by dam in the upstream or flood control system
c. Preferably half km away from high way or railway line

---

3 Ministry of environment and forest, technical guidelines for leather/skin/hide processing industry, Sourced at http://moef.nic.in/Manuals/CETP.pdf accessed on 23th July 2010
d. Site located near water resources, lakes, ponds, rivers etc. used for drinking water purpose or bird sanctuaries with in 2 kms should not be allowed for tanning activity.
e. Use of banned and restricted pesticides by Government of India is not allowed. Pesticides that are not registered should not be used.

Due to non conformance with World Bank’s Environmental Safeguard Policies:

- All activities financed by the project should go through environmental assessment - Environmental Assessment (OP/BP/GP 4.01)
- No activities should be carried in protected areas without prior written permission from State Forest Department - Natural Habitats (OP/BP 4.04)
- Activities that involve significant conversion or degradation of critical forest areas or related critical natural habitats are not allowed. - Forests (OP/BP 4.36)
- Activities involving significant excavations, demolition, movement of earth, flooding, or other environmental changes in, or in the vicinity of, a recognized physical cultural resources site will not be allowed without detailed assessment and management plan. - Physical Cultural Resources (OP/BP 4.11)
- Dams more than 3 meters in height are not allowed – based on Safety of dams (OP/BP 4.37)
- Pesticides classified by WHO as falling in Class Ia (extremely hazardous), Ib (highly hazardous) and II (moderately hazardous) should not be used under project activities. Pesticides classified as class III (slightly hazardous) can be used along with integrated Pest Management measures - Pest Management (OP 4.09).
  List of non permissible pesticides is attached as

Due to major environmental implications:

- For fisheries development no invasive species such as African catfish (clarias gariepinus) should be promoted
- No drinking water sources, especially hand bores should be permitted for use without quality testing for checking contamination with fluoride, arsenic etc. by Public Health and Engineering Department
- All bore holes (either at the time of construction or abandoned ones) should be properly covered to prevent accidental fall of children
ENVIRONMENTAL GUIDELINES - Mitigation measures for adverse environmental impacts of various activity:

1. Agriculture related activities
Activities by Panchayats:

*Land development and Earth works:*

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activities</th>
<th>Possible Negative Impact on Environment</th>
<th>Mitigation Measures by GPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Land development</td>
<td>• Improper land leveling and disturbances to land topography will lead to soil erosion</td>
<td>• Undulations should be avoided during land leveling operations to avoid erosion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Loss of bio diversity due to removal of native vegetation</td>
<td>• Soil should be compacted and erosion proof measures like growing grass on bunds etc. to be followed after land leveling operations</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Do not permit diversion of forest lands or groves for agriculture, or avoid cutting trees and disturbances to native vegetation as much as possible</td>
</tr>
<tr>
<td></td>
<td>Earth works under NREGS</td>
<td>• Fertile soil is extracted from agricultural lands for construction of roads etc under NREGS.</td>
<td>• Avoid use of soil from agricultural lands for Road Construction etc. under NREGS except for the silt which is deposited during floods etc. Alternatives like soil from wastelands, and silt from tanks etc. should be explored</td>
</tr>
<tr>
<td>2.</td>
<td>Silt removal</td>
<td>• Leaving the silt removed from tanks, ponds etc. near the agricultural fields leads to erosion and deposition in fields reducing the productivity of fields</td>
<td>• Silt removed from tanks, ponds etc. should be used for land filling etc. or disposed away from agricultural fields</td>
</tr>
</tbody>
</table>
Irrigation works:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activities</th>
<th>Possible Negative Impact on Environment</th>
<th>Mitigation Measures by GPs</th>
</tr>
</thead>
</table>
| 1.    | Development of irrigation systems (small channels, canals) | • Impact on local ecology and biodiversity during construction for irrigation systems, canals is possible  
• Change of land use patterns/drainage patterns is possible  
• Construction of watershed or irrigation works on up streams will impact the availability of water for downstream users  
• Increased dust pollution during construction of irrigation canals will lead to health problems  
• Unstabilised irrigation canals will lead to erosion if the bunds etc. are not strengthened in proper manner | • Avoid damage to the trees to the extent possible during construction of irrigation systems, canals etc.  
• Priority should be given to restore and maintain existing drainage systems during construction of irrigation works and canals  
• Water for irrigation shall be sourced after assessing the water availability at the source  
• Diversion of water from any source should be done only after considering other uses and users.  
• Dust proof measures such as nose masks and sprinkling of water to be adopted at the time of construction of irrigation canals  
• Once the canals, channels etc. are constructed the bunds should be strengthened by compacting, planting fodder grasses, etc. |
|       | Desilting of water bodies | • Erosion and Siltation if the removed soil is left near the water body from where it is removed | • The silt removed from water bodies should be transported to far off places or can be used for land filling  
• After desilting of a pond or tank the bunds should be strengthened and vegetation can be grown to avoid erosion. regular bund repair and maintenance is crucial to avoid Siltation, breaching etc. |
**Construction of farm ponds, Ahars:**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activities</th>
<th>Possible Negative Impact on Environment</th>
<th>Mitigation Measures by GPs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Construction of water conservation structures like Aahars, farm ponds</td>
<td>• Loss of trees or damage to trees is possible during construction of ahars, pynes and farm ponds</td>
<td>• Damage to trees should be avoided to the extent possible during construction of ahars, pynes and farm ponds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Leaving the excavated soil at the site itself during construction of ahars, pynes, ponds etc. will lead to siltation of these structures</td>
<td>• The excavated soil during construction of ahars, pynes, farm ponds etc. should be transported to far off place or can be used for land filling wherever required</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Weak bunds of ahars, pynes and farm ponds will lead to breaching and cut off during monsoon overflows</td>
<td>• Bunds of aharas, pynes and farm ponds should be compacted after construction and strengthened. Suitable grass species should be grown to check erosion of soil</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lack of regular maintenance and repairs for ahars, pynes and farm ponds will lead to siltation and weed growth</td>
<td>• Regular maintenance and repairs are to be taken care of for ahars and pynes</td>
</tr>
</tbody>
</table>
### Construction of tube wells:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activities</th>
<th>Possible Negative Impact on Environment</th>
<th>Mitigation Measures by GPs</th>
<th>Approximate Costs and Available Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Construction of tube wells</td>
<td>• Ground water levels might decreased over period of time due to over exploitation through tube wells</td>
<td>• Required permission should be taken from State Ground Water Authority for digging tube wells</td>
<td>• Cost of recharging structures will vary with the location and depth of ground water. However the Approximate cost will be around 1000/-⁴. Support can be taken from the Ground Water Department</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Excavation of wells near the irrigation works for domestic use either on personal or community basis shall be done with in the distance specified by the State Government from time to time.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Safe distance of 250 mts should be followed between two bore wells. Do not construct latrines within 30 ft distance from open well/bore well/hand pump</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Ground water recharge measures can be planned near tube wells</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Possibility of accidental fall of children into the abandoned bore holes or unsecured bore holes or</td>
<td>• The boreholes should be secured to prevent accidental fall of children into</td>
<td></td>
</tr>
</tbody>
</table>

---

Unsecured bore holes during construction  
• unprotected/abandoned boreholes.

• Presence of fluoride, arsenic and nitrate in drinking water will lead to health problems  
• For the tube wells those are meant for drinking water, water should be tested for the chemical contaminants.

• Technical support can be sourced from PHED

### Promotional activities by panchayats with reference to their functions:

Table 47: Environmental Guidelines for Agriculture – Promotional Activities by GPs

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activities</th>
<th>Possible Negative Impact on Environment</th>
<th>Mitigation Measures by GPs</th>
<th>Costs and Available Support</th>
</tr>
</thead>
</table>
| 1.    | Production promotion – through promoting use of pesticides and fertilisers | • Promoting the use of hazardous chemical pesticides will have an impact on the surrounding environment and health (possible increase of pesticide residues in food chain) | Promotional activities by GPs:  
• GP can promote Non Chemical Pest Management Practices and Integrated Crop Management Practices  
• GPs can provide information on proper recommendations of pesticides at the panchayat bhavan though the production committees or display materials  
Actions by GPs:  
• Restrict the use of non permissible and banned | • The cost of plant protection in IPM fields was Rs. 653.00/ha. On the other hand it was Rs. 2320.00/ha. in Non-IPM fields and the Cost Benefit Ratio of IPM over Non-IPM was 1:7.51 \(^5\).  
• Support for Non Chemical and Integrated Pest Management can be taken from District or Block Agricultural Officer, KVKs and ATMAs. |

---

\(^5\) Source: [http://www.vigyanprasar.gov.in/comcom/develop51.htm](http://www.vigyanprasar.gov.in/comcom/develop51.htm), accessed on 4\(^{th}\) September 2010
- Promoting the use of chemical fertilisers without technical guidance will lead to less production or erosion of soil fertility, leaching losses and ground water contamination. The run off will have an impact on water bodies.
- Soil testing to be facilitated at village level and individual farm level for the recommendations of fertiliser use.
- Promotion of Integrated Nutrient Management (INM) Practices can be done by GPs.
- Support for soil testing can be sourced from ATMA or Agriculture Department for soil testing.
- INM costs Rs. 1500 less per acre on average compared to general fertiliser application.
<table>
<thead>
<tr>
<th>2. Seed multiplication, raising nurseries for promotion of high yielding and hybrid varieties</th>
<th>• Extensive use of High Yielding Varieties might lead to loss of indigenous varieties of crops.</th>
<th>• While promoting High Yielding Varieties in agriculture, local suitability and impact on native species should be considered. • Seed banks can be maintained by panchayats with the help of farmers for conservation of local biodiversity as well as for utilization during post floods or drought situations.</th>
<th>• Monoculture of crops leads to increased pest attacks, loss of soil fertility etc.</th>
<th>• Continuous monoculture should be discouraged to the extent possible and crop rotation, intercropping can be promoted.</th>
<th>• Spread of invasive species is possible due to monoculture</th>
<th>• Avoid introduction of invasive species under farm forestry as monoculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Distribution/use of irrigation water</td>
<td>• Excess irrigation might lead to drainage problems and soil salinisation</td>
<td>• To avoid soil salinisation, Micro irrigation methods like drip and sprinkler irrigation can be promoted by linking.</td>
<td></td>
<td>• Drip irrigation would cost around Rs.50,000 per acre. However the costs vary from crop to crop.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---


**Source:** [http://www.nabard.org/modelbankprojects](http://www.nabard.org/modelbankprojects), accessed on 3rd October 2010.
with the Government programmes of micro irrigation.

- Non conventional energy sources are to be explored for irrigation (solar pumps) or use of treadle pumps can be explored
- Solar pumps costs around Rs. 4,50,000 for 2 HP pump⁸. Subsidies will be available from MNRE
- Treadle pumps costs around Rs.500-1000⁹

| 4. Harvest and storage | • Lack of proper storage facilities at individual level is a constraint for farm produce especially in flood prone areas | • Provision of common granaries by Panchayat for storage of farm produce should be explored
• Common machinery such as harvesters and threshers can be made available at Panchayat for the use of farmers for harvesting. Government schemes promoting tool banks at village level are to be explored
• Use of solar dryers for drying certain produces such as chillies, tomatoes etc. should be explored to avoid loss of horticultural produce | • A drier of capacity 50kgs will cost around 30,000-50,000/- Techncial support can be sourced from BREDÁ¹⁰ |

---


⁹ Source: [http://www.ide-india.org](http://www.ide-india.org), accessed on 3rd October 2010

## 2. Animal Husbandry

**Possible adverse environmental impacts and mitigation measures:**

Activities by Panchayats:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activity</th>
<th>Adverse Impact on Environment</th>
<th>Mitigation Measures</th>
<th>Costs and Available Support</th>
</tr>
</thead>
</table>
| 1.    | Fodder development, grass land/pasture land development | • Loss of native grass varieties is possible due to introduction of new fodder varieties in grass lands. Spread of exotic species such as Leucaena | • Selection of native grasses for pasture land development or mix of local and exotic species should be practiced | • Fodder land development costs comes around Rs. 6000 - 7000 per ha per year\(^{11}\)  
• Fodder development in waste lands can be planned under NREGS  
• Fodder scarcity during drought and floods  
• Over use of chemical fertilizers or pesticides might lead to contamination of water sources near by and might lead to bio | 

|       | • Fodder scarcity during drought and floods | • Create fodder banks and store fodder under dry and hygiene conditions for distribution during drought and floods | • Cost for fodder bank will be around 3 lakhs for around 150 cattle heads\(^{12}\)  
• Avoid use of chemicals in fodder cultivation or grass land development. Restrict to organic methods of cultivation | • Technical Support can be sourced from Department of Animal Husbandry |

---


2. Maintenance of grazing lands

- Loss of biodiversity of grazing lands due to over grazing
- Control open grazing and promote rotational grazing to avoid loss of biodiversity of grazing lands
- Over grazing on grazing lands might lead to soil erosion due to complete removal of grass cover
- Reseeding, manuring, tilling etc. should be done for maintaining the grass lands and regulated grazing should be practiced
- Continuous grazing will result in very less time for regeneration of grasses
- Promoting stall feeding and regulated grazing will help for regeneration of grasses in grazing lands
- Pasture land maintenance will cost around Rs.5,000 per ha\(^ {13}\).

3. Animal health, disease spread

- Spread of epidemics will lead to loss of cattle lives
- Ensure vaccination programmes happen regularly in the village with the help of department of Animal Husbandry to check the spread of epidemics
- Open disposal of carcasses leads to further spread of epidemics
- Dispose the carcass in the suggested manner wither by burning or by burying
- Costs for hiring labor for digging land if buried and costs of fuel wood if burned.

---

\(^{13}\) Source: [http://rural.nic.in/anual0203/chap-17.pdf](http://rural.nic.in/anual0203/chap-17.pdf), accessed on 21\(^{st}\) September 2010.
Promotional activities by panchayats with reference to their functions:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activity/Functions</th>
<th>Adverse Impact on Environment</th>
<th>Mitigation Measures</th>
<th>Costs and Available Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Selection of cattle breeds</td>
<td>• Selection of breeds that can not adapt to local climatic conditions will lead to health problems and less production.</td>
<td>• Select suitable cattle breeds to local conditions with the help of department of Animal Husbandry</td>
<td>• Technical support can be taken from local Veterinary Doctor for selection of locally suitable cattle breeds</td>
</tr>
<tr>
<td>2.</td>
<td>Technical support for improving production</td>
<td>• Lack of technical knowledge on livestock rearing how will lead to production decline and non efficient use of resources</td>
<td>• Organize training programmes in the village with the help of department of Animal Husbandry on aspects like fodder cultivation, enrichment of dry fodder through urea treatment etc, vaccinations</td>
<td>• Cost of urea treatment of dry fodder per 100 kgs is around Rs. 5\textsuperscript{14}. and transport and labor charges if quantity is large Technical support can be sourced from Department of Animal Husbandry</td>
</tr>
</tbody>
</table>

\textsuperscript{14} Urea cost per Kg is 5/- and for treatment of straw 1 kg is dissolved in 60 lits of water to treat 100 kgs of straw.
3. Fisheries Development

Possible adverse environmental impacts and mitigation measures:

Activities by Panchayats:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activity/Functions</th>
<th>Adverse Impact on Environment</th>
<th>Mitigation Measures</th>
<th>Costs and Available Support</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>• Cleaning of ponds for fish culture might harm the local aquatic bio diversity</td>
<td>• Care should be taken to avoid clearing of native species of plants and aquatic life, and the species on which migratory birds are dependent as food source while cleaning the ponds for fish culture.</td>
<td>• Any technical support for mitigation measures can be sourced from District Fisheries Officer</td>
</tr>
<tr>
<td></td>
<td>Cleaning of ponds for fish culture</td>
<td>• Silt removed and dumped next to pond will lead to erosion and Siltation of the pond during cleaning the ponds for fish culture</td>
<td>• Dispose the silt removed from the pond by filling the low lying areas, or use it for strengthening the bunds.</td>
<td>• Costs will be for labor hiring as per the local costs. Technical assistance can be sourced from Technical Assistant under NREGS</td>
</tr>
<tr>
<td>1.</td>
<td></td>
<td></td>
<td>• Construction and repairs of inlet and out let channels for maintaining the water flow is important during silt removal of ponds for fish</td>
<td></td>
</tr>
</tbody>
</table>
### 2. Species selection (for seed production or culture)

- Introduction of predatory fish like cat fish for culture will lead to loss of local fish varieties
- For fish culture select the species such as carps which are compatible or less harmful to the local native species.
- In addition to stocking the fish ponds with Indian major carps which are fast growing species, indigenous species such as *Anabas testudineus*, *Clarias batrachus*, *Ompok* spp., *Amblyp bgColor�haryngodon mola*, *Gudusia chapra*, *Puntius* spp may also be used for stocking. The low yield rates of these species can be compensated with high price they fetch.
- Technical support can be sourced from District Fisheries officer, ATMA or KVK.

### 3. Feeding, disease control etc.

- Spread of diseases from the cultured species to the native species is possible due to fish culture in local water bodies like ponds.
- During fish culture minimize use of antibiotics and anti-parasite drugs. Take measures to keep fish healthy, including vaccinating fish to avoid spread of diseases to native species.

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>culture</td>
<td></td>
</tr>
</tbody>
</table>
eaten fish food, fish waste, drugs and chemicals might pass into near by water bodies and harm the eco systems and affect water quality

treatment mechanisms like duck weed ponds\textsuperscript{15} can be followed for fish culture to treat the residues of feed, chemicals etc.

- Grow more than one species such as mussels near fish farms to remove micro organisms and nutrients thus improving water quality.

| 4. Weed control | 4.1 Quick spreading weeds like water hyacinth in fish ponds will reduce the BOD levels thus affecting the production of fish |
| 4.2 Water Hyacinth from fish ponds should be controlled by periodic harvesting |
| 4.3 Alternative uses of Water Hyacinth (that is removed from fish ponds) as cattle feed, for bio gas generation, basket weaving, etc. can be explored |
| 4.4 Can be done under NREGS |

| 5. Use of fertilisers | 5.1 Overuse of fertilizers in fish ponds will lead to pollution of the water body, over growth of algal blooms and loss of fish |
| 5.2 Use of fertilizers (cow dung, lime, etc.) as per recommended quantities for fish culture will maintain the required water quality |
| 5.3 Indicative fertilizer doses are given below: |
| 5.4 Technical guidance can be sourced from Fisheries Department on fertilizer dosage |

\textsuperscript{15} The duckweed culture complex comprises a series of duckweed ponds where aquatic macrophytes like Spirodela, Wolffia and Lemna are grown. The wastewater is taken on gravity or pumped through intake system into duckweed culture system where it is retained for 2 days before allowing to fish-ponds.
6. Low productivity of fish

- Appropriate stocking of fish species (species ratio and density) to be determined based on the availability of food (plankton, benthos, detritus etc.) in the ponds.

- Indigenous ornamental fish species like Gold Barb (*Puntius sophore*), Rosy Barb (*P. conchonius*), Labyrinth or Banded Gourami (*Colisa fasciatus*), Honey dwarf Gourami (*C. sota*) can be reared for sale as aquarium species.

- Promoting fish poly culture (growing 2-3 varieties of fish at once which forage at different depths of ponds (surface feeders, bottom feeders, and middle feeders) will help in increasing production per unit area.

- Promotion of integrated fish farming such as fish poultry, fish duck etc. will increase
| 7. | Utilisation of submerged fields, wet lands etc. for economic purposes | Fish nurseries can be taken up in makhana ponds or in the fields that are submerged for 3-6 months | Cost of nurseries will be around 2 lakhs per ha\(^{16}\). Technical support can be sourced from District Fisheries Officer |
| 3. | Makahna cultivation | Use of chemical pesticides for Makhana cultivation may lead to the loss of aquatic bio diversity | Avoid using chemical pesticides for makhana culture and follow traditional practices. Integrated fish makhana cultivation will use the space efficiently and increases the income |
| | | Integrated fish makhana culture will cost around Rs. 15000-20000 per acre\(^{17}\) |

Capture fisheries

| 1. | Fishing from water bodies (ponds, tanks, rivers, lakes, wetlands) | Loss of Biodiversity due to improper methods of fishing | No harmful fishing practices including use of dynamite or explosives, poison and poisonous chemicals should be promoted. Activities such as bird |

\(^{16}\) Source: [http://assamagribusiness.nic.in/2ndoct/Nonconventionalfishculture.pdf](http://assamagribusiness.nic.in/2ndoct/Nonconventionalfishculture.pdf), accessed on 22\(^{nd}\) September 2010

\(^{17}\) Source: [http://www.unctadindia.org/Studies_ExportPromotionOfMakhanaFromBihar.pdf](http://www.unctadindia.org/Studies_ExportPromotionOfMakhanaFromBihar.pdf), accessed on 21\(^{st}\) September
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>trapping, turtle/terrapin trapping, etc. should be restricted by panchayats in wetlands, lakes etc.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>• No drawing of water from tanks, reservoirs and mauns for irrigation without permission is allowed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• No pollution or encroachment of water bodies (Jalkars) by any means is allowed</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>• Overexploitation of fish from the common water bodies like lakes, rivers, tanks etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• No fishing in rivers from 15th June to 15th August</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use of fishing net or Gill net with less than 4 cm mesh size in rivers is not allowed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• No fishing of fingerlings of culturable fishes of any species is allowed in rivers and reservoirs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Identification and protection of fish breeding grounds should be done by Panchayats</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Protection of brood stock and juveniles should be done by Panchayats</td>
</tr>
</tbody>
</table>
### 4. Social and Farm Forestry, Minor Forest Produce, Fuel and Fodder

**Possible adverse environmental impacts and mitigation measures:**

**Activities by Panchayats:**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activity/Functions</th>
<th>Adverse Impact on Environment</th>
<th>Mitigation Measures</th>
<th>Costs and Available Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Selection of foreign, invasive species for plantations under Social Forestry</td>
<td>• Selection of certain foreign invasive species like eucalyptus, subabul etc. under social forestry might dominate the native species</td>
<td>• Native/local tree species should be the major part of species composition for social forestry activities</td>
<td>• Technical support can be taken from Forest Department or Department of Agriculture/Horticulture</td>
</tr>
<tr>
<td>2.</td>
<td>Mono culture of single species under social forestry</td>
<td>• Plantations with single species under social forestry will not meet the multiple local needs</td>
<td>• Proper combination of trees yielding food, fuel, fodder etc. should be selected for plantation, social forestry activities</td>
<td>• do</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Mono culture of trees will have impact on local biodiversity and pressure on the resources like soil fertility, water etc</td>
<td>• Multiple tree species with different growth rates and depth of root systems should be selected for plantations under social forestry</td>
<td>• do</td>
</tr>
<tr>
<td>3.</td>
<td>Unsustainable harvest of fuel wood, fodder, Non Timber Forest Produce</td>
<td>• Irregular and unsustainable harvest of fuel wood, fodder, Non Timber Forest Produce will reduce the regrowth and will effect the future production</td>
<td>• Sustainable methods of harvesting of fuel wood, fodder and Non Timber Forest Produce from forest are should be promoted</td>
<td>• do</td>
</tr>
<tr>
<td></td>
<td>Over grazing, browsing might lead to loss of regeneration capacity</td>
<td>Controlled or regulated grazing should be followed, minimal grazing charges can be levied</td>
<td>do</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Protection and management of forests in dry seasons</td>
<td>Incidence of forest fires during summer might destroy the trees and adjacent properties</td>
<td>Precautions should be taken during dry seasons to avoid forest fires with the help of forest department</td>
<td>do</td>
</tr>
<tr>
<td>5.</td>
<td>Use of chemicals for pest control in forests</td>
<td>Use of chemical pesticides in control of forest pests will have adverse impact on surrounding environment and animals</td>
<td>Banned pesticides should not be used. Non chemical methods of pest control should be tried for control of forest pests</td>
<td>Technical support can be sourced for Forest Department or Agriculture/Horticulture department.</td>
</tr>
</tbody>
</table>
5. Drinking Water, Health and Sanitation

Possible impact on the environment and mitigation measures:

**Drinking water:**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activities</th>
<th>Possible environmental impact</th>
<th>Mitigation measures</th>
<th>Costs and Available Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Construction and maintenance of Public hand pumps, open wells etc. for drinking water</td>
<td>• Construction of hand pumps, wells will involve digging and drilling activities leading to generation of waste water and mud</td>
<td>• Drilling mud from construction of tube wells should be reused in fields as far as possible and in construction of eet soling or kutcha roads</td>
<td>•</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Un-repaired and Leaking drinking water hand pumps may lead to wastage of water</td>
<td>• Regular repairs to the drinking water hand pumps are to be ensured with the help of PHED</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Fluoride, arsenic and iron residues in ground water will have impact on health</td>
<td>• After drilling tube wells for drinking water, water should be tested for the quality. In areas with iron contamination Iron Removal Plant (IRP) plant can be fixed to the hand pump. In case of fluoride contamination fluoride</td>
<td>• Technical support can be sourced from PHED</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Rs.1000 approximately, however it depends on depth, area etc.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Treatment Options are to be Explored by Panchayat</th>
<th>From a source (ground water hand pump) meeting requirement of less than 50,000 population sampling should be done twice a year for testing with the help of PHED</th>
<th>Safe distance of 250 mts should be followed between two bore wells. Do not construct latrines within 30 ft distance from open well/bore well/hand pump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Possibility of accidental fall of children into bore holes during drilling or in abandoned bore holes.</td>
<td>Secure the boreholes to prevent accidental fall of children into unprotected/abandoned boreholes.</td>
<td>Drilling hand pumps in dry areas will result in over exploitation and reduction in the ground water resource.</td>
</tr>
<tr>
<td>Water stagnation near the drinking water hand pumps will lead to</td>
<td>Near each drinking water hand pump concrete or cement platform should</td>
<td>Recharge structures can be planned near drinking water pumps in dry areas.</td>
</tr>
</tbody>
</table>
breeding of vectors

be constructed with a channel to direct the waste water to a soak pit

- Submergence of hand pumps during floods will lead to inaccessibility of drinking water during floods and subsequent contamination of drinking water
- Height of the water pump should be more so that it stays above flood water during floods in flood prone regions

### Solid and Liquid Waste management:

#### Activities by Panchayats:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activities</th>
<th>Possible environmental impact</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Solid and liquid waste management practices in panchayat</td>
<td>• Prevalence of disease during monsoons and floods due to water contamination with solid and liquid wastes</td>
<td>• Setting up proper systems for collection and disposal of solid waste and construction of drainages for liquid waste disposal should be followed by panchayats</td>
</tr>
<tr>
<td>2.</td>
<td>Preventive measures for diseases spread and disposal of animal carcasses etc.</td>
<td>• Lack of preventive measures for checking the disease spread will lead to break of epidemics</td>
<td>• Taking preventive or remedial measures to control the spread of epidemics by spraying disinfectants etc. and safe disposal of carcasses through burning or burying should be followed by panchayat</td>
</tr>
<tr>
<td>3</td>
<td>Lack of primary health care facilities</td>
<td>• Lack health care facilities will obstruct the vaccinations etc.</td>
<td>• Organising health camps and vaccination programmes on regular basis should be practiced by</td>
</tr>
</tbody>
</table>
Lack of drainages and open disposal of liquid wastes will lead to unhygienic situations
- Disposal of solid waste into drainages
- Construction of drains without considering the slope leads to stagnation and overflows

Restrict solid waste disposal into drainages and regular cleaning to be followed to avoid choking and stagnation especially before monsoon
- Proper technical support should be sourced on required slope etc. from PHED for construction of drains

Open defecation due to lack of toilets
- Construction of community toilets for the use of general public

Sanitation:
Activities promoted by Panchayats:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activity/Functions</th>
<th>Adverse Impact on Environment</th>
<th>Mitigation Measures</th>
<th>Costs and Available Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Facilitating construction of toilets under government schemes like Indira Awas Yojna, Total Sanitation Campaign</td>
<td>• Poor quality of construction of toilets leads to collapse of super structure and some times the pits and Water Closet</td>
<td>• Supervise the construction of toilets so that there are no technical hurdles in using</td>
<td></td>
</tr>
</tbody>
</table>

panchayats
<table>
<thead>
<tr>
<th>Lack of electricity and natural ventilation discourages the use of toilets</th>
<th>Proper ventilation and electricity connection to be provided to toilets if possible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contamination of drinking water sources near to the toilets</td>
<td>Safe distance to be maintained between the toilets and drinking water sources or any other water bodies near by.</td>
</tr>
<tr>
<td>Open defecation even though the toilets are constructed as they are not usable due to poor quality</td>
<td>Community awareness programmes for promoting toilet use. Should be part of Panchayats programmes</td>
</tr>
<tr>
<td>Submergence of toilets during floods in district of north Bihar</td>
<td>Elevated toilet construction (supported by pillars) with proper connection to soak pit and stairs case should be followed in flood prone regions</td>
</tr>
<tr>
<td>Lack funds leading to low quality construction and subsequent collapse</td>
<td>Explore alternative materials like bamboo in place of bricks for toilet</td>
</tr>
<tr>
<td></td>
<td>Technical support can be sourced from PHED. Cost will be for labour, construction materials like stones, sand etc. depending on availability</td>
</tr>
<tr>
<td>• construction</td>
<td></td>
</tr>
<tr>
<td>----------------</td>
<td></td>
</tr>
<tr>
<td>• Water logging, water stagnation near toilets and bathrooms</td>
<td></td>
</tr>
<tr>
<td>• Soak pits can be promoted to avoid water logging near toilets, bathrooms</td>
<td></td>
</tr>
</tbody>
</table>
### 6. Rural Housing

**Possible adverse environmental impacts and mitigation measures:**

**Activities promoted by GPs**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activity/Functions</th>
<th>Adverse Impact on Environment</th>
<th>Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Identification of house sites</td>
<td>• Cutting and removal of trees for house constructions will have negative impact on environment</td>
<td>• Avoid areas near to the forest lands</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Selection of sites for house construction with poor drainage capacity, near to the rivers that swell during floods etc. will lead to inundation during floods</td>
<td>• The site selected for house constructions should have good drainage facility and should be at safe distance from the rivers and at higher elevation</td>
</tr>
<tr>
<td>2</td>
<td>Construction of houses</td>
<td>• Use of burnt bricks for house construction might lead to the loss of good soil, creates pollutions and puts pressure on fuel wood</td>
<td>• Use of compressed Mud bricks or fly ash bricks for construction of houses can be explored</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Single room house for residing and cooking will expose the residents to indoor air pollution</td>
<td>• Separately, kitchen for a house or a partition should be provided. Provision for cross ventilation is must</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Smokeless chulhas can be part of house design</td>
</tr>
<tr>
<td>3</td>
<td>Creation basic amenities</td>
<td>• Lack of toilet facility</td>
<td>• Construction of toilet should be integral part of house construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Appropriate provisions should be</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
</tbody>
</table>
|   |   | provided for drainage and waste water disposal  
  • Roof water harvesting can be made an integral part of house designs in drought prone areas and areas where ground water is highly contaminated |
| 4. | Ventilation |  • Lack of ventilation |
| 5. | Improvement of the premises |  • Unhealthy surrounding with stagnant water, openly dumped solid waste etc. near houses will lead to spread of vector borne diseases |
|   |   |  • The house premises are to be kept clean for which proper solid waste disposal mechanism should be worked out. Low lying areas collecting rain water should be filled back with mud.  
  • Soaks pits are to be constructed near the wash area or bathrooms  
  • Tree plantations or kitchen gardening should be promoted |
### 7. Construction of Roads:

**Possible adverse environmental impacts and mitigation measures:**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activity/Functions</th>
<th>Adverse Impact on Environment</th>
<th>Mitigation Measures</th>
<th>Costs and Available Support</th>
</tr>
</thead>
</table>
| 1.    | Site selection    | • Possibility of disturbances to the forest land near by or culturally important sites etc. | • Local revenue, forest authorities should be consulted before selection of site for road construction  
  • In case the proposed road project is located or passes through forest areas, efforts have to be emphasized on minimizing encroachment into forest areas and tree cutting  
  • For roads that require a diversion of forest land, GP needs to obtain a forest clearance from the relevant State Forest Department | |
|       |                   | • Disturbance to the land and water bodies may impact livelihoods activities such as agriculture, fishing etc. during road constructions | • Discussion with the local community is must for road construction activities as it should not have major impact on their livelihood activities | |
|       |                   | • Sites that are prone to erosion and flooding will | • The road alignment should as much as possible avoid passing | |
2. **Site clearing**

- Impact on local vegetation/bio diversity due to land clearing activities such as clearing bushes and felling trees etc. during road construction
- Avoid felling of trees during road construction to the extent possible. In cases where tree felling is necessary replant the saplings of the same species by the side of the road or in the near by waste lands

3. **Soil excavation works or cut and fill operations**

- Extraction of fertile top soil from near by agricultural lands for road construction will have negative impact on the crop productivity, water holding capacity etc.
- Avoid extraction of fertile soil from agricultural lands for road construction. Use soil from tanks, or from leveling the uneven lands areas, waste lands etc. flora/fauna
- Under no circumstances, topsoil shall be allowed to be used as a fill material in road construction activities

- Changes in land topography due to
- Avoid excavation of pits, heavy cuts etc. for road
| excavation of deep pits in selected areas and due to continuous movement of trucks etc. during road construction activity | constructions. Use alternate filling material like fly ash\(^{19}\), modified bitumen, plastic wastes etc  
- Restrict the movement of machinery and trucks with in a row to avoid disturbance to near by fields etc. during road construction  
- After construction of roads, provide immediately slope stabilization in the form of concrete wall, rock fill, vegetative slope protection  
- Cut and fill operations to prepare embankments for roads can generate serious environmental impacts like soil erosion, disturbances to aquifers, impair drainage and increase the risk of flooding etc.  
- During road construction excavation should be done carefully where the ground water level is relatively shallow, to avoid cutting aquifers that could disturb the supply of water to nearby wells  
- Improper drainage arrangements might leads to submergence of |  
|  | Road construction should not obstruct natural drainage pattern  

\(^{19}\) The Government of India through MoEF notification, SO 1164(E) on 5 November 2002, requires that all road construction works located within a radius of 100 km from coal or lignite based thermal power plants have to use “fly ash” as part of materials for construction of embankment.  

There is possibility of few GPs of Patna and Nalanda falling with in the radius of Barauni thermal power plant.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th>roads during rainy season</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Road construction activities might obstruct water flow in the nearby water bodies due to mud spillage etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Where ponds or lakes are located on the roadsides, earthwork should for road construction be done in such a manner to avoid any spillage of excess materials into nearby ponds, lakes, irrigation systems, drainage etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loss of fertile soil due to over extraction (than the required amount) is a possible phenomenon during road construction</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preserve topsoil that is extracted during road construction works and use it for roadside tree planting or for turfing of embankments</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ensure that the selected area for roads is not located in irrigated agriculture land, grazing land, protected areas, wetlands supporting area</td>
</tr>
<tr>
<td>4.</td>
<td>Use of water</td>
<td>Use of water from the community sources for road construction will affect the routine needs of the local people</td>
</tr>
<tr>
<td></td>
<td></td>
<td>As far as possible avoid use of water from community sources for road construction activities</td>
</tr>
<tr>
<td>5.</td>
<td>Construction process</td>
<td>Air and noise pollution will be there during construction of roads</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Transportation of construction materials for roads should be done by</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td>due to drilling, blasting, transport etc. Continuous exposure of workers to high level of noise may result in annoyance, fatigue, and may cause temporary shift of threshold limit of hearing</td>
<td>using trucks with cover</td>
</tr>
<tr>
<td></td>
<td>• Health impact on workers and passers by due to dust inhalation during construction and noise during road construction</td>
<td>• Limit spread of dust by sprinkling water during road construction activities</td>
</tr>
<tr>
<td></td>
<td>• Health impact on road construction workers due to lack of clean drinking water facilities near the site</td>
<td>• Advocate the road construction workers to use nose masks for avoiding dust inhalation</td>
</tr>
<tr>
<td></td>
<td>• After completion of road construction left over excess soil and construction material will pollute surface water, land, air etc. and cause inconvenience for transport</td>
<td>• Provide clean drinking water near the road construction site for the workers</td>
</tr>
<tr>
<td>6.</td>
<td>Post construction – clean up and disposal of wastes</td>
<td>• Find alternative ways to use the excess materials after road construction. It can be used for filling back the excavations or for strengthening the embankments</td>
</tr>
<tr>
<td></td>
<td>• Tree planting operations shall</td>
<td>• The concerned District Forest</td>
</tr>
</tbody>
</table>
be commenced immediately after completion of embankment compaction after road construction.

- The species shall be suitable for local climate\(^2\).
- Proper care shall be taken to increase survival rate of saplings like regular watering, pruning, provision of tree guards, manure for better nourishment, etc., including timely replacement of perished saplings.

| Officer can be consulted for selection of species and technical guidance, if required. |

\(2\) Species suitable: Seeshum, Arjun, Guava, Mango, Litchi, Butea spp.
3. Promotion of Non Conventional Energy

Possible adverse environmental impacts and mitigation measures:

Activities by GPs:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activity/Functions</th>
<th>Adverse Impact on Environment</th>
<th>Mitigation Measures</th>
<th>Costs and Available Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Provision electricity to Households, street lights etc.</td>
<td>• Lack of electricity impairs the GP to provide street lighting</td>
<td>• GPs can provide use solar street lights.</td>
<td>• Technical support can be sourced from BREDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Use of diesel generators for electricity generators will increase cost as well as pollution</td>
<td>• Potential sites for mini hydro generation should be identified and planned with the help of government</td>
<td>• The cost of Mini Hydro power generation project is around 2 lakhs per 2 MW&lt;sup&gt;21&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

### Activities promoted by GPs:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activity/Functions</th>
<th>Adverse Impact on Environment</th>
<th>Mitigation Measures</th>
<th>Costs and Available Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Provision/use of electricity for lighting, irrigation, threshing etc.</td>
<td>• Use of diesel run generators for electricity create air and noise pollution besides high costs</td>
<td>• Pancayats should promote use of non conventional energy resources like solar energy, bio mass energy etc.</td>
<td>• Technical support can be sourced from BREDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Wind power can be used for irrigation etc. open land (private/public) can be identified and utilized for installing wind mills with the support of government at block level</td>
<td>• The cost is about 2.5 lakhs- 3 lakhs per KW</td>
</tr>
<tr>
<td>2.</td>
<td>Domestic energy requirements</td>
<td>• Use of fuel wood, dung etc. for cooking leads to indoor air pollution besides heavy cost for fuel wood</td>
<td>• Promote community based or family level bio gas plants or smokeless chulhas and fuel efficient cook stoves for reducing indoor air pollution</td>
<td>• Technical support can be sourced from BREDA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Cost of smokeless chulha is around Rs. 100-150 and cost for Bio gas plant is around Rs.5000 per cubic meter</td>
</tr>
</tbody>
</table>

---

22 Source: [http://www.sdabeebreda.com/Wind%20mill.htm](http://www.sdabeebreda.com/Wind%20mill.htm), accessed on 22\textsuperscript{nd} August 2010

23 Source: [http://www.sdabeebreda.com](http://www.sdabeebreda.com), accessed on 22\textsuperscript{nd} August 2010

9. Khadi Village and Cottage industries

Possible adverse environmental impacts and mitigation measures:

Promotional Activities by GPs

<table>
<thead>
<tr>
<th>S. No</th>
<th>Activity/Functions</th>
<th>Adverse Impact on Environment</th>
<th>Mitigation Measures</th>
<th>Costs and Available Support</th>
</tr>
</thead>
</table>
| 1.    | Identification of suitable locations for small scale industries | • Waste released from small scale industries such as leather tanning, milk cooling etc. can pollute the surrounding areas  
• Noise pollution form units like floor mills etc. will cause inconvenience to near by residents | • Locate the small scale industrial units away from the villages. Follow the safe distance recommended for individual industries  
  o Leather tanning units – 5 kms away from ecologically sensitive area, 2 kms away from ponds, lakes, rivers  
  o Milk cooling – a distance of 500 mts should be maintained from residential areas |                                                                  |
<p>| 2.    | Monitoring the use of common property resources and release of wastes in to common property resources | • Over exploitation of local natural resources such as trees, water, soil etc. as raw materials for small scale industries will lead to degradation, which will impact the eco system services and livelihoods | • Permit the use of natural resources with in the limits – cutting of trees for collection of raw material, extraction of fertile soil, over exploitation of surface and ground water should be restricted for small scale industries |                                                                  |</p>
<table>
<thead>
<tr>
<th>3</th>
<th>Awareness and training programmes related to small scale industries</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Release of harmful wastes from small scale industries will lead to pollution of land, water etc</td>
</tr>
<tr>
<td></td>
<td>• Avoid dumping of wastes from small scale industrial units into common water bodies, land etc.</td>
</tr>
<tr>
<td></td>
<td>• Promote reuse and recycling of wastes in small scale industrial units</td>
</tr>
<tr>
<td></td>
<td>• Facilitation/promotion of technologies under promotion of small scale industries that are harmful to environment will impact the local environment</td>
</tr>
<tr>
<td></td>
<td>• Promote the environmental best practices in the individual small scale industrial activities through awareness and training programmes. Keep the information available in Panchayat bhavan on display (rolling).</td>
</tr>
<tr>
<td></td>
<td>• Conduct regular medical camps for small scale industry workers/artisans</td>
</tr>
<tr>
<td></td>
<td>• Support can be taken from Khadi Village Industries Commission</td>
</tr>
<tr>
<td></td>
<td>• Not using the protective gear, or protective measures will have negative impact on health of the workers of small scale industries and the people residing in the neighboring area</td>
</tr>
<tr>
<td></td>
<td>• Promote use of safety gear like gloves, masks etc. (for activities like agarbathi) by workers/artisans of small scale industries</td>
</tr>
</tbody>
</table>
### 10. Construction of Panchayat Bhavans

**Possible impact on the environment and mitigation measures (along with compensations/entitlements):**

<table>
<thead>
<tr>
<th>Activities</th>
<th>Possible environmental impact</th>
<th>Mitigation measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Site selection and construction aspects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Site selection</strong></td>
<td>• Loss of agricultural lands, ecologically important areas like wetlands causing negative impact on the local environment and livelihoods</td>
<td>• Avoid selection of agricultural lands, grazing lands, wetlands, irrigated lands etc. to the extent possible. Select waste lands, non crop lands etc.</td>
</tr>
<tr>
<td></td>
<td>• Selection of low lying areas and areas with drainage problem such as water stagnation etc. will magnify the inundation problem during floods in flood prone districts.</td>
<td>• Select elevated land which has good drainage properties</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• In cases where elevated land is not available increase the elevation through land filling and improve the drainage system through channels and soak pits etc.</td>
</tr>
<tr>
<td><strong>Land clearing</strong></td>
<td>• Loss of Trees</td>
<td>• Permission should be taken from the concerned Zonal Officer for felling of the trees and the patta holder will have full right on the cut tree but has to plant tree for tree.</td>
</tr>
<tr>
<td></td>
<td>• Compensation at Market value to be computed with assistance of horticulture department</td>
<td>• Advance notice to harvest fruits and remove trees</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Replanting the trees in the premises of panchayat bhavans, if possible option of relocation of the trees should be explored</td>
</tr>
<tr>
<td></td>
<td>• Loss of Crops</td>
<td></td>
</tr>
</tbody>
</table>
should be calculated for mature crops based on average production.

- Agricultural laborer/share cropper
- Loss of Common Property Resources (CPRs)
- Loss of livelihoods and affect on source of income due to loss of CPRs like grazing lands, water bodies etc.

- Avoid selection of CPR related land areas
- Developing alternative grazing lands etc. can be considered if existing CPR areas are to be used
- Permission to use the land for grazing, fishing near the water bodies etc. after construction as well

**Construction**
- Temporary impact during construction like disruption of normal traffic, damage to adjacent parcel of land / assets due to movement of heavy machinery and plant site

- Precautions should be taken to avoid dust or noise pollution through sprinkling water, using masks etc.
- Avoid use of heavy machinery in agricultural fields, use locally available materials to avoid transportation to the extent possible

**Building material**
- Use environment friendly construction material such as compressed mud blocks and fly ash bricks

**Post construction**
- Disposal of construction rubble

- Disposal of construction rubble near water bodies and agricultural land will have an impact of water flow, pollute the water and affects the land fertility
- Leaving the rubble near the site itself will cause inconvenience

- Boreholes with out cover

- Bore holes should be securely covered during construction or post construction (abandoned bore holes) to prevent accidental fall of
<table>
<thead>
<tr>
<th>Design aspects</th>
<th>children</th>
</tr>
</thead>
</table>
| • Lack of ventilation or use of energy for ventilation  
• Difficulty to access water in dry periods  
• Water stagnation during floods | • Use of natural ventilation should be considered to reduce energy use  
• Integrate rain water harvesting structures and soak pits  
• Proper drainage plan should be designed to avoid flooding |
ENVIRONMENT FRIENDLY MEASURES

These Interventions can be Implemented and Promoted by PRIs

3.1. Environment Friendly Technologies/Practices in agriculture:

The proven sustainable technologies in agriculture that are suitable to the state can be promoted by GPs for increased production, income and efficient utilization of existing resources. Few such technologies match with the environmental situation of Bihar are given below:

3.1.1. Boro Rice cultivation:

Boro rice is cultivated in waterlogged, low-lying or medium lands with irrigation facility during November to May. This type of rice has been cultivated traditionally in river basin deltas of Bangladesh and Eastern India including Eastern U.P., Bihar, West Bengal and Assam. In these regions, water accumulates in the low lands during monsoon months and cannot be drained out in winter months.\(^{25}\)

*Description of practice:*

This system takes advantage of residual moisture after the harvest of Kharif rice. Besides these areas have high moisture retention capacity and water is usually accumulated in low lying areas and ditches. The area is water logged for more than 9 months from June – July to February – March. Nurseries for Boro rice (in depog method) are usually sown in the months of late November – early December and transplantation is done in February – March followed by harvesting in May – June\(^{26}\). This gives the farmers a chance to grow a Rabi season crop which normally they could not grow. The suitable varieties are Gautam, Richharia, Dhanlaxmi, Prabhatar, IR 64, Krishna Hensa, IR-36, Joyamati, Vishnu Prasad, Jyoti Prasad, Chinsura *Hybrid*-3 are the varieties that do well under irrigated conditions.

*Environment friendly features and other advantages:*

- Efficient utilization of water logged low lying areas
- Reduced pest infestation due to winter season
- High productivity (5-6 t/ha) in deepwater areas where the productivity has traditionally been very poor (<1 t/ha) during the *kharif* as the crop responds well to higher doses of fertilizers

\(^{25}\) Boro Rice: An opportunity for intensification, [www.knowledgebank.irri.org](http://www.knowledgebank.irri.org), accessed on 12\(^{th}\) May 2010

Status of implementation in Bihar:
Boro rice cultivation has increased in the State during the last decade. Boro rice is grown in Chaurs of more than 2 lakh hectares mainly in the districts of Katihar, Purnia, Saharsa, Supaul (project districts) and Madhubani where rainfall is high and temperature not too low.

Cost involved:
Around 10,000 per acre (Approx). Government supports Boro rice cultivation by providing subsidy on seed and training.

Boro Rice Cultivation in Chaur Lands of Madhubani

Sri. Benam Prasad of Purani Bazaar, Jhanjharpur, Madhubani district has cultivated boro rice in chaur land in 1995 with the variety Gautam in ¼ acre of land and an yield of 7.5 ton/ha is obtained. To address the problem of raising the boro rice seedling during winter an innovative approach is developed, where sprouted seeds were kept on bamboo made pan dagra or on plastic sheets. With this method, seedling could be grown under hut or in courtyard or even on roof. In this method, area required to rise is less and it is very easy to carry the seedling from one place to other. It saved the cost and time of uprooting from seedling nursery as well. This method is widely adopted and the farmer earns a lot by selling the seedling through this method as well as by cultivating boro rice. It is estimated that boro rice cultivation nearly covers about 5000 hectare area especially in water logged chaur land.

(Source: http://www.atmamadhubani.com/boro.pdf)

Boro-Boro Ratoon

Boro-ratoon refers to the crop which grows from the stalks left after the harvest of the main boro rice crop. Ratooning is possible only when boro rice is harvested before middle of May and field is not inundated up to June. Irrigation facility is an important pre-condition for taking a ratoon crop.

In this system, the main crop is harvested leaving stalks 30-45 cm high. Soon, new tillers re grow and the boro ratoon crop is ready within five to six weeks.

Boro- Rice Fish culture:

Boro rice-fish culture technology package can also be promoted which helps farmers in increasing their incomes.

Boro rice can be practiced in Saharsa, Supaul and Madhepura districts of the project area

---

Contacts for technical support:

- ICAR Research Complex for Eastern Region
  ICAR Pariser
  P.O Bihar Veterinary College
  Patna- 300014, Bihar, India
  Ph:+91-612-2223305,2223332, 2223962 (Director)
  FAX: +91-612-2223956
  Website : www.icarrcer.org, Email : info@icarrcer.org
- Rajendra Agricultural University,
  Pusa, Samasthipur, Bihar – 343125
  Ph: 06274 – 240262
- District Agriculture Offices
- BAIF (Bihar Programme) East Patel Nagar, House No. 2 Road No. 3, Patna, Bihar.
  Ph: 0612- 2292436

3.1.2. System of Rice Intensification\(^\text{30}\): 

The System of Rice Intensification, better known as SRI or Madagascar method of rice cultivation is popular among the farmers of several states of the country. This method has the potential to improve productivity of land, capital and water and labour simultaneously.

Description of practice:

In SRI method of rice cultivation seedlings are transplanted at an early age. 3-12 days old seedlings are transplanted to the main field along with the seedbed soil without disturbing the root system. Seedlings will be transplanted within 15-30 minutes after removing from the seedbed to avoid any kind of shock. Single seedling per hill is recommended for allowing more number of tillers. A spacing of 25 cm X 25 cm or more is provided to create better micro environment for higher number of tillers. Sufficient FYM to the tune of 10 t/ha should be applied to make the soil rich in organic matter. Frequent mechanical weeding will be done with specially designed weeders called rotary weeders which uproots the weeds and incorporates into the soil. Alternate wetting and drying is followed to create an aerobic condition at the root zone which helps in channeling the energy required to create aerenchyma (air pockets) in the roots under anaerobic conditions to increased productivity. When the soil and other conditions are favorable rice plant can produce as many as 34 or more tillers from a single plant.

Even in rain fed conditions farmers can easily adopt this method. The major constraints are lack of small scale agricultural implements like power tillers, mechanical weeders, harvesters and threshers.

SRI technology is suitable to all the 6 project districts.

---

Main environment-friendly features and other advantages of SRI\(^{31}\):
- Plants grow healthy and develops resistance to major pests and diseases
- Saves 35-45\% of water
- Reduces 65-70 \% seed
- More number of tillers/productive tillers resulting in 1.5-2 times more yield
- Early maturity (5-20 days) and less duration

**SRI in Bihar:**

The SRI programme is being implemented by Bihar Rural Livelihoods Project (Jeevika project) with the help of Professional Assistance for Development Action (PRADAN) in Gaya and Nalanda. PRADAN conducted the pilot work with 200 families with an average of 1 acre per family. Rice productivity in these project villages was around 1.5 t/ha under rain fed conditions. Substantial increase in the yields was observed compared to conventional methods. The plan is to scale up of SRI in 13 development Blocks falling in 6 districts- Gaya, Nalanda, Madhubani, Mujafarpur, Purnia and Khagaria with effect from February, 2003.

**Cost involved:** Rs. 12,000 per acre (Approx)

**Contacts for technical support:**

- **ICAR Research Complex for Eastern Region**
  ICAR Parisar
  P.O Bihar Veterinary College
  Patna- 300014, Bihar, India
  Ph: +91-612-2223305, 2223332, 2223962 (Director)
  FAX: +91-612-2223956
  Website: www.icarrcer.org, Email: info@icarrcer.org
- **PRADAN, Bihar**
  Road No.6, East Shastri Nagar
  Sikariya More
  Gaya – 323 001
  Bihar
  Tel: 0631-2210133
  E-mail: gaya@pradan.net
- District Agricultural Officer
- District ATMA office
- Krishi Vignan Kendra

---

\(^{31}\) Status of System of Rice Intensification (SRI) in India, M. C. Diwakar, Directorate of Rice Development, Bihar
3.1.3. Bamboo boring

**Description of practice:**

Bamboo boring is a low cost device for exploiting ground water which is introduced by the farmers of Saharsa district of Bihar in 1963. Bamboo borings (or Bamboo tube wells) are essentially shallow tube wells drilled up to a depth of only 50 ft. to 30 ft. These traditional bamboo borings are cased with a pipe made of bamboo strips. Recently some improvements have been made is this technology. The top 15 to 20 ft. portion of the casing is now replaced by the metal pipe to avoid the cutting by rats.

**Environment friendly features and other advantages:**

- The bamboo borings keep the exploitation of ground water low and within the reach of small cultivators and cultivators with scattered holdings
- Low capital cost (cost of shallow tube wells is 7 times more)
- Simple technology, can be drilled and installed by local artisans in a relatively shorter period of time
- The life of traditional borings was about at 4 to 5 years. But, the life of the improved ones is about 7 to 10 years. The life of the shallow tube wells is estimated to be 15 years. The cost of improved boring is nearly double than that of traditional bamboo boring.

**Status of Implementation in Bihar:**

It is popular among small and marginal cultivators of North-Eastern Bihar (Saharsa, Purnea, Khagaria, Madhepura, Supaul, Katihar and some parts of Bhagalpur). At present about 1,57,629 hectares of land is being irrigated through this source of irrigation. The estimated capacity of this system constitutes 3.15 per cent of all the sources of irrigation in Bihar. Bamboo Boring is sustainable in the whole area of Bihar. The soil in North-West of Bihar and the parts of Bihar just south of river Ganga is extremely congenial for bamboo boring as water is available within 30 ft. and this is extremely suitable for having irrigation by bamboo boring.

**Cost involved:**

Rs. 3000 (Approx)

**Contacts for technical support:**

- ICAR Research Complex for Eastern Region
  ICAR Parisar
  P.O Bihar Veterinary College
  Patna- 300014, Bihar, India
  Ph:+91-612-2223305,2223332, 2223962 (Director)
  FAX: +91-612-2223956
  Website : www.icarrcer.org, Email : info@icarrcer.org
- Rajendra Agricultural University,
  Pusa, Samasthipur, Bihar – 343125

---

3.1.4. Ahar-Pyne

Bihar has a rich tradition of community managed water harvesting systems that has been neglected in the past few decades. This system is called as Ahar-Pyne and is prominently developed in South Bihar which is characterized by scanty rainfall, rapid slope and dry or loose sandy soil that does not retain moisture. Here in this region the terrain has a marked slope 1 m per km from south to north. The soil here is sandy and does not retain water. Groundwater levels are low. Rivers in this region flow only during the monsoon, but the water is swiftly carried away or percolates down into the sand. All these factors make floodwater harvesting the best option here, to which this system is well suited.

Description of the practice:

Ahars are formed by constructing a series of retaining embankments across the line of drainage. An Ahar is a catchment basin embanked on three sides, the ‘fourth’ side being the natural gradient of the land itself. Ahars were also used to grow a Rabi (winter) crop after draining out the excess water that remained after kharif. Pynes are artificial channels constructed to utilise river water in agricultural fields. Starting out from the river, pynes meander through fields to end up in an ahar. Most pynes flow within 10 km of a river and their length is not more than 20 km. Water from the river is either directly transferred to the fields or impounded in Ahar.

Water supply for an ahar comes either from natural drainage after rainfall (rainfed ahars) or through pynes where necessary diversion works are carried out. Water for irrigation is drawn out by opening outlets made at different heights in the embankment.

The routine upkeep work involves cleaning and desilting of ahar and pyne and maintaining the water conveyance network, while the system is in operation. Ordinary maintenance such as the periodic clearance of silt, the repair of small breaches of the ahars and field channels should be done before the onset of monsoon.

The reasons behind the decline of the Ahar-Pyne system include lack of community involvement in maintenance due to changes in land tenure, the spread of tube well technology, poor integration of Medium Irrigation Projects, etc. While handing back Ahars for community management is not a feasible option in view of the changed community structures, the revival of the Ahar-Pyne can be done by tapping from existing schemes like NREGA.
**Environment friendly features and other advantages:**
Conserves water and checks soil erosion.
Crops can be grown in Ahar beds during dry seasons

**Status Implementation in Bihar:**
Most common feature in South Bihar

**Cost involved:**
Construction is done by Government. The cost of maintenance is between Rs. 500-1,000 per ha.

3.1.5. Organic farming:

**Description of the practice:**
Organic agriculture is primarily defined as a production system which is supportive of the environment. Organic production systems are based on specific standards precisely formulated for food production and aim at achieving systems which are socially and ecologically sustainable. The use of chemical synthetic fertilizers and pesticides is avoided. The farming system emphasizes upon management practices which are purely based on agronomic, biological and mechanical methods. To facilitate trade and avoid misleading terms the Codex Alimentarius, a joint body of Food Agricultural Organisation (FAO) and World Health organization (WHO) framed certain guidelines for the production, processing, labeling and marketing of organically produced food.

Organic Farming is mainstreaming in the country due to increased public and private attention and increasing prospects of organic agribusiness trade because of increasing awareness among citizens and demand for safe food and an approach to sustainable development of farming based rural livelihoods in marginal areas and for small farmers. A holistic system based approach will also help to enhance productivity, profitability, equity and environmental sustainability through synergistically integrating crop, horticulture, livestock, fisheries, agro forestry, watershed-based soil and water management, social capital formation, agro-processing and marketing.

**Status of Implementation in Bihar:**
In Bihar consumption of fertilizers and pesticides is less compared to national average especially in Kosi region due to lack of transport and marketing facilities. This can be an added advantage to promote organic farming. Organic farming of litchi is being promoted by National Horticulture Mission in 1000 ha area.

The GPs can promote organic farming through:

- Demonstrations and trainings
- Market development and promotion

**Cost involved:**
Varies depending on the crop; however costs are less by Rs. 5000 per acre compared to conventional method.
Contacts for technical support:

- ICAR Research Complex for Eastern Region
  ICAR Parisar
  P.O Bihar Veterinary College
  Patna- 300014, Bihar, India
  Ph:+91-612-2223305,2223332, 2223962 (Director)
  FAX: +91-612-2223956
  Website : www.icarrcer.org, Email : info@icarrcer.org
- Krishi Vignan Kendras
- ATMAs
- Rajendra Agricultural University,
  Pusa, Samasthipur, Bihar – 343125
  Ph: 06274 – 240262
- District Agriculture/Horticulture Offices
- BAIF (Bihar Programme) East Patel Nagar, House No. 2 Road No. 3, Patna, Bihar.
  Ph: 0612- 2292436

3.1.6. Few Best Practices Promoted by ICAR Eastern Region Complex: The following are some best practices designed and being promoted by ICAR Eastern Region Complex. GP Production Committees can play an active role in promoting these.

- Studies on rain water utilization in Sone Command, Bihar indicated that raising bund height from 7.5-15 cm to 25-30 cm around paddy fields to conserved maximum rainwater in their fields, retained moisture for longer period which reduced the irrigation water requirement of rice by 1-2 irrigations to rice crop from canal water.
- A Low Energy Water Application (LEWA) device operating at 0.4 kg/cm² pressure and fittable on existing sprinklers has been developed for irrigating rice, wheat and other close growing crops. The system has resulted in reducing overall energy requirements and high water and nutrient use efficiency as compared to other pressurized irrigation systems. The system is estimated to cost 2.5 times less than the cost of sprinklers (impact) system for the small area.
- Fish trenches cum raised bed intervention yielded a benefit of around Rs.35,000/ha from horticulture and fish production. Under the rice-fish system, rice yield increased by 4-13 per cent, income increased by 32 per cent as compared to sole rice cultivation.

Contact for technical support:

- ICAR Research Complex for Eastern Region
  ICAR Parisar
  P.O Bihar Veterinary College
  Patna- 300014, Bihar, India
  Ph:+91-612-2223305,2223332, 2223962 (Director)
3.1.7. Strategies for Flood Prone Areas:

*Crop Management Strategies in post flood situation of Kosi Region, Bihar*\(^\text{34}\):

Pre rabi cultivable area, Where flood water recedes by first week of October:

- From last week of September onward in uplands, Toria (Panchali, Bhawani, R.A.U.-17,T-9 and B.R.-23) can be sown.
- Lands which have excessive moisture during October, without irrigation facility, rabi crops like, gram (Pant G-114, RAU-52, Pusa-256 and C-235), lentil (BR-25, Arun), lathrythus and bakla etc can be taken.
- Fodder maize, berseem and cowpea + fodder sorghum (MP chari), cowpea + mustard can also be taken as fodder crops.

Where water recedes during to November:

- The area with low lands water stagnation is there upto 15th October, fields will continue to be wet during October-November. Instead of waiting for the field to dry up for normal ploughing and planting operations, rabi sowing of wheat may be taken up with Zero Tillage Machine. Lentil can also be sown with ZT machine.
- In uplands with irrigation water availability crops like. Winter Maize, Potato, Onion, Sweet Potato and Vegetables can be sown.

**Different crops (varieties and duration) to be grown during rabi season after receding of water are:**

<table>
<thead>
<tr>
<th>Crop</th>
<th>Varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mustard</td>
<td>Pusa bold, Varuna, Rajendra anukul, Rajendra suphalam, RAURDL02-01, RAURD1002, RAURD9403</td>
</tr>
<tr>
<td>Potato</td>
<td>Kufri Chandramukhi (30-90 days), Kufri Ashoka, (30-90 days), Rajendra Aloo-3 (75-35 days), Kufri Pukhraj (30-90 days)</td>
</tr>
<tr>
<td>Wheat</td>
<td>K0307 (Satabdi), HD2324, HD2733, PBW443, PBW343, HUW463, HP1761 (Jagdish), NW1012, HW2045, DBW14, NW2036, NW1014, HP1744 (Rajeshwari), HP2643 (Ganga), RAJ3765, HD2333, MACH6145, KRL19</td>
</tr>
<tr>
<td>Winter maize</td>
<td>Laxmi, Devki, Hi Starch, Ganga-11, Rajendra hybrid maize- 1,2, Saktiman-1,2,3,4</td>
</tr>
</tbody>
</table>

---

\(^\text{34}\) Crop Management Strategies in Post flood situation of Kosi Region, Bihar, sourced at [http://www.icarrcer.org/cropmang.pdf](http://www.icarrcer.org/cropmang.pdf) accessed on 11th may 2010
<table>
<thead>
<tr>
<th>Crop</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pulses</strong></td>
<td></td>
</tr>
<tr>
<td>Lentil</td>
<td>BR25, Arun, PL-406, PL77-12</td>
</tr>
<tr>
<td>Rajmah</td>
<td>PDR-14, DTL-62, HUL-57, KLS-213</td>
</tr>
<tr>
<td>Peas</td>
<td>Malviya-15, Adarsh, HUDP-15, Swati, Hariyal</td>
</tr>
<tr>
<td>Fodder</td>
<td>Berseem, Jai, Napier grass, Para-grass</td>
</tr>
<tr>
<td><strong>Seed spices:</strong></td>
<td></td>
</tr>
<tr>
<td>Dhania</td>
<td>Rajendra Swati, Pant Haritima</td>
</tr>
<tr>
<td>Methi</td>
<td>Rajendra Kanti, HM444</td>
</tr>
<tr>
<td>Mangrail</td>
<td>Rajendra Shyama</td>
</tr>
<tr>
<td>Azwain</td>
<td>Rajendra Muni</td>
</tr>
<tr>
<td><strong>Tuber crops</strong></td>
<td></td>
</tr>
<tr>
<td>Sweet Potato</td>
<td>Rajendra Sakarkand-5,35, 43, 47, Cross-4, Subhadra</td>
</tr>
<tr>
<td>Misrikand</td>
<td>Rajender misrikand-2</td>
</tr>
<tr>
<td><strong>Vegetables:</strong></td>
<td></td>
</tr>
<tr>
<td>Onion</td>
<td>N-53, Agrifound Light Red</td>
</tr>
<tr>
<td>Garlic</td>
<td>Yamuna Safed-2, G-1, G-50, G-323, G-232</td>
</tr>
<tr>
<td>Cauliflower</td>
<td>Early Variety: Patna early, Kuanri, Pusa Dipali, Pusa Katki</td>
</tr>
<tr>
<td></td>
<td>Mid Variety: Aghani, Pusi, Patna Main, Pusa Subhra</td>
</tr>
<tr>
<td></td>
<td>Late variety: Maghi, Snowking, Pusa Snowking-1, Pusa, Snowball-16,</td>
</tr>
<tr>
<td>Cabbage</td>
<td>Late and Mid: Late drum head, Pusa drum head, Pusa mukta, Questo</td>
</tr>
<tr>
<td>Radish</td>
<td>Pusa Himani, Pusa Chetki, Japanese white, Jaumpuri, Punjab</td>
</tr>
<tr>
<td></td>
<td>ageti, Kash, sweta, Kash hans</td>
</tr>
<tr>
<td>Palak</td>
<td>Pusa Hareet, Al-green</td>
</tr>
<tr>
<td>Methi</td>
<td>PEB</td>
</tr>
<tr>
<td>Coriander</td>
<td>Pant dhania-1</td>
</tr>
<tr>
<td>Carrot</td>
<td>Pusa Kesar, Pusa Meghali, Naintes</td>
</tr>
<tr>
<td>Tomato</td>
<td>DVRT-1, DVRT-2, H-36, Pusa Gaurav, Pusa Hybrid-1, Vaishali, Rupali, Pant-T3,</td>
</tr>
<tr>
<td></td>
<td>Arka Vikas, Utkal Pallavi, Pusa Hybrid-2, Pusa Hybrid-4, Uttkal Kumari,</td>
</tr>
<tr>
<td></td>
<td>Swarn Baibhav, Swarn Naveen, Swarn Lalima</td>
</tr>
<tr>
<td>Chilli</td>
<td>Pusa sadabhar, Pusa Jwala, Pant C-11, Jawahar 213</td>
</tr>
<tr>
<td>Capsicum</td>
<td>California wonder, Bharat, Indira</td>
</tr>
<tr>
<td>French Bean</td>
<td>Swarn Priya, Swarn Lata, Arka Komal, Pant Anupama 3</td>
</tr>
<tr>
<td>Vegetable Peas</td>
<td>Arkel, Kashi Nandini (VRP-5), Kashi Uday (VRP-6), Kashi Mukthi (VRP-22),</td>
</tr>
<tr>
<td></td>
<td>Azad-P1, Azad-P3, Pant Matar-2, Swarn Mukti</td>
</tr>
<tr>
<td>Cowpea</td>
<td>VRCP-1, VRCP-2, VRCP-3, VRCP-4</td>
</tr>
</tbody>
</table>
Late (Where water recedes after December):

Table 59: Different crops (varieties and duration) to be grown where water recedes after December

<table>
<thead>
<tr>
<th>Crop</th>
<th>Varieties</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boro Rice</td>
<td>Gautam, Dhanlakshmi, Richaria, Prabhat, Pusa-334, Pusa-44</td>
</tr>
<tr>
<td>Spring Maize</td>
<td>(15th February- 20th April): Suwan, Ganga-11, Shaktiman-1 &amp; 2</td>
</tr>
<tr>
<td>Sunflower</td>
<td>(15th February- 10th March): Surya, Moden, CO-1, Paradebik</td>
</tr>
<tr>
<td>Til</td>
<td>(February- March): Krishana, Kalika</td>
</tr>
<tr>
<td>Moong</td>
<td>(15th March- 10th April): Pusa Vishal, Samrat, PS-16</td>
</tr>
<tr>
<td>Urd</td>
<td>(15th March- 10th April): T-9</td>
</tr>
</tbody>
</table>

Excessive soil moisture condition:

- Broad casting/surface seeding of mustard, lentil, barley and wheat can be undertaken in soils with excess moisture
- Where timely sowing is not possible, dibbling of maize seed can be done in moist soil
- Zero Tillage sowing is very ideal for wheat and barley in flood-affected area to save the tillage cost and timely sowing
- In silt deposited area it is advised that half of the recommended dose of nutrient should be applied to all the rabi crops due to enriched fertility of the soil. In case of sand deposition, it should be removes and ploughed thoroughly
- In Kosi region, bamboo boring is suggested for irrigating rabi crops due to shallow water table in order to reduce the cost of tube well

Sand casted land

- In lands badly effected with sand and gravel casting, suitable land treatment needs to be carried out with soil amelioration.
- In less affected sand casted soil, radish (alka), palak, methi can be sown with soil ameliorates.
- Different vegetables such as bottle gourd, sponge gourd, pumpkin, bitter gourd etc can be grown in sand casted soil.
- All the vegetables are required to be protected from cold waves and frost through locally available materials likes sarkanda etc.
- Life saving irrigation should be applied as per the need of the crops.
3.2. Sustainable technologies in Animal Husbandry:

Activities by GPs:

3.2.1. Development and management of pasture lands:

Description of the practice:

To improve the productivity grazing lands can be reseeded with suitable grass varieties and high yielding perennial grasses that are adapted to the local conditions. The existing lands can be developed by the GPs under the NREGS and utilization fee/charges can be collected from the livestock owners. Fodder trees are one of the reliable sources for green fodder at the times of fodder scarcity. Fodder trees can be grown through agro forestry, silvipasture, and hortipasture systems. The house premises, bunds, road sides can be planted with fodder trees. After initial protection for three to five years they could be used as fodder.

The table below gives the extent of wastelands available in the project districts (2005-06):  
Table 60: Area under wastelands in project districts

<table>
<thead>
<tr>
<th>S. No</th>
<th>District</th>
<th>Wasteland (sq. kms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bhojpur</td>
<td>32.43</td>
</tr>
<tr>
<td>2</td>
<td>Nalanda</td>
<td>3.57</td>
</tr>
<tr>
<td>3</td>
<td>Patna</td>
<td>54.99</td>
</tr>
<tr>
<td>4</td>
<td>Saharsa</td>
<td>172.70</td>
</tr>
<tr>
<td>5</td>
<td>Supaul</td>
<td>213.51</td>
</tr>
<tr>
<td>6</td>
<td>Madhepura</td>
<td>194.70</td>
</tr>
</tbody>
</table>

The following trees and grasses can be used for developing the grazing lands:

Fodder trees:

1. *Acacia nilotica*
2. *Acacia tortolis*
3. *Azadirachta indica*
4. *Ailenthus excelsa*
5. *Leucaena spp*

---


Fodder grasses:

1. *Cenchrus ciliaris*
2. *Sehima nervosum*
3. *Dicanthium spp*
4. *Themeda spp*
5. *Lasiurus indicus*

Legumes:

1. *Stylosanthes spp*
2. *Macroptelium spp*

In waterlogged areas of North Bihar growing of fodder varieties like para grass and napier grass can be explored.

*Environment friendly features and other advantages:*

Efficient utilisation of wastelands

Checking the soil erosion

*Management of grazing lands:*

There are two best practices of grazing namely rotational grazing and zero grazing:

Rotational grazing: In rotational grazing, field should be divided into equal parts and the cattle are allowed to graze in rotational manner. This provides sufficient time for the grass to regenerate which can be utilized later.

Stall feeding (zero grazing): In case of stall-feeding the grass should be harvested and fed to the cattle. The harvesting should also be in a rotational manner to allow grass growth in other plots.

*Cost involved:*

Rs. 4,000 to 5,000 per ha

*Contacts for technical support:*

- District level offices of Animal Husbandry (Veterinary Offices)

*3.2.2. Establishing fodder banks:*

*Description of practice:*

During drought, availability of green fodder and natural grasses is drastically reduced leading to mortality and infertility in animals. This is usually accompanied by the shortage in the supply of crop residue which is the main source during these times. As a relief measure during drought fodder banks can be established by the Panchayats. The fodder can come from cultivation, procurement and collection as described below:
Green fodder:

- Catch crops like maize, bajra, sorghum, cowpea, bajra + cowpea, maize + cowpea and toria may be taken up after light showers during August-September. For quick growth in cereal fodders and higher crude protein contents, application of urea as foliar spray may be taken up
- Where ever irrigation is available, fodder crops like Berseem and Lucrene can be grown
- Perennial grasses like Bhabhar grass (*Eulaliopsis binata*), guinea grass (*Panicum maximum*), hybrid napier, (*Dichanthium annulatum*), *Chloris gayana* etc. which grow naturally during rainy season in different parts of the country can also be properly harvested, baled and treated with nutrients
- Fodder trees can be grown for supply of green fodder

Dry fodder:

- Residues of crops like rice, wheat, mustard, maize, groundnut, chick peas, lentil, etc. can be procured by Panchayats after harvest and dried, chaffed and stored for use during scarcity.
- Perennial grasses that grow during monsoon can be cut, dried and stored
- The fodder should be properly baled, treated with 4% urea or molasses and properly stored for use during fodder scarcity. Standardised machinery for harvesting, baling, is available in the market

Supplementary fodder/concentrates:

- Efforts should be made to increase the production of supplements like UMMB (Urea Molasses Mineral Block) lick
- In areas where scarcity is acute, sugarcane baggase and press mud, based on the availability may be treated and used for survival feeding
- Partially damaged wheat grain may be diverted for feeding to save the productive animals. However, substandard wheat having very high aflotoxin content should be avoided as the same may result in abortion in pregnant animals

**Cost involved:**

Around 1,00,000 for 100 cattle heads.

**Contact for technical support:**

- ICAR Research Complex for Eastern Region
  ICAR Parisar
  P.O Bihar Veterinary College
  Patna- 300014, Bihar, India
  Ph: +91-612-2223305,2223332, 2223962 (Director)
  FAX: +91-612-2223956
  Website: www.icarrcer.org, Email: info@icarrcer.org
- District Animal Husbandry Department
3.2.3. Chaff Cutters:
Panchayats can plan for installing chaff cutters in the premises for the use of livestock owners on paying on service charges. Depending on the population of the livestock, availability of electricity the following machines can be installed.

**Description:**

Hand operated:

Hand operated chaff cutter or manual chaff cutter machine is useful for chopping up hay and straw to feed livestock. The capacity of hand operated machine will be 75kgs per hour.

Electric:

Electric chaff cutters are useful for uniform chopping of the fodder for livestock or raw material to agro industries in short time. The capacity will be 360 kgs per hour. It is available in 1 H.P and 2 H.P. models.

**Environment friendly features and other advantages:**

Fodder wastage will be reduced by feeding the chopped fodder, occupies less storage space and easy to transport. Cut fodder improves digestion capacity of the animal.

**Cost involved:**

Hand operated chaff cutter – Rs. 3000-3500 (approximate)

Electric operated chaff cutter – Rs. 15,000 (approximate)

**Promotional activities:**

3.2.4. Utilization of manure for Bio gas generation:

Biogas is a clean and efficient fuel. It contains about 65 per cent methane, about 34 percent carbon dioxide and traces of other gases, such as hydrogen sulphide and ammonia. Biogas is produced when organic materials, such as cattle dung, are digested in the absence of air, in `Biogas Plant'.

**Description of practice:**

The biogas plant comprises of two concrete masonry structures known as inlet where the dung is fed mixed with water and an outlet where the by product or slurry comes out from the digester where the decomposition will happen in absence of air. The gas is collected with gas holder and supplied through a pipe.

**Environment friendly features:**

- Non polluting and renewable source of energy in place of fuel wood which is costly and leads to indoor air pollution
- Produces enriched organic manure, which can be used in agricultural fields
- Leads to improvement in the environment, and sanitation and hygiene

---

Cost involved:

1 cubic meter plant costs Rs. 5,500 and 2 cubic meter plant is Rs. 9,000

Contacts for technical support:

- Bihar Renewable Energy Development Agency (BREDA),
  3rd Floor, Sone Bhawan
  Birchand Patel Marg
  Patna – 300 001
  Fax – (0612) 2506572
  Phone – (0612) 2233572, 2223734

- Ministry of Non-Conventional Energy Sources,
  Govt. of India
  Block-14, CGO Complex, Lodi Road
  New Delhi – 110 003
  Tel: 91 11 2436 0707/ 2436 0404
  Fax: 91 11 2436 1293

3.3. Sustainable technologies in fisheries:

The proven sustainable technologies in fish culture that can be practiced or promoted by the GPs for the increased production, income, efficient utilisation of the resources besides environmental protection. Few of the technologies suitable for Bihar state are listed below.

3.3.1. Composite Fish Culture[^38]:

Central Inland Fisheries Research Institute, after two decades of research has standardised a system of synergic aquaculture, properly known as composite fish culture. This is mixed culture or polyculture of a group of compatible, mutually complementary and supplementary freshwater species of fast growing food fish, jointly in pond over a period of time.

**Description of the practice:**

Under this system of culture, most of available ecological niches of the pond ecosystem are exploited by culturing compatible fish species of different feeding habits. The varieties of fish that can be grown by this system are Chinese carps such as catla (*Catla catla*), Rohu (*Labeo rohita*), Mrigal (*Cirrhinus mrigala*), silver carp (*Hypophthalmichthys molitrix*), Grass carp (*Otenopharyngodon idella*) and Common carp (*Cyprinus carpio*), which graze from different zones of the pond. The Catla and silver carp are both surface feeders, but catla is zooplanktophagous, where as silver carp is predominantly phytoplanktophagous. The Rohu is column feeder and both mrigal and common carp are bottom feeders. Common carp is, as a matter of fact omnivorous and is also called a ‘scavenger fish’. The grass carp feed on macrovegetation. These six species can be cultured together under a system with proper

[^38]: Strategy For Transfer Of Composite Fish Culture Technology, sourced from [www.fao.org/docrep/field/003/AC229E/AC229E07.htm](http://www.fao.org/docrep/field/003/AC229E/AC229E07.htm), accessed on 21st August 2010
fertilization, manuring, feeding and manipulation of stock through intermittent harvesting and stocking. The fish yields ranging from 3,000–6,000 kg/ha/yr have generally been achieved through the adoption of prescribed package of practices in the field conditions against the conventional production rate of 600–1000 kg/ha/yr\(^{39}\).

**Environment friendly features:**
- efficient utilization of existing water bodies and feed

**Status of implementation:**
The production system has since been verified in different parts of the country through All India Coordinated Research Project on Composite Fish Culture with its centres located in Haryana, Uttar Pradesh, Maharashtra, West Bengal, Andhra Pradesh, Tamil Nadu, Assam, Bihar, Gujrat, Madhya Pradesh and Orissa. The production level in some of the experimental ponds of the All India Co-ordinated Research Project went upto 10,673 kg/ha/yr (Sinha, 1979).

**Cost involved:**
Rs. 1,00,000 per ha (Approx)

3.3.2. Integrated Fish Farming:

When Fish culture is practiced along with other systems of crop or animal production, it is referred to as 'Integrated Fish Farming'. The basic principle involved in Integrated Fish Farming is the by product or waste of one system is utilised by the other. The possible combinations of integrated system are: Fish-poultry integration, Fish-duck integration, and Fish-livestock integration.

**Description of practices:**

**Fish-poultry integration\(^{40}\):**
In fish-poultry integration, the poultry birds waste is used for manuring the fish pond. For one ha of fish pond 500-600 birds can be reared in cages @ 4-5 nos / m\(^2\). Droppings obtained from the birds are sufficient to supply required nutrient for one ha pond. This manure provides 2 %; nitrogen 1.25 % phosphoric acid and 0.75 % potash.

Selection of birds depends on the utility and economic importance, which may be meat type (broilers) or egg type (layers); dual purpose breeds can also be used.

---

\(^{39}\) Strategy For Transfer Of Composite Fish Culture Technology, sourced from [www.fao.org/docrep/field/003/AC229E/AC229E07.htm](http://www.fao.org/docrep/field/003/AC229E/AC229E07.htm), accessed on 21\(^{st}\) August 2010

The shed can be constructed adjacent to the pond site over the dyke for manurial management. The ponds may be stocked with fingerlings of the three Indian Major Carps Catla, Rohu and Mrigal or together with exotic carps Grass carp and Silver carp at a stocking density of 5,000-6,000 nos/ ha. No additional fertilizers are required in this system, except liming at periodical intervals to maintain the pH of the pond also helps to increase the productivity of the pond. Fish production levels of 3-4 tons/ ha is normally obtained besides eggs and birds.

**Fish-duck integration:**
Another system of integration can be fish-duck integration which is well suited to Bihar. Fish pond system with several aquatic animals and plants provides an excellent foraging environment for ducks. Ducks consume insects and pests from the water body, making the environment safe for fish. Duck droppings go directly into the pond fertilizing the water homogenously, which in turn provides essential nutrients for growth of natural food for fish. Ducks also help in aerating the water while raking and dabbling for food collection.

The manurial requirement of one-hectare carp pond can be met through introduction of 200-300 ducks. Ducks can be released to the pond immediately after seeding. After four to five months of rearing the male ones can be sold, keeping the females for egg production till end of the culture period of one year. The harvested ones can be replaced with fresh stock of ducklings. Low cost night shelter of suitable size may be constructed over the pond or near the pond. Though the ducks collect their food from the pond, they also need to be provided additional supplementary feed for higher output. Usually ducks are fed with ground nut oil cake and rice bran (1: 1 ratio) with 3-5% of body weight.

ICAR Eastern Region Complex has successfully stocked Khaki Campbell ducks @ 300 /ha of water area. Ducks started laying eggs at the age of 24 – 26 weeks Average egg production was 160 eggs/bird/yr

**Rice-Fish Integration**

**Description of practice:**
Fish species, such as carps, tilapias and catfish, can also be cultured in rice fields, which has the potential to increase rice production by as much as 15% This increase is due fish excreta increasing soil fertility and the fish contributing to the control of weeds and insect pests. During the experiments conducted by

---

\[41\] [www.icarerc.org](http://www.icarerc.org), sourced on 21\textsuperscript{st} August 2010

\[42\] [www.icarerc.org](http://www.icarerc.org), sourced on 21\textsuperscript{st} August 2010

ICAR Eastern Region Complex the fish yield varied from 3 - 5 t/ha in pond and about 2 t/ ha in renches.

Local varieties of rice which take upto 6 months are preferable; this makes it possible to have a longer period of fish culture. Generally deep-water (floating) rice is more suited for rice fish farming. Coming to fish species Catla, Rogu and Mrigal can be grown.

Low lying rice field, with sufficient water holding capacity are suitable for fish farming. The embankments should be of 40-50 cm height. Water level should be maintained at 30cm level throughout the period. Trenches should be made on the periphery of the field (occupying around 20% of land) filled with water for movement of fish and a pond of 1/10th of size of field towards the tail end of the filed to act as refuge. The weir should be constructed between the trench and refuge for free access. The excess rainwater spilling over the weir should be harvested in to the refuge.

Fish stocking should be done at the rate of 5,000-6,000 nos/ ha in the ratio of 3:3:4 in the field. No chemical pesticides should be used as they will kill the fish

The wetland areas or submerged fields can be used as integrated fish farming with Makhana as well.

Environment friendly features and advantages:

- Efficient recycling of wastes for improved production
- Scope for less use of chemicals
- Increased income per unit areas and available resources

Costs involved (per ha):

- Poultry fish culture - Rs. 1,50,000 (Approx)
- Fish cum duck – Rs. 1,30,000 (Approx)
- Rice fish farming – Rs. 50,000 – 70,000

3.3.3. Cage culture of fish

Description of practice:

Cage culture of fish is method of raising fish in containers enclosed on all sides and bottom by materials that hold the fish inside while permitting water exchange and waste removal into the surrounding water. The advantage is many types of water resources can be used, including lakes, reservoirs, ponds, strip pits, streams and rivers which could otherwise not be used. Investment will be little and harvest is simple. Indian major carps, viz., Rohu, Catla and Mrigal and Carps viz., Common carp (Cyprinus carpio), Grass carp (Ctenopharyngodon idella) and Silver carp (Hypophthalmichthys molitrix) can be grown under cage culture.

The following are criteria that should be considered before attempting cage culture

- The surface area should be at least half an acre and preferably an acre or larger (but should not include weed infested areas of the pond).

Source: Division of Livestock and Fishery Management, sourced at www.icarrcer.org/dlfm.pdf, accessed on 21st August 2010
The pond should be at least 6 feet deep over a sizable area, and most of the pond should be more than 3 feet deep. Cages for fish culture can be constructed from a variety of materials according to required shape and size. In Bihar bamboo can be used. Mesh size should not be smaller than 1/2 inch to assure good water circulation through the cage while retaining small fingerlings (4 to 5 inch) at the start of the production cycle.

**Status of implementation:**

Not in practice in Bihar, however the Department of Fisheries is planning for trials.

**Cost involved:**

Around 20,000 for 5 cages of size 3m x 2m x 1.5 m

**Contacts for technical support:**

- Central Inland Fisheries Research Institute (ICAR)
  Kausalyagang
  Bhubaneswar-751002
  Orissa.
- Department of Fisheries, Government of Bihar and District Fisheries Officer at District level
- ICAR Research Complex for Eastern Region
  ICAR Parisar
  P.O Bihar Veterinary College
  Patna- 300014, Bihar, India
  Ph:+91-612-2223305,2223332, 2223962 (Director)
  FAX: +91-612-2223956
  Website : www.icarrcer.org, Email : info@icarrcer.org

### 3.4. Sustainable technologies in Promoting Social Forestry:

#### GP activities

**3.4.1. Nurseries:**

Social forestry or plantations has become a major environmental protection activity taken up under NREGS. Hundreds of saplings are required by each village under this programme. In order to meet this demand, there is ample scope for introduction of small rural nurseries, which will serve to augment the incomes of poorer sections of rural society while boosting the environmental quality of the region. Such rural nurseries would also provide useful extension mechanisms for introduction of new or better varieties of different crops.

**Description of practice:**

Availability of fertile soil, compost and water are crucial for success of the nursery. Ideally, a mixture of soil, sand (or crushed stone) and compost, in the proportion of 1:1:1 can be used. A compost pit or Vermicompost unit can be maintained for continuous supply of compost.
Local species should be selected. Seeds can be selected from good, healthy trees.

Saplings can be raised in polythene bags. This ensures large number of seedlings in minimum space.

Shade is necessary. In absence of natural shade, shade nets can be used.

For any pest attack or disease infestation use non chemical methods of control such as spray of neem oil, ash, cow dung and urine spray etc can be used. Physical methods like collection and destruction of larvae can also be practiced.

Based on the available capital improved technologies like humidity chamber, green house etc. can be adapted.

Contacts for technical support:

- District Forest nurseries can be approached for necessary technical guidance, training

3.5. Environment Friendly Practices in Water and Sanitation:

**Water purification for Arsenic and Fluoride Contamination**

3.5.1. Subterranean Arsenic Removal Technology (SAR):45

*Description of technology:*

The technology involves a very simple and easily adaptable process to remove arsenic and other heavy metals from groundwater using controlled oxidation by aerial oxygen and bioremediation process taking place inside the aquifer. In the in situ treatment method, the aerated tube well water is stored in feed water tanks and released back into the aquifers. The dissolved oxygen in aerated water oxidizes arsenite to less mobile arsenate, the ferrous iron to ferric iron and Manganese complexes (II) to Manganese (III), followed by adsorption of arsenate on Fe (III) and manganese (III) and subsequent precipitation resulting in a reduction of the arsenic content in tube well water. The excess iron contamination turns an advantage here as it arsenic gets co precipitated with iron in the aquifer itself without coming to the surface. The more iron in water the better will be the performance which is ideal for Bihar situation. The plant can run for 10 years with little maintenance and after that the water within 200 mts radius will become arsenic free.

*Environment friendly features:*

No chemicals are used and almost no sludge is produced during operational stage since iron and arsenic are trapped under the earth. Oxidation is further enhanced biologically by bacteria.


Status of implementation in India:

The SAR Technology was developed by a consortium of European and Indian partners led by Queen’s University Belfast, UK and successfully demonstrated at a location near Kolkata during 2005-06. The technology was subsequently replicated successfully in six arsenic affected areas in West Bengal through World Bank Development Marketplace 2006 programme. The operation and maintenance cost is very low and the SAR plants have an expected lifetime of 10 years.

Cost involved:

The estimated cost of a SAR plant of 4000 lt/cycle capacity is 1,50,000/-. Maintenance cost is Rs. 50/- month. Local plumbers can maintain with minimum training.

Promotional Activities:

3.5.2. Nalgonda Technique for Removal of Fluoride\textsuperscript{46}:

The method is popularly known as the Nalgonda technique (1993), developed by National Environmental Engineering Research Institute (NEERI) and named after the town in India, where it was first used at water works level.

Description of procedure:

It involves adding lime, bleaching powder (optional) and alum in sequence to the water, followed by coagulation, sedimentation and filtration. As hydrolysis of alum to aluminium hydroxide releases H\textsuperscript{+} ions, lime is added to maintain the neutral pH in the treated water. Excess lime is used to hasten sludge settling.

Status of implementation:

The Nalgonda technique has been successfully used at both individual and community levels in India and other developing countries. Domestic defluoridation units are designed for the treatment of 40 litres of water whereas the fill and draw defluoridation plants are designed for small communities.

Cost involved:

Annual costs for the treatment are within Rs.100/-.  

\textsuperscript{46} Defluoridation Techniques with Cost Analysis – sourced at http://www.watersanitationhygiene.org/References/EH_KEY_REFERENCES/WATER/Water%20Quality/Fluoride/Defluoridation%20(India).pdf accessed on 23\textsuperscript{rd} August 2010
3.5.3. Ion Exchange method

Description of the process:
In Ion Exchange method, aluminium oxide is used as ion exchanger. The raw water is poured over an aluminium oxide filter and the de-fluoridated water is stored in a storage tank. The material used in contact beds includes processed bone, natural or synthetic tri calcium phosphate, hydroxy apatite magnesia, activated alumina, activated carbon and ion exchanger. Models are available for domestic and community use.

Indion fluoride treatment device that can be attached to the hand pump is developed by Ion exchange India limited and tried out in some villages in Madhya Pradesh.

Contacts:
Ion House, Dr. E. Moses Road,
Mahalaxmi, Mumbai-400 011, India
Tel: (91) 22 3939 0909 / 3047 2042
Fax: (91) 22 2493 3737
email: hocro@ionexchange.co.in
IEL@ionexchange.co.in

3.5.4. Eco-San toilets:
Two NGOs SCOPE and MYRADA supported by UNICEF have brought ecological sanitation into the community domain in Tamil Nadu.

Description:
The design of the eco-toilet is based on the following principles:

- There is no pit in the ground; instead there are two chambers above the ground. This ensures there is no pollution of ground water.
- Separation of the solid waste (faeces) and the liquid waste (urine+wash water). The separation is essential as faeces kept separate from liquid waste desiccate and disintegrate faster and occupy less space. Separation also prevents bad odour which results from mixing of urine and faeces.

References:
- The ECOSAN Toilet – source: http://www.humana-india.org/Articel.asp?NewsID=70, accessed on 29th August 2010 and
• The user of the toilet will defecate in the defecation hole and the urine is drained separately. Then the user has to move a foot backwards or sideways to wash in a separate washing trough.

• The liquid waste (urine+wash water) is drained through a mud pot into the earth adjoining the toilet about one foot below surface. There can be a small square plot which can be used for horticulture or growing sturdy flowering plants. The second chamber is used only after the first is full.

• The products of the first chamber, the faecal matter will become free of pathogens like bacteria, viruses and protozoal cysts after a year which turns into black humus with a pleasant odour. It is good manure and an excellent conditioner that restores health and productivity of the soil.

**Cost involved:**
The price of eco-sanitation toilets installed by SCOPE ranges from Rs. 3,500 to Rs. 5,000, most of which comprises the cost of materials for the superstructure and above-ground chambers.

**Status of implementation in Bihar:**
Eco-San models are being tried out in Bihar too. Adithi organization has constructed household EcoSan toilets in Muzaffarpur and Sitamarhi district. This model requires strong NGO role and IEC as it needs change in practices. Cost is an important factor in case of EcoSan toilets. The users of the toilet have to understand the primary principle on which eco-friendly compost toilets are based.

**Contacts for technical support:**

• UNICEF State Office for Bihar
  No. 3, Patliputra Colony
  Patna 300 013
  Bihar, India
  Tel: 91 0612 2275-722, 2261-621, 2261-723, 2275-720
  Fax: 0612 2262-620
  Email: patna@unicef.org

• Adithi
  2/30, State Bank Colony-II
  Bailey Road
  Patna - 300014
  Bihar - 300014
  Tel - 91-612-233013
  Fax - 91-612-233013

• Ecosan Services Foundation
  “Vishwa Chandra”,
  1002/42 Rajenda nagar,
  Pune - 411030,
  Maharashtra, India
  Phone: 0091 (0)20 64 000 736
  Fax: 0091 (0)20 24 530 061
3.6. Sustainable housing technologies

3.6.1. Energy efficient house construction materials

Steel, cement, glass, aluminium, plastics, bricks, etc. commonly used for building constructions which are energy intensive materials. Generally these materials are also transported over great distances. Extensive use of these materials can drain the energy resources and adversely affect the environment. On the other hand, it is difficult to meet the demand for buildings by adopting only energy efficient traditional materials (like mud, thatch, timber, etc.) and construction methods. Hence, there is a need for optimum utilization of available energy resources and raw materials to produce simple, energy efficient, environment friendly and sustainable building alternatives and techniques. Some of such energy efficient technologies are given below:

3.6.1.1. Stabilized Mud Blocks (SMB)

**Description of process:**
These are dense solid blocks compacted using a machine with a mixture of soil, sand, stabilizer (cement or lime) and water. After 23 days curing, the Stabilized Mud Blocks (SMB) are used for wall construction. Two block sizes (305 × 143 × 100 mm and 230 × 190 × 100 mm) have been standardized. These blocks are 2.5 to 2.3 times bigger in volume when compared with locally available conventional burnt clay bricks. Compressive strength of the block depends upon the soil composition, density of the stabilizer.

**Environment friendly features and advantages:**
- Energy efficient, do not require burning, saves 70% energy when compared to burnt bricks, economical, 20–40% savings in cost when compared to brick masonry, plastering can be eliminated, and better block finish and aesthetically pleasing appearance.

**Cost involved:**
- 20-40% less compared to conventional bricks

3.6.1.2. Fine concrete blocks/Fly ash bricks

**Description of process:**
The concept and process is similar to the one employed for SMB production except that instead of soil, fine materials are added to the mix. Materials like fly ash, polished stone waste, etc. are mixed with either sand or stone quarry dust, along with cement and water. The mixture is then compacted into blocks using a machine (manual or mechanized) and then cured for 23 days. Fly ash is used in the range of 20–25% by weight of sand for good quality block.

---

In addition to the flyash adding 10% red loamy soil can give mud colour for the block.

**Environment friendly features and advantages:**
Use of waste materials which is otherwise a problem for the local environment. No fuel use and low cost of manufacturing and good quality bricks.

**Cost involved:**
Around 40% less compared to conventional bricks.

**Contacts:**
- Given below are contacts of few fly ash brick suppliers in Patna.
  - Shila Infra Material Private Limited
    Manufacturer of fly ash bricks
    Address: Mithila Colony,
    Nasriganj, Danapur,
    Patna, Bihar - 300 013, India
    Phone: +(91)-(612)-2561006
    Fax: +(91)-(612)-2561006
    Mobile / Cell Phone: +(91)-9335421766/9303453667
    Website: [http://www.indiamart.com/shilainframaterial/](http://www.indiamart.com/shilainframaterial/)
- RKD TRADERS
  R K SHARMA
  Main road,
  West Patel Nagar,
  Patna, Bihar, India

3.6.1.3. Vertical Shaft Brick Kilns

**Description of the practice:**
The VSBK technology is one of the best available options for small brick manufacturers which substantially reduces the fuel wood and is environment friendly. VSBK essentially comprises one or more rectangular vertical shafts within a kiln structure. Dried raw bricks and coal were carefully stacked into batches and loaded on to the top of the shaft. From the bottom of the shaft, batches of fired clay bricks were continuously removed. During the kiln operation, the raw bricks were progressively moved from the pre heating, firing, and cooling zones before reaching the shaft exit.

**Environment friendly features and advantages:**
- Energy consumption (coal) is 20%-50% less when compared to the conventional set ups.
- SPM (suspended particulate matter) emission is less.
- The VSBK could be operated during all the seasons as the kiln’s roof protected it from the vagaries of weather.

**Cost involved:**
Around 30-50% less compared to conventional bricks.

---

The details of research Agencies in Rural Housing are attached as **Annexure 10.**

### 3.7. Sustainable energy technologies that can be promoted by PRIs:

#### 3.7.1. Smokeless chulhas\(^{51}\):

To tide over the drawbacks of indoor pollution, efficient stoves models (both fixed and portable) and smokeless models are being developed and disseminated.

**Description of the practice:**

The stoves are constructed with Bricks, Soil, Metal rods, Grate and Chimney. They can also be constructed using metal moulds of standard dimensions. The space required for the construction of this cook stove is 3 cubic ft. The dimensions of the cook stove are 3’x1’x1’. There will be 2-3 openings to keep the vessels food vessels. A chimney is provided to the cook stove to allow the escape of smoke and fuel gases. Solid fuels such as fuel wood, agricultural waste, and dung cake can be used in the cooking stove. However, biomass such as saw dust, rice husk that are available in the form of fine dust cannot be used as they close the air entrance.

**Environment friendly features:**

The heat transfer efficiency of this cook stove is 25-23%. For cooking the food that takes 1.5 kg of fuel wood in traditional cook stove, the improved cook stove takes about 1 kg. Provides smoke free environment.

**Cost involved:**

Rs. 100-150

#### 3.7.2. Biomass Gasification\(^{52}\):

Biomass gasification is basically conversion of solid Biomass (Wood, agriculture residues etc.) in to a combustible gas mixture normally called “Producer Gas”.

**Description of the process:**

The process involves partial combustion of Biomass. Partial combustion is carried out in absence of air. Partial combustion produces Carbon Monoxide (CO) as well as hydrogen (H2) which are both combustible gas. Solid Biomass fuels, which are usually inconvenient and have low efficiency of utilization can thus, be converted in to a high quality gaseous fuel with associated convenience etc.

**Environment friendly features:**

Use of renewable resource, clean energy production.

---

\(^{51}\) http://www.sdabeebreda.com

Status of implementation in Bihar:

In Bihar during the year 2007-03, 13 biomass gasification units are established including 2 in Patna of capacities 60 KW and 120 KW\(^3\).

Cost involved:

Around 15 lakhs for 100 kw.

3.7.3. Wind mills\(^4\):

Description of process:

The windmill is powered by wind energy. The rotating blades of wind mill effectively turn wind energy into usable energy such as electricity. A typical windmill comprises of a 13 bladed rotor of 3 meter diameter installed on a tower of 10 meter height. At village level it can be used for pumping water for irrigation. A wind mill can pump water from a maximum depth of 30 meter, at an average wind speed of 3-10 km per hours. The approximate rate of pumping under ideal conditions ranges from 1000 to 1200 liters per hour, which could cater to the irrigation needs of about half to one hectare area depending upon the cropping pattern and its water requirement.

A Windmill could be installed on an open well, bore well, pond etc at a site which is free from any obstacles such high rise buildings, tall trees etc. that could restrict the availability of Wind to the rotor of the windmill.

Environment friendly features and advantages:

Clean energy production, less production cost.

Cost involved:

2.5 to 3 lakhs per Kw. MNRE subsidies are available from 50% to 75%

Contacts:

List of eligible manufacturers for water pumping wind mills:

- Kamal Engineering Works,
  Bhatt Market Block 'C',
  Bharopar, Ramchandrapur,
  Biharsharif, Nalanda, Bihar
- Nalanda Engineering Works,
  Bhainsasoor, Ranchi Road,
  Biharsharif, Nalanda, Bihar
- Sarvodaya Engineering
  Works, Industrial Estate,
  Ramchandrapur, Opp. Ajanta

---

\(^3\) Road map for power sector development in Bihar, a report of special task force on Bihar, Government of India, July 2007 - Sourced at [http://planningcommission.nic.in/aboutus/taskforce/tsk_bps.pdf](http://planningcommission.nic.in/aboutus/taskforce/tsk_bps.pdf), accessed on 22\(^{nd}\) May 2010

\(^4\) Source: [http://www.sdabeebreda.com/Wind%20mill.htm](http://www.sdabeebreda.com/Wind%20mill.htm), accessed on 22\(^{nd}\) August 2010
3.7.4. Solar dryers\textsuperscript{55}:

\textit{Description:}
In solar dryer, the radiant energy of the sunrays is utilized to evaporate the moisture content in the food material. The water vapour thus formed escapes into the open space of the dryer and is removed with the help of exhaust fans. The Solar Air Heating System raises the ambient air temperature by 30\textdegree C to 40\textdegree C and provides preheated air as input to the conventional heaters. The Solar Air Heating Systems are currently used in processing of tea leaves, fruits, vegetables and drying of grains etc.

\textit{Environment friendly features and advantages:}
Saves fuel like coal, wood etc. utilizes freely available resource.

\textit{Cost involved:}
Rs. 10,000 – 12,000 per sq m (Approx). MNRE is providing subsidies on solar cookers.

3.7.5. Solar cookers\textsuperscript{56}:

\textit{Description:}
In solar cooking, the radiant energy of sun is trapped and converted into heat energy for the cooking food. In India a number of designs of solar cookers have been developed in recent years. These include the Box type solar cooker (for a family of 4 to 5 members), Dish type solar cooker (for 10-15 people), Community solar cooker (for about 40 – 50 people) and Solar steam cooking system (that can cook for 500 people). They are ideal for cooking food for a family of 5 persons. These are useful for migrant workers since the cooking can be done at site even as they work this can also be used to keep the food warm.

\textit{Environment friendly features and advantages:}
Saves use of fuel like wood, coal, LPG. No pollution, use of freely available energy.

\textit{Cost involved:}
Rs. 2,000 – 3,000 (Approx). MNRE is providing subsidies on solar cookers.

3.7.6. Solar photovoltaic water pumps\textsuperscript{57}:

\textsuperscript{55} http://www.sdabeebreda.com, http://www.teda.gov.in/page/Thermal-Air.htm, accessed on 27\textsuperscript{th} August 2010
\textsuperscript{56} http://www.sdabeebreda.com/solar%20cooker.htm
\textsuperscript{57} http://www.tn.gov.in/citizen/teda.pdf, http://www.teda.gov.in accessed on 27\textsuperscript{th} August 2010
Description:
In a solar photovoltaic water pumping system, photovoltaic modules convert sunlight directly into electricity. This electrical energy is used to run an electric motor-pump for pumping water. Several thousand individual cells assembled into sizeable arrays supply electricity to operate the pump.
The water discharge from the pump depends on the intensity of the sunrays from morning till evening. The water discharge would hence be maximum around noontime. The direction of the solar panel / arrays are to be adjusted such that sunrays fall directly on the solar cells thus trapping maximum solar radiation. In a day, the solar photovoltaic water pumping system can deliver a maximum of 77 liters of water (from a depth of 10 meters) per watt of installed photovoltaic capacity.

Environment friendly features and advantages:
Use of renewable energy that is freely available.

Cost involved:
Rs. 4,50,000 for 1300 Wt capacity with 2 HP pump. MNRE is providing subsidies.

3.7.7. Solar lanterns:
Solar lanterns are portable and can be used indoor and outdoor as well. This can be used for home lighting and in remote areas. This provides illumination for 4 hrs in a day.

Description:
Solar Photo Voltaic (SPV) lantern consists of 10 watt. SPV module, rechargeable battery, 5W/7 W CFL Lamp and electronics (i.e., inverter & Charge Controller). When sun light falls on the SPV module, it is converted into DC Electricity. This DC Electricity is stored in a battery and is converted into AC electricity by the Electronics and used for supplying power to the CFL Lamp.

Environment friendly features and advantages:
Use of renewable energy that is freely available.

Cost involved:
Rs. 3,500-5,000 per unit. Subsidies are available from MNRE.

Contacts:

Bihar Renewable Energy Development Agency (BREDA),
3rd Floor, Sone Bhawan
Birchand Patel Marg
Patna – 300 001
Fax – (0612) 2506572
Phone – (0612) 2233572, 2223734
TOOL TO INCORPORATE NRM ASPECTS INTO GP PLANNING:

1. Wastelands:
   - What is the extent of wasteland in the Gram Panchayat Area?
   - What is the current use of these wastelands?
   - What are the problems associated with these wastelands (open grazing, soil erosion, flooding etc.)?
   - What actions do you think are necessary to put the wastelands into productive use?
   - What specific actions can the Gram Panchayat take in the coming year (eg: developing grazing lands, plantation with economically important native species, fencing and protection?)
   - What are the resources required to take this action?
   - What schemes/programmes can support this specific action?

2. Fertile lands:
   - What is the extent of agricultural lands?
   - What are the crops grown?
   - What are the problems associated with agricultural lands (siltation, erosion, water logging, lack of irrigation etc.)
   - What are the specific actions that Gram Panchayat can take in the coming year (eg: silt removal, erosion proof measures, improving the drainage, reclamation etc.)
   - What are the resources required to take this action?
   - What schemes/programmes can support this specific action?

3. Ponds and tanks:
   - Number of tanks in panchayat and extent of area under each?
   - What are the current uses of these ponds, tanks (irrigation, fish culture, use for domestic purposes etc.)?
   - What are the problems associated with these ponds and tanks (weed infestation, siltation, breaching of bunds during floods, pollution due to inflow of sewage, effluents etc.)
   - What specific actions can the gram panchayat take in the coming year (eg: silt removal, weed removal, strengthening the bunds, checking the sewage flow etc.)
   - What are the resources required to take this action?
   - What schemes/programmes can support this specific action?

4. Canals and rivers:
   - Number of canals and river that flow through the Panchayat?
   - Current use of the canals and rivers (irrigation, fishing, domestic purposes etc.)
   - What are the issues associated with these (silt deposits, breaching of bunds, bank erosion etc.)
• What specific actions can the gram panchayat take in the coming year (soil removal, strengthening bunds, construction of check dams, outlet channels in flood prone areas etc.)?
• What are the resources required to take this action?
• What schemes/programmes can support this specific action?

5. Ground water:
• What is the level of ground water table of the panchayat?
• What are the current uses of the ground water (drinking, irrigation, other uses)
• What are the problems associated with ground water use in the Panchayat (degradation, quality etc.)
• What specific actions can the gram panchayat take in the coming year (recharge measures, purification etc.)?
• What are the resources required to take this action?
• What schemes/programmes can support this specific action?

6. Wetlands:
• Number or extent of area under wetlands in the panchayat?
• What are the current uses of the wetlands (fishing, agriculture, irrigation, grazing etc?)
• What are the problems associated with the wetlands (over flow during rains, weed infestation etc.)
• What specific actions can the gram panchayat take in the coming year (strengthening bunds, construction of outlet channels to near by fields, removal of weeds, fish seeding with native varieties, makhana/sighada cultivation etc.)?
• What are the resources required to take this action?
• What schemes/programmes can support this specific action?

7. Forests and trees:
• What is the extent of land under forest area in the panchayat?
• What are the current uses of the forest (minor forest produce collection, fuel wood collection, grazing etc.)
• What are the problems associated with the forest area (loss of forest cover, unsustainable collection of produce etc.)?
• What specific actions can the gram panchayat take in the coming year (increasing density of plantations, promoting sustainable methods of collection etc.)?
• What are the resources required to take this action?
• What schemes/programmes can support this specific action?
Brief Report on the Stakeholder Consultation Workshop on EMF:

The stakeholder consultation workshop on Environment Management Framework (EMF) was organized on 15th November to invite the suggestion of stakeholders – Panchayat Representatives, Government Line Departments, NGOs, and the BPSP Project functionaries for strengthening the EMF. About 75 people from the listed sectors/fields have participated in the workshop. The schedule of the workshop included the following sessions:

<table>
<thead>
<tr>
<th>Session</th>
<th>Resource Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction (About BPSP, Context of EMF etc.)</td>
<td>Sri. C.P. Khanduja, IFS, Project Director, BPSP</td>
</tr>
<tr>
<td>Presentation on Environment Assessment Study – methodology, Findings</td>
<td>Mr. Sanjay Tiwari, Centre for Environment Education (CEE)</td>
</tr>
<tr>
<td>Presentation on EMF</td>
<td>Ms. Vanitha Kommu, Centre for Environment Education</td>
</tr>
<tr>
<td>Discussion and Conclusion remarks</td>
<td>Centre for Environment Education, BPSP, World Bank</td>
</tr>
</tbody>
</table>

The brief summary of the workshop is given below:

The Project Director has made the opening remarks in which he invited the feedback from the participants for enhancing the guidelines related to EMF.

Followed by this presentations were made by CEE for sharing the findings of field study and the Environment Management Framework designed. Copies of the executive summary of the EMF report in English and Hindi were circulated the participants for reference.

The details of the presentations are as follows:

Environment Assessment Study, Methodology and Findings:
The purpose of Environment Assessment Study, methodology followed and the findings were shared through a presentation. The key aspects of the presentation included:

- Purpose of Environment Assessment Study and Environment Management Framework (EMF)
- Key tasks under the study and outputs
• Methodology followed
• Key findings:
  o Over view of environment in the project area – Rain fall, water resources, land use pattern etc.
    ▪ Status of Agriculture – Soil nutrient status, cropping pattern and crop productivity
    ▪ Status of livestock sector
    ▪ Status of fisheries, aquatic bio diversity
    ▪ Status of forestry
    ▪ Drinking water, health and sanitation
  o Current capacities of Panchayats, Environment support system available
  o Nature of PRI activities and impact on environment
    ▪ Road construction and repairs
    ▪ plantations
    ▪ tank and canal desiltation works
    ▪ Water conservation structures, irrigation works – ponds, ahars, pynes
    ▪ Drainage construction
    ▪ House construction
    ▪ Construction of tube wells
  o Promotional activities by panchayats
    ▪ Agriculture
    ▪ Livestock
    ▪ Water and sanitation
  o Sources of pollution in villages
  o Environmental friendly interventions by panchayats
• Suggested environment friendly interventions
• Environment guidelines for Panchayat Bhavan constructions
  o Design and construction materials
  o Precautions during construction and post construction
• Impact of floods
• Flood preparedness, handling the aftermath - measures

Environment Management Framework:
Details of the Environment Management Framework (EMF) designed for the project are shared through a presentation. The key aspects of the presentations included:

  o Components under EMF
    o Integrating natural resource management into GP planning
    o Promotion of environment friendly activities
    o Environmental Appraisal of Panchayat bhavans, GP plans
      ▪ Screening – Checking for compliance with environmental safeguards, identifying the level of assessment
      ▪ Environmental Assessment using activity specific environmental guidelines developed
- Institutional structure and responsibilities at various levels for implementation of EMF
- Capacity Building plan for project functionaries and Panchayat representatives
- IEC material to be developed (suggested themes)
- Plan for implementation of environment friendly activities
- Monitoring – Procedures and sample for Internal and External monitoring, monitoring indicators,

The need for and provisions of the EMF were appreciated by the participants. The suggestions following the presentations included:
- need for capacity building of GPs on natural resource management
- need for inclusion of list of suitable fodder tree species in the guidelines on Animal husbandry
- need for inclusion of recent acts in forestry section

The report was also circulated to the concerned Government line departments (Department of Agriculture, Department of Forests, etc.) and research Institutes for inputs and suggestions through the BPSP project.

List of the participants:

The participants of the workshop are:

<table>
<thead>
<tr>
<th>S. No</th>
<th>Name</th>
<th>Designation</th>
<th>District</th>
<th>Department</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Ms. Kalyani Kandula</td>
<td>Consultant</td>
<td></td>
<td>World Bank</td>
</tr>
<tr>
<td>2.</td>
<td>Dr. Sanjeeb Kumar Dev</td>
<td>Executive</td>
<td></td>
<td>PRADAN</td>
</tr>
<tr>
<td>3.</td>
<td>Salbi</td>
<td>Executive</td>
<td></td>
<td>PRADAN</td>
</tr>
<tr>
<td>4.</td>
<td>Mr. Santosh Kumar Mnadal</td>
<td>Executive</td>
<td></td>
<td>PRADAN</td>
</tr>
<tr>
<td>5.</td>
<td>Mr. Sanjay Tiwari</td>
<td>Programme Officer</td>
<td></td>
<td>CEE</td>
</tr>
<tr>
<td>6.</td>
<td>Mr. Bindeswar Prasad Singh</td>
<td>Mukhiya</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Mr. Laleswar Mandal</td>
<td>DRP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Mr. Gyan Chandra Singh</td>
<td>DPRO</td>
<td></td>
<td>BAIF, Bihar Programme</td>
</tr>
<tr>
<td>9.</td>
<td>Mr. naveen Kumar</td>
<td>PRS</td>
<td></td>
<td>DRDA</td>
</tr>
<tr>
<td>10.</td>
<td>Mr. Lalan Kumar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Name</td>
<td>Designation</td>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>------------------------------</td>
<td>-------------</td>
<td>-----------------------</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Mr. Kumar Shailendra</td>
<td>PO</td>
<td>Undaykishungunj</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Mr. Pramod Kumar Yadav</td>
<td>PRS</td>
<td>Madhepura</td>
<td>DRDA</td>
</tr>
<tr>
<td>13.</td>
<td>Mr. Arun Kumar</td>
<td>Secretary</td>
<td>Patna</td>
<td>Navchetan NGO</td>
</tr>
<tr>
<td>14.</td>
<td>Mr. Ajay Kumar</td>
<td>Project Management</td>
<td>Patna</td>
<td>DoPR</td>
</tr>
<tr>
<td>15.</td>
<td>Mr. Akhilesh Kumar Teriyar</td>
<td>BPRO</td>
<td>Patna</td>
<td>DoPR</td>
</tr>
<tr>
<td>16.</td>
<td>Mr. Syed Agar Ameen</td>
<td>BPRO</td>
<td>Patna</td>
<td>DoPR</td>
</tr>
<tr>
<td>17.</td>
<td>Ms. Sunita Devi</td>
<td>Mukhiya</td>
<td>Chilwilli, Patna</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Mr. Satish Kumar</td>
<td>Planning Officer</td>
<td>Patna</td>
<td>RDD</td>
</tr>
<tr>
<td>19.</td>
<td>Ms. Nirmala Kumari</td>
<td>Planning Officer</td>
<td>Patna</td>
<td>RDD</td>
</tr>
<tr>
<td>20.</td>
<td>Mr. Gopal Kumar Sinha</td>
<td>PTA, Harnaut</td>
<td>Patna</td>
<td>RDD</td>
</tr>
<tr>
<td>21.</td>
<td>Noolhudda</td>
<td>PTA, Harnaut</td>
<td>Patna</td>
<td>RDD</td>
</tr>
<tr>
<td>22.</td>
<td>Bablu Kumar</td>
<td>PRS</td>
<td>Patna</td>
<td>RDD</td>
</tr>
<tr>
<td>23.</td>
<td>Shyam Nivas</td>
<td>MRP</td>
<td>Patna</td>
<td>DoPR</td>
</tr>
<tr>
<td>24.</td>
<td>Mr. Shshok Kumar Yadav</td>
<td>PRS</td>
<td>Patna</td>
<td>RDD</td>
</tr>
<tr>
<td>25.</td>
<td>Mr. Bhola Das</td>
<td>PO</td>
<td>Patna</td>
<td>RDD</td>
</tr>
<tr>
<td>26.</td>
<td>Mr. Ranjan Kumar</td>
<td>PO</td>
<td>Patna</td>
<td>RDD</td>
</tr>
<tr>
<td>27.</td>
<td>Mr. Anand Kumar</td>
<td>Mukhiya</td>
<td>Patna</td>
<td>RDD</td>
</tr>
<tr>
<td>28.</td>
<td>Mr. Nirlesh Kumar</td>
<td>PRS</td>
<td>Patna</td>
<td>RDD</td>
</tr>
<tr>
<td>29.</td>
<td>Mr. Kishore Kumar</td>
<td>Mukhiya</td>
<td>Patna</td>
<td>DoPR</td>
</tr>
<tr>
<td>30.</td>
<td>Ms. Simmi Kumari</td>
<td>DRP</td>
<td>Patna</td>
<td>DoPR</td>
</tr>
<tr>
<td>31.</td>
<td>Mr. Alok Kumar</td>
<td>PO</td>
<td>Patna</td>
<td>DoPR</td>
</tr>
<tr>
<td>32.</td>
<td>Mr. Susheel Kumar</td>
<td>PRS</td>
<td>Patna</td>
<td>DoPR</td>
</tr>
<tr>
<td>33.</td>
<td>Mr. Baijant Paswan</td>
<td>Mukhiya</td>
<td>Patna</td>
<td>DoPR</td>
</tr>
<tr>
<td>34.</td>
<td>Mr. Girish Shankar</td>
<td>Principal Secretary</td>
<td>Patna</td>
<td>DoPR</td>
</tr>
</tbody>
</table>

BGSYS-EMF/ Final (Modified) version-01/May 2011
<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Designation</th>
<th>City</th>
<th>Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Mr. B.A. Khan</td>
<td>PCCF</td>
<td>Patna</td>
<td>Forest Depat</td>
</tr>
<tr>
<td>36</td>
<td>Mr. C.P. Kandhuja</td>
<td>PD, BPSP</td>
<td>Patna</td>
<td>BPSP</td>
</tr>
<tr>
<td>37</td>
<td>Ms. Yongmei Zhou</td>
<td>TTL</td>
<td></td>
<td>World Bank</td>
</tr>
<tr>
<td>38</td>
<td>Mr. Susheel kumar</td>
<td>BPRO</td>
<td>Patna</td>
<td>World Bank cell</td>
</tr>
<tr>
<td>39</td>
<td>Mr. Joel Hellman</td>
<td>Sector Manager</td>
<td></td>
<td>World Bank</td>
</tr>
<tr>
<td>40</td>
<td>Mr. Sureah Prasad</td>
<td>Assistant</td>
<td>Patna</td>
<td>World Bank Cell</td>
</tr>
<tr>
<td>41</td>
<td>Mr. Pavan Kumar Singh</td>
<td>Web information leader</td>
<td>Patna</td>
<td>World Bank Cell</td>
</tr>
<tr>
<td>42</td>
<td>Mr. K. Amrendra Singh</td>
<td></td>
<td></td>
<td>World Bank</td>
</tr>
<tr>
<td>43</td>
<td>Mr. Amit Preetam</td>
<td>Community Mobiliser</td>
<td>Nalanda</td>
<td>BPSP</td>
</tr>
<tr>
<td>44</td>
<td>Mr. Raghubushan Mani</td>
<td>PRS</td>
<td>Bhojpur</td>
<td>BPSP</td>
</tr>
<tr>
<td>45</td>
<td>Mr. SANjeev kumar Singh</td>
<td>Mukhiya</td>
<td>Bhojpur</td>
<td></td>
</tr>
<tr>
<td>46</td>
<td>Mr. Ramesh Singh Yadav</td>
<td>PRS</td>
<td></td>
<td>DRDA</td>
</tr>
<tr>
<td>47</td>
<td>Mr. B.P. Ojha</td>
<td>Director</td>
<td>Patna</td>
<td>PHED GoB</td>
</tr>
<tr>
<td>48</td>
<td>Ms. Seema Singh</td>
<td>State Coordinator</td>
<td>Patna</td>
<td>PHED</td>
</tr>
<tr>
<td>49</td>
<td>Mr. Suraj Kumar</td>
<td>PRS</td>
<td>Patna</td>
<td>DRDA</td>
</tr>
<tr>
<td>50</td>
<td>Mr. M. Bhaghat</td>
<td>US</td>
<td>Patna</td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>Mr. Sanjay Kumar</td>
<td>Deputy Director</td>
<td>Patna</td>
<td>PRD</td>
</tr>
<tr>
<td>52</td>
<td>Mr. Vijay Kumar</td>
<td>Prof. Economics</td>
<td>Patna</td>
<td>DRDA</td>
</tr>
<tr>
<td>53</td>
<td>Mr. Dinesh Kumar</td>
<td>PO</td>
<td>Patna</td>
<td>DRM</td>
</tr>
<tr>
<td>54</td>
<td>Mr. Kursheed Alam</td>
<td>Director</td>
<td>Patna</td>
<td>DRDA</td>
</tr>
<tr>
<td>55</td>
<td>Mr. Manish Kumar Gaurav</td>
<td>PO</td>
<td>Patna</td>
<td>DRDA</td>
</tr>
<tr>
<td>56</td>
<td>Mr. SANjeev Kumar</td>
<td>PO</td>
<td>Patna</td>
<td>DRDA</td>
</tr>
<tr>
<td>57</td>
<td>Mr. Mihir. S.</td>
<td>AVP</td>
<td>Patna</td>
<td></td>
</tr>
<tr>
<td>No.</td>
<td>Name</td>
<td>Designation</td>
<td>Location</td>
<td>Department</td>
</tr>
<tr>
<td>-----</td>
<td>-------------------</td>
<td>----------------------------------</td>
<td>----------</td>
<td>------------------</td>
</tr>
<tr>
<td>58</td>
<td>Mr. Dharmendra</td>
<td>Sr. Manager</td>
<td>Patna</td>
<td></td>
</tr>
<tr>
<td>59</td>
<td>Mr. N. Piligrim</td>
<td></td>
<td>New Delhi</td>
<td>WSP</td>
</tr>
<tr>
<td>60</td>
<td>Mr. Arshad Ali</td>
<td>Director, NEP</td>
<td>Nalanda</td>
<td>DRDA</td>
</tr>
<tr>
<td>61</td>
<td>Mr. Dhananjay Kumar</td>
<td>Mukhiya</td>
<td>Nalanda</td>
<td></td>
</tr>
<tr>
<td>62</td>
<td>Mr. B.A. Kishan</td>
<td>PCCF</td>
<td>Patna</td>
<td></td>
</tr>
<tr>
<td>63</td>
<td>Mr. Anil Kumar</td>
<td>Mukhiya</td>
<td>Nalanda</td>
<td></td>
</tr>
<tr>
<td>64</td>
<td>Mr. S. Anand</td>
<td>TSC</td>
<td>Patna</td>
<td>PRD</td>
</tr>
<tr>
<td>65</td>
<td>Ms. Seema Singh</td>
<td>SPC, Patna, PRD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Mr. Rajeev Ranjan</td>
<td>PO</td>
<td>Simri</td>
<td></td>
</tr>
<tr>
<td>67</td>
<td>Mr. Anil verma</td>
<td>TL</td>
<td>Gaya</td>
<td></td>
</tr>
<tr>
<td>68</td>
<td>Mr. R.C. Prasad</td>
<td>MO</td>
<td>Patna</td>
<td></td>
</tr>
<tr>
<td>69</td>
<td>Smt. bimla Pd</td>
<td>Joint Director cum joint Secretary</td>
<td>Patna</td>
<td>PRD</td>
</tr>
<tr>
<td>70</td>
<td>Mr. Anil Kumar</td>
<td>Joint Secretary</td>
<td>Patna</td>
<td>RDD</td>
</tr>
<tr>
<td>71</td>
<td>Mr. Debraj Behra</td>
<td>SPM - Livelihood</td>
<td>Patna</td>
<td>Jeevika</td>
</tr>
<tr>
<td>72</td>
<td>Mr. Praksah Kumar Philip</td>
<td>Consultant</td>
<td>Patna</td>
<td>IMACS</td>
</tr>
<tr>
<td>73</td>
<td>Ms. Nimani Singh</td>
<td>TSC</td>
<td>Patna</td>
<td>PRD</td>
</tr>
<tr>
<td>74</td>
<td>Mr. Vijay Kumar Pandit</td>
<td>DEO</td>
<td>Patna</td>
<td>PRD</td>
</tr>
<tr>
<td>75</td>
<td>Mr. Arbind Sharma</td>
<td>DDA</td>
<td>Patna</td>
<td>Agriculture</td>
</tr>
</tbody>
</table>
**Monitoring strategy:**
Monitoring of EMF implementation will be done at two levels, internal and external.

**Internal monitoring:**

During the implementation, the activities will be monitored for integration of mitigation measures identified during the environmental appraisal and incorporated in EMP. The monitoring will also focus on the systems and the capacities in the GPs for environmental management.

Monitoring of GPs at the block level will be done by Block Facilitator - ENRM, at the district level by District ENRM Coordinator and at state level by SPM-ENRM. The monitoring will cover GP Bhavans, GP activities supported by Panchayat Performance Awards as well as other activities of the GPs implemented with discretionary resources. The sample will be stratified to include GPs that are and are not part of the NRM initiative.

The monitoring will cover a sample of:

EMF Monitoring Sample

<table>
<thead>
<tr>
<th>Monitoring aspect</th>
<th>Level of Monitoring</th>
<th>Staff</th>
<th>Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>GP Bhavan</td>
<td>State level</td>
<td>SPM-ENRM</td>
<td>100%</td>
</tr>
<tr>
<td></td>
<td>District level</td>
<td>District ENRM Coordinator</td>
<td>100%</td>
</tr>
<tr>
<td>GP activities under Performance Award</td>
<td>State level</td>
<td>SPM-ENRM</td>
<td>10% of the GPs</td>
</tr>
<tr>
<td></td>
<td>District level</td>
<td>District ENRM Coordinator</td>
<td>100% of GPs in the district</td>
</tr>
<tr>
<td></td>
<td>Block level</td>
<td>Block Facilitator - ENRM</td>
<td>100% of GPs in the block</td>
</tr>
<tr>
<td>Other GP activities</td>
<td>State level</td>
<td>SPM-ENRM</td>
<td>2% of the GPs from each district</td>
</tr>
<tr>
<td></td>
<td>District level</td>
<td>District ENRM Coordinator</td>
<td>Sample of 10% of GPs</td>
</tr>
<tr>
<td></td>
<td>Block level</td>
<td>Block Facilitator - ENRM</td>
<td>100% of GPs</td>
</tr>
</tbody>
</table>

---

59 Sample coverage will be of number of GP, Block & District covered in the particular year.
**External monitoring:**

External audits will be conducted by hiring an external agency in 3rd and 5th year of the project.

The process will be a combination of desk reviews (to check the management aspects) and field visits (to check on technical aspects) and stakeholder interactions.

A sample of 10% of GPs implementing activities under Panchayat performance award (including first timers, second timers and third timers), a sample of 10% Panchayats Bhavans and a sample of 2% of other GPs will be field visited as part of the external audit. The sample will be stratified to include GPs that are and are not part of the NRM initiative. The field visits will include site inspections of works undertaken as well as interactions with functionaries, PRI representatives and resource agencies.

The key aspects that will be monitored and the monitoring indicators are given below:

**Key aspects to be monitored:**

- Implementation of capacity building programmes (orientation, training, IEC) on environmental management
- Integration of environmental management into the GP planning process
- Compliance of the GP activities with the legal and regulatory framework
- Application of environmental appraisal (screening and assessment) for the GP activities
- Implementation of mitigation measures identified through the environmental appraisal and included in EMP.
- Technical soundness and user friendliness of the Environment Guidelines
- Implementation of environment friendly activities
- The changing environmental conditions, emerging environmental concerns and modifications to EMF recommended

**Monitoring indicators:**

- Percentage of activities in compliance with legal and regulatory requirements
- Number of GPs with environmental appraisal of activities supported by Panchayat Performance Award
- Number of GPs with environmental appraisal of activities supported by other discretionary funds
- Number of GPs with implementation of mitigation measures identified through environmental appraisal
- Cumulative impact (positive and negative) of the GP activities on the local environment
- Capacity building programmes organized for project and GP functionaries
- Number of environment friendly activities implemented by GPs
- Feed back on impact of environment friendly activities from community/user groups
Capacity Building Plan:
Capacity building is required for the project functionaries and elected representatives of GPs to enable them to execute the functions pertaining to the EMF in an efficient manner. The capacity building programmes will be conducted on regular basis both through integrating into the general induction training programmes (for all the staff under the project) as well as through focused training for relevant staff and GP functionaries on the EMF, under different sub-component.

Identification of support organization:
Support organization hired for ENRM activities under sub-component 2.2(d)i.e strengthening Development of Panchayats relating to NRM, at the State/Regional level will also be responsible for developing training module under the guidance of SPM-ENRM and conducting the capacity building programmes for project functionaries. Field level presence, working experience with Panchayats, technical expertise will be considered while selecting the agencies. The responsibility of the Resource Agency includes:

- Designing the capacity building modules (for project functionaries and GP representatives) and conducting the training programmes for project functionaries at state and district levels (which includes block level staff)
- Development of IEC materials for the project, which cover ENRM aspects.

Orientation on EMF will be integral part of capacity building under sub-component 2.1&2.2 of the Project.

Capacity building curriculum:
It is expected from support agencies hired under different sub-component 2.1(a,b,c) & 2.2 (a,b,c,d) that they will prepare the curriculum as per the requirement of EMF.

EMF aspects:

- Environmental issues in the contest of rural development
- Environmental management and local governments
- Purpose and components of EMF for the BPSP
- Environmental appraisal process – screening, environmental assessment
- Key aspects for monitoring of EMF in the BPSP

Thematic aspects:

- Land: land use planning, soil erosion, drainage and fertility.
- Water: irrigation, watershed development, water harvesting, drought proofing measures
- Livestock: breeds, fodder management
- Forests: afforestation, social forestry
- Natural calamities (with specific focus on floods): water stagnation, silt/sand deposition
- Energy: use of renewable energy and fuel efficient devices
- Common property resources
- Infrastructure: environmental issues concerning location, construction and waste disposal

Information Education and Communication (IEC) Materials:
The IEC materials will be developed by the support agencies under the guidance of SPM - ENRM.

The following IEC materials will be developed by the appointed Resource Agency/Agencies under the guidance of State Environment/NRM Specialist.

- An easy-reference guide/manual on environmental appraisal for use by the project and GP functionaries
- Posters on environmental guidelines for various functional areas of the GPs activities
- Video documented case studies of GPs with good environmental management practices

Depending on the feasibility few technology demonstrations (a minimum of two) will be planned in the GPs (eg: solar lanterns, solar cookers, fuel efficient cook stoves, models of rain water harvesting, vermicompost units, medicinal plants cultivation, etc.).

**NRM Resource Centre at GPs:**

A portion of the GP Bhavan constructed under the Project will be allotted for display of information related to NRM. This will include IEC materials developed through the BPSP as well as information from line departments regarding technologies/practices, existing support schemes and programmes, etc.

The production committee will be made responsible for maintaining the resource centre and updating the information with the support of technical Resource Person(TRP) under sub-component 2.2(d) in consultation with Block Facilitator - ENRM.

Overall the resource centre will be able to offer the following services:

1. Easy-reference guide/manual on environmental appraisal
2. Information on schemes of the central and state government for environmental management
3. Information on relevant environment friendly technologies
4. Extension material on natural resource management
5. Collection of CDs/DVDs on natural resource management, water and sanitation, agriculture, etc.
6. Information on natural resource status of the GP (soil fertility status, quality of drinking water and irrigation water, extent of grazing lands, native cattle breeds, tree biodiversity)

**Training programme:**

**State level:**

Orientation on EMF to all project functionaries:

An orientation on EMF will be conducted for all project functionaries as part of the induction training programme. This will cover the purpose of the EMF, components, and procedures for environmental appraisal, Environmental Management Planning, Environmental guideline, monitoring, capacity building and institutional arrangements.
Regional level:

Training of District ENRM Coordinator and Block Facilitator - ENRM on EMF:

Two day regional level (South Bihar districts as one batch and North Bihar districts as one batch) training programmes on EMF will be conducted for all the District ENRM Coordinators and Block Facilitators - ENRM. Support organization will be responsible for conducting these trainings.

Panchayat level:

Training of Mukhiyas, production and relevant standing committee members on EMF/NRM.

At the GP level it is important to train the functionaries including the Mukhiya and the production/other relevant standing committees on Natural Resource Management and EMF. These trainings will be organized by Block Facilitator – ENRM at GP level.

Over all capacity building plan and the roll out is as follows:

**Integration of EMF/NRM into communication campaign:**

Environmental/Natural Resources Management will be part of the communication campaigns under taken for the panchayat functionaries and community. The themes for this will be chosen in accordance with local relevance and may include rain water harvesting, drought proofing measures for dry regions, sanitation measures during floods, etc.

**Budget:**

The budgetary provision for EMF is mostly shared with NRM, IEC & communication sub-component. Orientation on EMF is integrated into the overall induction training cost of the Project.

<table>
<thead>
<tr>
<th>Particulars</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Staff at State and Districts</td>
<td>Integrated into Project Management Cost</td>
</tr>
<tr>
<td>Block Team</td>
<td>Cost taken under NRM sub-component of the project.</td>
</tr>
<tr>
<td>IEC material development (guide/manual on environmental assessment, posters, video documentation of best practices)</td>
<td>Cost taken under NRM sub-component and communication of the project.</td>
</tr>
<tr>
<td>Orientation to EMF as part of induction training of SPMU, DPMU, BPMU staff</td>
<td>Integrated in the overall training costs of the project and management &amp; coordination</td>
</tr>
<tr>
<td>Training of District and Block ENRM</td>
<td>Cost taken under Institutional Strengthening and</td>
</tr>
<tr>
<td>Coordinator/Facilitators</td>
<td>NRM sub-component of the project.</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>Training of GPs (Mukhiya, Production Committee, etc.) by Block Environment/ NRM Resource Persons</td>
<td>This is a cost taken under NRM sub-component of the project.</td>
</tr>
<tr>
<td>NRM Resource Centre</td>
<td>Budgeted under NRM sub-component</td>
</tr>
<tr>
<td>Monitoring at state and district levels of GP Bhavans, Performance Award activities, sample of other GP activities</td>
<td>Integrated into Project Management Cost</td>
</tr>
</tbody>
</table>
A6.0 Details of environmental due diligence requirements for Levels E0, E1 and E2

Environmental appraisal will be mandatory for all project-supported activities including GP Bhavans and activities supported by the Panchayat Performance Award (PPA). The capacity building efforts of the project will promote the use of environmental appraisal as a good practice for all GP activities irrespective of the source of funding. The Environmental Appraisal will be done by the Block Facilitator ENRM / District ENRM Coordinator in consultation with the production standing committee (and/or any other relevant standing committee) and will be reviewed by the District ENRM Coordinator/SPM ENRM depending on the level of assessment (described later).

This involves checking to ensure that no activity on the negative list is taken up and to identify the required level of assessment. This is followed by preparation of an Environmental Management Plan (EMP) by referring to the Environmental Guidelines for identifying the potential issues and mitigation measures. The EMP is integrated into the activity plan along with additional costs if any.

The detailed description of the process is as follows:

A6.1 Environmental Appraisal:

Purpose: To ensure that none of the activities are in non-compliance with the laws and regulations of Government of India and Government of Bihar and Operational Policies of World Bank and to identify the required level of assessment and the responsibility of conducting the assessment.

Process:

- Involves checking the proposed activities against the negative list of activities (screening) and identifying the required level of assessment.
- This will be done by the Block Facilitator ENRM in discussion with relevant standing committee i.e. production committee; family health and rural sanitation committee; public works committee etc. The activities that match with activities given in the negative list will be cancelled or changed into a form that is in compliance after necessary interventions. The required level of assessment will be identified.
- The activities classified under Level E0 will not require assessment.
- Activities classified under Level E1 and E2 (other than GP Bhavans) will be assessed by Block Facilitator ENRM and reviewed by District ENRM Co-ordinator.
- In case of GP Bhavans (classified as Level E2) the assessment will be done by the District ENRM Coordinator in consultation with District cell of BCD and it will be reviewed by the SPM ENRM in co-ordination with SPM Civil/Architect Engineer and State level cell of BCD.
- The Block Facilitator ENRM will facilitate for required permissions and support at block level and forward details to District ENRM Coordinator for higher level facilitation/permission, if any. At district level, the District ENRM Coordinator will review the environmental appraisal and provide any facilitation or support required for permissions, etc. at higher level.

---

60 Based on section 11.3.2 of the detailed version of the EMF report.
A6.2 Preparation of Environmental Management Plan (EMP):

**Panchayat level:**

Purpose: To identify any possible negative impact of the proposed activity on environment and to arrive at suitable and feasible mitigation measures.

Process: After the activity goes through environmental appraisal (screening against negative list and decision on level of assessment required) the Environmental Management Plan (EMP) will be prepared for all but GP Bhavan activities by the Block Facilitator ENRM in discussion with the relevant standing committee and in case of GP Bhavan by District ENRM coordinator in close coordination with BCD cell at the District level. The Environmental Guidelines provided for individual activities will be used for preparing the EMP.

**Block Level:**

Purpose: To consolidate the outputs of environmental appraisal and EMP preparation process, to provide/facilitate any necessary support for implementing the EMPs from the departments/ institutes at block level.

Process: The outputs of the environmental appraisal and the EMPs (of the GP level activities) will be consolidated at block level by the Block Facilitator ENRM for identifying and facilitating required/possible support through convergence.

**District level:**

Purpose: To conduct the environmental appraisal and EMP preparation of GP Bhavans. And to review the environmental appraisal and EMP preparation of Level E1 and E2 (other than Bhavan) activities, to provide any necessary support at district level.

Process: Environmental appraisal and EMP preparation of all GP Bhavans will be done by District ENRM Coordinator in close coordination with district cell of BCD ENRM. Review of assessment of Level E1 and E2 (other than Bhavan) activities will be done by District ENRM coordinator and review of assessment of GP Bhavan (classified as Level E2 activity) will be done by the SPM ENRM.

**Filing requirements:**

Each GP should maintain a file of the EMPs including the implementation report. The GP Sachiv and/or the Production Committee is responsible for this. At block level both the copies of the EMPs and block level consolidation should be filed. The responsibility of this is with the Block Facilitator ENRM. Similarly at district level the copies of block level consolidation and district level consolidation forms are to be filed. The responsibility is with District ENRM Coordinator.

**Discussions in Gram Sabha (GS):**
Environmental management actions of the GP need to feature as one of the agenda items in the Gram Sabha. The activities identified for NRM under NREGS and other schemes, the plan for promotion of environment friendly activities and mitigation measures, etc. will be presented in the Gram Sabha.

A6.3 EMF arrangements for works that are outsourced by the GPs:

In cases where certain activities (e.g. construction of roads, drains, toilets, etc.) are outsourced to the external agencies or contractors, the appraisal and preparation of EMP will be done by the Block Facilitator ENRM in consultation with the relevant standing committee and the EMP will be made part of the contract documents so that the external agency/contractor is bound to implement it. The external agency/contractor will be oriented by the Block Facilitator ENRM and/or the District ENRM Coordinator on EMP implementation requirements.

A6.4.1 Environment Appraisal procedures for construction of Panchayat Bhavans:

The environmental appraisal followed by preparation of the Environmental Management Plan for the Panchayat Bhavans will be done with the help of the environmental guidelines provided for Panchayat Bhavans. This exercise will be done by District ENRM Coordinator in close coordination with BCD cell at the District level. The outputs will be checked and reviewed by the SPM ENRM and SPM Civil/Architect Engineer in close coordination with the state cell of BCD to ensure that the EMP is made part of the bid documents and is executed satisfactorily. The contractors will be oriented by the SPM Civil/Architect Engineer, SPM ENRM and/or the District ENRM Coordinator on EMF implementation requirements.

A6.4.2 Community Consultation on Environment Appraisal of Gram Panchayat Bhavans:

The Environmental Appraisal of Panchayat Bhavans will include a community consultation with all key stakeholders. This will be through a community meeting / Gram Sabha through which the results of environmental appraisal will be disclosed to the community. The potential impacts, mitigation measures identified and any environmentally proactive interventions planned will be shared with the community. The responsibility of organising the consultation lies with the Mukhiya and will be facilitated by the Block Facilitator ENRM. A report of the community consultation will be part of the Environmental Appraisal documentation of the Panchayat Sarkar Bhavans maintained at the District and State levels. It will record the key concerns raised and how they were addressed/integrated into the mitigation plan.

A6.5 Environmental Appraisal for activities taken up with Panchayat Performance Awards:

As mentioned earlier, environmental appraisal is mandatory for all activities taken up by the GPs with the Panchayat Performance Awards (PPA). The GPs receiving the PPA for the first time will be required to sign an agreement that (a) they will not use Award grant for any activity on the ‘negative list’ (b) they will seek assistance from Block Facilitator ENRM for environmental appraisal of activities that they will take up with the PPA. The GPs receiving the PPA for the second time onwards will be required to submit record of environmental appraisal and implementation of mitigation measures with respect to activities undertaken with the preceding PPA.
Environmental Appraisal Process – Flow chart:

GP activities

Appraisal: Screening using Negative List by Block Facilitator ENRM

Activity not in Negative List

Appraisal: Identifying the level of assessment by Block Facilitator ENRM

Level E0 – No further assessment

Take necessary actions for compliance with Negative List

Level E1 E2 (other than GP Bhavan) Assessment by B F ENRM & Review by District ENRM Co-ordinator

Level E2 (GP Bhavan) - Assessment by District ENRM Coordinator & review by SPM ENRM

: Preparation of Environment Management Plan (EMP) by using the Environmental Guidelines

Block level consolidation and monitoring of EMPs by Block Facilitator ENRM

Approval of EMP by DLCC

Approval of EMP by SPMU

District level consolidation and monitoring of EMPs by District ENRM coordinator

Integration of EMP in bidding document

Implementation of EMP

Monitoring

Use of NRM tool for integration of NRM aspects into GP planning
GP Bhavans

Checking against 'screening checklist' – by Block Facilitator ENRM

If in compliance proceed for environmental assessment

If not in compliance take required action to ensure compliance

Environmental assessment and preparation of the EMP by District ENRM Coordinator in close coordination with District cell of BCD

Disclosure of findings of environmental assessment and EMP in community consultation meeting by Block Facilitator – ENRM and District ENRM Coordinator

Forward to SPM ENRM for inclusion in contract documents in consultation with state cell of BCD

Monitoring during EMP implementation by District ENRM Coordinator, SPM ENRM in consultation with SPM Civil/Architect Engineer and state cell of BCD

Filing of monitoring reports as part of GP Bhavan documentation at DPMU and SPMU
Details on monitoring of performance of contractors and implications for non-compliance

A7.1 Environmental Appraisal

- In cases where certain activities (e.g.: construction of roads, drains, toilets, etc.) are outsourced to contractors, environmental appraisal will be done by the Block Facilitator ENRM in consultation with the relevant standing committee and the EMPs will be made part of the contract document so that the contractor follows the mitigation measures.
- The contractors will be oriented by the Block Facilitator ENRM or District ENRM Coordinator on EMP implementation requirements.
- The environmental appraisal of Panchayat Bhavans followed by preparation of the Environmental Management Plan will be done by District ENRM co-ordinator in consultation with District cell of BCD. The outputs will be reviewed by the SPM ENRM & SPM Civil/Architect Engineer who will coordinate with BCD to ensure that the EMP is made part of the contract documents and is executed satisfactorily. The contractors will be oriented by the SPM ENRM & SPM Civil/Architect Engineer and/or the District ENRM Coordinator on EMF implementation requirements.

A7.2 Monitoring

- Monitoring of the EMP implementation will be undertaken by District ENRM Coordinator, SPM ENRM in consultation with SPM Civil/Architect Engineer and state cell of BCD. The monitoring will cover 100% of the GP Bhavans and will be undertaken prior to, during and after the completion of the GP Bhavan construction. The key aspects to be monitored include:
  - Compliance with the legal and regulatory requirements
  - Agreement with contractors for implementation of mitigation measures
  - Implementation of mitigation measures identified through environmental appraisal
  - Incorporation of environment friendly features and materials into design and construction
  - Community consultation/disclosure of the results of the environmental appraisal
- In case of non-compliance of the contractor with the EMP, and in case of any residual environmental issues of concern, the SPM Civil/Architect Engineer will coordinate with the state cell of BCD who will follow up with the contractor to ensure that required action is taken. In case of non-compliance of the contractor, BCD will take appropriate action as provided for in the contract documents.
- Reports of the internal monitoring will be filed at both the State and District project offices. These will be updated periodically (at least bi-annually) to include reports on the status of implementation of the recommendations.