EXECUTIVE SUMMARY – ENVIRONMENTAL IMPACT ASSESSMENT & ENVIRONMENT MANAGEMENT PLAN

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1.0 General

The originally conceived Upper Krishna Project was modified in order to provide irrigation facilities to the lands of Bijapur, Gulbarga and Raichur District. Upper Krishna Project is a multipurpose project which mainly provides water for irrigation and generates hydel power. In order to derive maximum benefits as early as possible, execution of project in stages was envisaged. The Upper Krishna Project Stage I and II envisaged utilization of 173 TMC of water to irrigate an area of 6,22,023 ha.

2.0 Project Description

The FRL of Almatti dam is to be raised from EL- 519.60 m to EL- 524.256 m in order to store and make use of additional water allocated to Upper Krishna Project by Government of Karnataka i.e. 130 TMC of water for irrigating 5,30,475 Ha under Stage III. The Index Map of the scheme is shown in Figures-1. With the increase in FRL by 4.656 m, additional land coming under submergence is 30,875 Ha and 22 villages are to be rehabilitated. The total submergence of Almatti Reservoir is 74,742.15 Ha. Out of 74,742.15 Ha, 43,867.15 Ha have already been acquired upto FRL-519.60 m The total number of villages coming under submergence is 158 villages. Out of 158 villages, 136 villages have already been rehabilitated in Stage I & II of UKP and remaining 22 villages are to be rehabilitated in Stage – III of UKP.

In Stage-III of UKP, it is proposed to irrigate 5,62,032.73 Ha of land duly utilizing 130 TMC of water. After raising of FRL from 519.600 m to 524.256 m of Almatti dam in Stage-III of UKP to store the additional allocation of water i.e. 130 TMC. It is planned to utilize the proposed allocation of water under schemes as given in Table-1.

**Table-1: Utilization of the Proposed Allocation of Water Under Schemes**

<table>
<thead>
<tr>
<th>No.</th>
<th>Scheme</th>
<th>Contemplated ICA (Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Mulwad LIS</td>
<td>2,27,966</td>
</tr>
<tr>
<td>2.</td>
<td>Chimmalgi LIS</td>
<td>87,067</td>
</tr>
<tr>
<td>3.</td>
<td>Rampur LIS (Extension)</td>
<td>13,923</td>
</tr>
<tr>
<td>4.</td>
<td>Koppal LIS</td>
<td>86,089</td>
</tr>
<tr>
<td>5.</td>
<td>Narayanpur RBC (Extension)</td>
<td>61,747</td>
</tr>
<tr>
<td>6.</td>
<td>Mallabッド LIS</td>
<td>33,730</td>
</tr>
<tr>
<td>7.</td>
<td>Bhima Flank (Extension)</td>
<td>21,572</td>
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<td>8.</td>
<td>Herkal LIS</td>
<td>9,248.73</td>
</tr>
<tr>
<td>9.</td>
<td>Indi LIS (Extension)</td>
<td>20,690</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>5,62,032.73</strong></td>
</tr>
</tbody>
</table>
3.0 Assessment of Yield of Krishna river

The catchment area of river Krishna at Vijayawada gauge site is 2,51,360 Sq. Km. Earlier the Yield Series was built up by considering the Flow series at Vijayawada from 1894 to 1972 as agreed to by the Party States before the Krishna Water Disputes Tribunal (KWDT), which determined that for the purpose of the case of the Krishna Water Dispute, the 75% dependable flow of river Krishna upto Vijayawada is 58339.2 Mcum (206 TMC).

In KWDT - II award in December 2010, assessed the yearly yield of river Krishna afresh, board on the now available data on yearly water series for 47 years (1961-62 to 2007-08). Accordingly, the dependable yield considered at 65% dependability which works out to 2293 TMC. The average yield works out to 2578 TMC.

4.0 Need For Irrigation Development

The basic economic activity in the Stage III project area is agriculture. Uncertain rainfall and vagaries of Monsoon added with large number of marginal and poor farmers have resulted in low per capita income and poor standard of living. In the absence of other mineral resources, providing irrigation is the best strategy to provide employment opportunities to the local population, improving their per capita income and consequent improved standard of living. This will also result in optimal utilisation of water and land resources of the region. Development of irrigation and increase in agricultural production will act as a catalyst for development of industries, especially of agriculture produce processing including food processing.

5.0 Existing Cropping Pattern

The present agriculture practices are tuned to rainfall; such as Kharif, Rabi and bi-seasonal crops. However the cropping intensities and the yield are low, it is mostly subsistence farming. The cropping pattern under rain fed conditions practiced in the project area and their corresponding productivities are given in Table 1

<table>
<thead>
<tr>
<th>Table 1: Existing Cropping Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No.</strong></td>
</tr>
<tr>
<td>I Kharif Crops</td>
</tr>
<tr>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
</tr>
<tr>
<td>3.</td>
</tr>
<tr>
<td>4.</td>
</tr>
<tr>
<td>5.</td>
</tr>
<tr>
<td>6.</td>
</tr>
<tr>
<td>II Rabi Crops</td>
</tr>
<tr>
<td>1.</td>
</tr>
<tr>
<td>2.</td>
</tr>
</tbody>
</table>
### III Bi-Seasonals

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cotton</td>
<td>18.40</td>
</tr>
</tbody>
</table>

### IV Other Crops like

Tobacco, Potato, Onion, Fruits, etc.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7.30</td>
<td>7.50</td>
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</tbody>
</table>

Source: DPR, 2015

![Figure-1: Index Map of the Scheme](image-url)
6.0 Need for the Project
As per the KWDT-II award of 2010, it is mentioned that State of Karnataka has furnished details showing its DPAP area to the extent of 52,375 sq.Km. The area mainly lies in districts Belgaum, Chikkamagalur, Chitradurga, Davanagere, Dharwad, Gadag, Gulbarga, Hassan, Haveri and Tumkur. The basin area form part of the total drought prone area of 62,592 sq.km. in the state of Karnataka.
So the position as it emerges in so far as it relates to the drought prone area in Krishna basin is that the state of Maharashtra has 50,242 Sq.Km covered under DPAP. The State of Karnataka has an area of 52,375 Sq.Km in Krishna basin covered under DPAP and the state of Andhra Pradesh has drought prone area measured 45,493 sq.Km in Krishna basin. The highest drought prone area in Krishna basin is in the state of Karnataka whereas State of Andhra Pradesh have least drought prone area in Krishna basin as compared to Maharashtra and Karnataka.

The development of irrigation potential will ameliorate poverty and drought conditions of the region. It improves the welfare of population and result in optimal utilisation of land and water resources in the basin.

7.0 Environmental Baseline Status

7.1 Surface water quality
Apart from domestic sources, there are no other sources of pollution in the project area. The area has no major water polluting industries. As a part of the field studies, surface water quality was monitored for three seasons at various locations. The surface water quality was monitored at various locations on Krishna river, various canal and sampling locations are given in Table 2.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Station Code</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SW-1</td>
<td>Krishna River near Korti</td>
</tr>
<tr>
<td>2</td>
<td>SW-2</td>
<td>Krishna River near Mati</td>
</tr>
<tr>
<td>3</td>
<td>SW-3</td>
<td>Krishna River near Mankan</td>
</tr>
<tr>
<td>4</td>
<td>SW-4</td>
<td>Krishna River near Amarwadgi</td>
</tr>
<tr>
<td>5</td>
<td>SW-5</td>
<td>Krishna River near Adibhavi</td>
</tr>
<tr>
<td>6</td>
<td>SW-6</td>
<td>Krishna River near Chincholi</td>
</tr>
<tr>
<td>7</td>
<td>SW-7</td>
<td>Krishna River near Sugur</td>
</tr>
<tr>
<td>8</td>
<td>SW-8</td>
<td>Krishna River near Kapur</td>
</tr>
</tbody>
</table>
The water quality shows that the pH level in various seasons ranged from 7.6 to 7.9 indicating neutral nature of water. The pH level is within the permissible limit of 6.5 to 8.5, specified for meeting irrigation and domestic water requirements. The TDS level ranged from 408 to 709 mg/l, 391 to 681 mg/l and 371 to 645 mg/l in monsoon, post monsoon and pre monsoon respectively. The TDS levels were above the permissible limit of 500 mg/l specified for meeting drinking water requirements in some of the locations. The EC levels were well below the permissible limit of 2250 μS/cm specified for irrigation water requirements as per IS: 2296. This trend of TDS level is also reflected by the fact that the concentration of most of the cations and anions were above the permissible limit in some locations. The concentration of chlorides in various seasons ranged from 93.5 to 117.7 mg/l, 89.8 to 112.9 mg/l, 85 to 107 mg/l in monsoon, post monsoon and pre monsoon respectively. The chlorides level in surface water samples was well below the permissible limit of 200 mg/l. The hardness level in monsoon, post monsoon and pre monsoon ranged from 316.8 to 393.8 mg/l, 304.1 to 378.0 mg/l and 288 to 358 mg/l respectively. The river water is hard in nature, which is reflected by high calcium and magnesium level. The alkalinity level was lower than the hardness level. This indicates that out of total hardness Carbonate hardness is equivalent to alkalinity level and the remaining hardness is accounted for the bicarbonate hardness. The fluorides level was marginally lower than the permissible limit of 1.0 mg/l specified for meeting drinking requirements.

### 7.2 Ground water quality

Groundwater samples were collected from various locations in the command area for three seasons and the various ground water sampling locations in this scheme are
Table 3: Ground water sampling locations

<table>
<thead>
<tr>
<th>No.</th>
<th>Station Code</th>
<th>Village Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Mulwad LIS</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>GW1</td>
<td>Tadwalga</td>
</tr>
<tr>
<td>2</td>
<td>GW2</td>
<td>Nagatha</td>
</tr>
<tr>
<td>3</td>
<td>GW3</td>
<td>Chattarki</td>
</tr>
<tr>
<td>4</td>
<td>GW4</td>
<td>Chiksiindgi</td>
</tr>
<tr>
<td>5</td>
<td>GW5</td>
<td>Kakathur</td>
</tr>
<tr>
<td>6</td>
<td>GW6</td>
<td>Shekhapur</td>
</tr>
<tr>
<td>7</td>
<td>GW7</td>
<td>Hulagabal</td>
</tr>
<tr>
<td>8</td>
<td>GW8</td>
<td>Sarur</td>
</tr>
<tr>
<td>9</td>
<td>GW9</td>
<td>Guddadini</td>
</tr>
<tr>
<td>10</td>
<td>GW10</td>
<td>Banoshi</td>
</tr>
<tr>
<td>B</td>
<td>Chimalgi LIS</td>
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</tr>
<tr>
<td>1</td>
<td>GW11</td>
<td>Chicholi</td>
</tr>
<tr>
<td>2</td>
<td>GW12</td>
<td>Jalwad</td>
</tr>
<tr>
<td>3</td>
<td>GW13</td>
<td>Mangoli</td>
</tr>
<tr>
<td>4</td>
<td>GW14</td>
<td>Arjuna</td>
</tr>
<tr>
<td>5</td>
<td>GW15</td>
<td>Duddhal</td>
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<td>C</td>
<td>Rampur LIS (Extension)</td>
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</tr>
<tr>
<td>1</td>
<td>GW16</td>
<td>Hirenagnur</td>
</tr>
<tr>
<td>2</td>
<td>GW17</td>
<td>Honnahaun</td>
</tr>
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<td>3</td>
<td>GW18</td>
<td>Sarjapur</td>
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<td>D</td>
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<td>5</td>
<td>GW23</td>
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<td>Narayanpur RBC (Extension)</td>
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<td>1</td>
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<tr>
<td>1</td>
<td>GW30</td>
<td>Tumkur</td>
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<td>2</td>
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<td>Bablad</td>
</tr>
<tr>
<td>3</td>
<td>GW32</td>
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<tr>
<td>H</td>
<td>Herkal LIS</td>
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<tr>
<td>1</td>
<td>GW33</td>
<td>Hirabudhinal</td>
</tr>
<tr>
<td>2</td>
<td>GW34</td>
<td>Anaval</td>
</tr>
<tr>
<td>3</td>
<td>GW35</td>
<td>Janamati</td>
</tr>
<tr>
<td>I</td>
<td>Indi LIS (Extension)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>GW36</td>
<td>Ingalagi</td>
</tr>
</tbody>
</table>
**Mulwad LIS**

The pH level ranged from 7.47 to 8.49, 6.8 to 7.97 and 6.87 to 8.12 in monsoon, post monsoon and pre-monsoon covered as a part of the study. This indicates neutral nature of the water, and are within the permissible limit specified for meeting drinking water requirements. The chlorides level ranged from and 6.91 to 134.72 mg/l in monsoon season 8.94 to 171 mg/l in post-monsoon season and 3.36 to 120.94 mg/l in post monsoon season. The chlorides level in groundwater samples was mostly below the permissible limit of 200 mg/l. Sulphates ion is one of the major anions occurring in natural water. It is an important parameters because of its cathartic affect, when it is present in higher concentration. The sulphates level ranged from 12.15 to 56.4 mg/l, 3.3 to 75.14 mg/l and 11.18 to 51.88 mg/l in monsoon, post monsoon and pre-monsoon respectively. The hardness level ranged from 222.6 to 487.2 mg/l, 156.2 to 659.12 mg/l and 179.79 to 423.22 mg/l in monsoon, post monsoon and pre-monsoon respectively. The concentration of various heavy metals was below the detectable limits, indicating the suitability of water for meeting domestic requirements. The concentration of cyanides and phenolic compounds was also below the detectable limits. The concentration of various heavy metals was observed to be below detectable limit in various seasons. The oil & grease level were below detectable limits in all the samples, which is expected in ground water surface.

**Chimmaligi Lift Irrigation Scheme**

The pH level ranged from 7.69 to 8.55, 7.25 to 7.8 and 7.07 to 7.86 in monsoon, post monsoon and pre-monsoon covered as a part of the study. This indicates neutral nature of the water with alkaline character, and are within the permissible limit specified for meeting drinking water requirements. The hardness level ranged from 225.75 to 488.25 mg/l, 353.12 to 661.67 mg/l and 182.69 to 424.19 mg/l in monsoon, post monsoon and pre-monsoon respectively. The hardness level in some of the samples was above the permissible limit of 200 mg/l. however, the hardness level was below the cause for Rejection Limit of 600 mg/l. The chlorides level ranged from and 17.65 to 137.13 mg/l in monsoon season
20.2 to 167.94 mg/l in post-monsoon season and 13.24 to 123.16 mg/l in post monsoon season. The chlorides level in groundwater samples was mostly below the permissible limit of 200 mg/l.

The sulphates level ranged from 12.3 to 57.87 mg/l, 46.84 to 76.61 mg/l and 11.31 to 53.24 mg/l in monsoon, post monsoon and pre-monsoon respectively. The concentration of various heavy metals was below the detectable limits, indicating the suitability of water for meeting domestic requirements. The concentration of cyanides and phenolic compounds was also below the detectable limits.

The concentration of various heavy metals was observed to be below detectable limit in various seasons. The oil & grease level were below detectable limits in all the samples, which is expected in ground water surface.

**Rampur Lift Irrigation Scheme (Extension)**

The pH level ranges from 7.93 to 8.32, 7.56 to 8.11 and 7.29 to 8.27 in monsoon, post monsoon and pre-monsoon covered as a part of the study. This indicates neutral nature of the water, and are within the permissible limit specified for meeting drinking water requirements.

The chlorides level ranged from and 12.71 to 127.37 mg/l in monsoon season 20.68 to 116.2 mg/l in post-monsoon season and 10.05 to 114.18 mg/l in post monsoon season. The chlorides level in groundwater samples was mostly below the permissible limit of 200 mg/l.

Sulphates ion is one of the major anions occurring in natural water. It is an important parameters because of its cathartic affect, when it is present in higher concentration. The sulphates level ranged from 3.58 to 35.92 mg/l, 14.09 to 74.16 mg/l and 4.88 to 33.05 mg/l in monsoon, post monsoon and pre-monsoon respectively.

The hardness level ranged from 205.8 to 478.8 mg/l, 224.4 to 466.04 mg/l and 189 to 415.5 mg/l in monsoon, post monsoon and pre-monsoon respectively. The hardness level in some of the samples was above the permissible limit of 200 mg/l. however, the hardness level was below the cause for Rejection Limit of 600 mg/l. The concentration of various heavy metals was below the detectable limits, indicating the suitability of water for meeting domestic requirements. The concentration of cyanides and phenolic compounds was also below the detectable limits.

The concentration of various heavy metals was observed to be below detectable
limit in various seasons. The oil & grease level were below detectable limits in all the samples, which is expected in ground water surface.

**Koppal Lift Irrigation Scheme**

The pH level ranges from 7.86 to 8.31, 7.23 to 8.12 and 7.56 to 8.23 in monsoon, post monsoon and pre-monsoon covered as a part of the study. This indicates neutral nature of the water with alkaline character, and are within the permissible limit specified for meeting drinking water requirements. The hardness level ranged from 226.8 to 625.8 mg/l, 173.4 to 397.8 mg/l and 204.75 to 432.6 mg/l in monsoon, post monsoon and pre-monsoon respectively.

The chlorides level ranged from and 18.06 to 199.71 mg/l in monsoon season 5.17 to 67.22 mg/l in post-monsoon season and 24.12 to 156.2 mg/l in post monsoon season. The chlorides level in groundwater samples was mostly below the permissible limit of 200 mg/l.

The sulphates level ranged from 3.49 to 35.09 mg/l, 5.17 to 67.22 mg/l and 24.12 to 98.49 mg/l in monsoon, post monsoon and pre-monsoon respectively. The concentration of various heavy metals was below the detectable limits, indicating the suitability of water for meeting domestic requirements. The concentration of cyanides and phenolic compounds was also below the detectable limits.

The concentration of various heavy metals was observed to be below detectable limit in various seasons. The oil & grease level were below detectable limits in all the samples, which is expected in ground water surface.

**Narayanpur RBC (Extension) Scheme**

The pH level ranged from 7.65 to 7.98, 7.36 to 8.31 and 7.9 to 8.46 in monsoon, post monsoon and pre-monsoon covered as a part of the study. This indicates neutral nature of the water, and are within the permissible limit specified for meeting drinking water requirements.

The chlorides level ranged from and 19.67 to 63.29 mg/l in monsoon season 25.85 to 31.03 mg/l in post-monsoon season and 34.66 to 150.24 mg/l in post monsoon season. The chlorides level in groundwater samples was mostly below the permissible limit of 200 mg/l.

The concentration of various heavy metals was below the detectable limits, indicating the suitability of water for meeting domestic requirements. The concentration of cyanides and phenolic compounds was also below the detectable limits.

The concentration of various heavy metals was observed to be below
detectable limit in various seasons. The oil & grease level were below detectable limits in all the samples, which is expected in ground water surface.

**Mallabad Lift Irrigation Scheme**

The pH level ranged from 7.4 to 8.21, 7.27 to 8.09 and 7.86 to 8.24 in monsoon, post monsoon and pre-monsoon covered as a part of the study. This indicates neutral nature of the water with alkaline character, and are within the permissible limit specified for meeting drinking water requirements. The hardness level ranged from 194.25 to 199.5 mg/l, 229.5 to 316.2 mg/l and 189 to 332.6 mg/l in monsoon, post monsoon and pre-monsoon respectively.

The chlorides level ranged from and 48.04 to 55.13 mg/l in monsoon season 30.35 to 73.86 mg/l in post-monsoon season and 20.69 to 36.54 mg/l in post monsoon season. The chlorides level in groundwater samples was mostly below the permissible limit of 200 mg/l.

The sulphates level ranged from 3.61 to 9.87 mg/l, 0.45 to 66.82 mg/l and 5.93 to 18.04 mg/l in monsoon, post monsoon and pre-monsoon respectively. The concentration of various heavy metals was below the detectable limits, indicating the suitability of water for meeting domestic requirements. The concentration of cyanides and phenolic compounds was also below the detectable limits.

The concentration of various heavy metals was observed to be below detectable limit in various seasons. The oil & grease level were below detectable limits in all the samples, which is expected in ground water surface.

**Bhima Flank (Extension) Scheme**

The pH level ranges from 7.39 to 8.64, 7.33 to 8.39 and 7.65 to 8.2 in monsoon, post monsoon and pre-monsoon covered as a part of the study. This indicates neutral nature of the water, and are within the permissible limit specified for meeting drinking water requirements.

The chlorides level ranged from and 47.32 to 70.46 mg/l in monsoon season 15.37 to 65.42 mg/l in post-monsoon season and 24.12 to 131.04 mg/l in post monsoon season. The chlorides level in groundwater samples was mostly below the permissible limit of 200 mg/l.

The concentration of various heavy metals was below the detectable limits, indicating the suitability of water for meeting domestic requirements. The concentration of cyanides and phenolic compounds was also below the detectable limits.
The concentration of various heavy metals was observed to be below detectable limit in various seasons. The oil & grease level were below detectable limits in all the samples, which is expected in ground water surface.

**Herkal Lift Irrigation Scheme**
The pH level ranges from 7.57 to 8.03, 7.4 to 8.32 and 7.98 to 8.35 in monsoon, post monsoon and pre-monsoon covered as a part of the study. This indicates neutral nature of the water with alkaline character, and are within the permissible limit specified for meeting drinking water requirements. The hardness level ranged from 153.3 to 288.75 mg/l, 144.84 to 247.86 mg/l and 204.7 to 315.6 mg/l in monsoon, post monsoon and pre-monsoon respectively.

The chlorides level ranged from and 27.73 to 44.31 mg/l in monsoon season 26.94 to 31.83 mg/l in post-monsoon season and 28.36 to 83.04 mg/l in post monsoon season. The chlorides level in groundwater samples was mostly below the permissible limit of 200 mg/l.

The sulphates level ranged from 7.19 to 8.49 mg/l, 3.93 to 8.25 mg/l and 5.68 to 17.55 mg/l in monsoon, post monsoon and pre-monsoon respectively. The concentration of various heavy metals was below the detectable limits, indicating the suitability of water for meeting domestic requirements. The concentration of cyanides and phenolic compounds was also below the detectable limits.

The concentration of various heavy metals was observed to be below detectable limit in various seasons. The oil & grease level were below detectable limits in all the samples, which is expected in ground water surface.

**Indi Lift Irrigation (Extension) Scheme**
The pH level ranged from 7.95 to 8.21, 7.45 to 8.31 and 7.77 to 8.19 in monsoon, post monsoon and pre-monsoon covered as a part of the study. This indicates neutral nature of the water, and are within the permissible limit specified for meeting drinking water requirements.

The chlorides level ranged from and 44.42 to 205.7 mg/l in monsoon season 26.62 to 69.23 mg/l in post-monsoon season and 24.84 to 101.44 mg/l in post monsoon season. The chlorides level in groundwater samples was mostly below the permissible limit of 200 mg/l.

The concentration of various heavy metals was below the detectable limits, indicating the suitability of water for meeting domestic requirements. The concentration of cyanides and phenolic compounds was also below the detectable limits.
The concentration of various heavy metals was observed to be below detectable limit in various seasons. The oil & grease level were below detectable limits in all the samples, which is expected in ground water surface.

7.3 Ambient Air Quality
The ambient air quality with respect to the study zone around the proposed site forms the baseline information. There are no major sources of air pollution in the project area. The ambient noise level monitoring were observed during the field survey in monsoon (July 2014) postmonsoon (November 2014), and pre Monsoon (March 2015). The sources of air pollution in the region are vehicular traffic, dust emissions from unpaved village roads and domestic fuel burning. The baseline status of the ambient air quality has been established through a scientifically designed ambient air quality monitoring network and is based on the following considerations:
- Meteorological conditions on synoptic scale;
- Representatives of regional background air quality for obtaining baseline status
- Representation of likely affected area.

Four Ambient Air Quality Monitoring (AAQM) locations were selected taking care of above-mentioned points. The frequency of monitoring at each station per was twice a week for four consecutive weeks. The parameters monitored were PM10, PM2.5, SO2 and NO2. The ambient air quality was monitored at various locations in the study area, and the ambient air quality was found to be well within permissible limit. The various sampling location for the project is given in Table-4.

<table>
<thead>
<tr>
<th>S No.</th>
<th>Station Code</th>
<th>Village Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A1</td>
<td>Indi</td>
</tr>
<tr>
<td>2</td>
<td>A2</td>
<td>Hansihal</td>
</tr>
<tr>
<td>3</td>
<td>A3</td>
<td>Alur</td>
</tr>
<tr>
<td>4</td>
<td>A4</td>
<td>Bublad</td>
</tr>
<tr>
<td>5</td>
<td>A5</td>
<td>Yarmars</td>
</tr>
<tr>
<td>6</td>
<td>A6</td>
<td>Honnahalu</td>
</tr>
<tr>
<td>7</td>
<td>A7</td>
<td>Hirabudhighal</td>
</tr>
<tr>
<td>8</td>
<td>A8</td>
<td>Ukkali</td>
</tr>
<tr>
<td>9</td>
<td>A9</td>
<td>Honnalli</td>
</tr>
</tbody>
</table>

The maximum PM10 level observed in survey conducted during the post
monsoon season was 83.7 µg /m³. During field studies, PM10 level was observed to be well below the permissible limit of 100 µg/m³ specified for industrial, residential, rural and other areas at various stations covered during the survey.

The maximum PM2.5 level was observed 42.1 µg/m3 which is below the permissible limit of 60 µg/m³ specified for industrial, residential, rural and other areas. The source in particulate matter in the Study area could be the ongoing construction activities or containment of dust by winds.

The SO₂ level was observed to be <5.0 µg /m³ at all the sampling locations. The highest NO₂ value observed in post monsoon season was 11.2 µg /m³. The NO₂ level observed at various sampling stations was much lower than the permissible limit of 80 µg /m³ for industrial, residential, rural and other areas.

Based on the findings of the ambient air quality survey, it can be concluded that the ambient air quality is quite good in the area. The values of these parameters were well below the permissible limits specified for industrial, residential, rural and other areas. The absence of industries, low vehicular traffic and low population density can be attributed for good ambient air quality in the project area.

7.4 Ambient Noise Level

Noise levels monitoring was conducted for three seasons. The noise levels were monitored continuously for day time for 6 AM to 9 PM at each location and hourly equivalent noise level was measured. Sound Pressure Level (SPL) measurement in the ambient environment was made using sound pressure level meter. The ambient noise level monitoring were observed during the field survey in monsoon (July 2014) postmonsoon (November 2014), and pre Monsoon (March 2015). The monitoring was carried out in day time, at sampling locations, where ambient air quality monitoring was carried out. The day time equivalent noise levels are given in Table-5.

<table>
<thead>
<tr>
<th>Location</th>
<th>Monsoon</th>
<th>Post-Monsoon</th>
<th>Pre-Monsoon Season</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1</td>
<td>58.73</td>
<td>52.79</td>
<td>55.15</td>
</tr>
<tr>
<td>N2</td>
<td>57.75</td>
<td>55.07</td>
<td>56.31</td>
</tr>
</tbody>
</table>
The day time equivalent noise level at various sampling stations ranged from 54.38 to 60.02 dB(A) and 52.79 to 59.93 dB(A) in monsoon and post monsoon seasons respectively. In pre monsoon season, the day time equivalent noise level at various sampling stations ranged from 51.87 to 58.11 dB(A). The noise levels were observed to be well within permissible limits of 65 dB(A) specified for commercial area.

7.5 Land Use Pattern

Land use describes how a patch of land is used (e.g. for agriculture, settlement, forest), whereas land cover describes the materials (such as vegetation, rocks or buildings) that are present on the surface. Accurate land use and land cover identification is the key to most of the planning processes. The land use pattern of the study area has been studied through digital satellite imagery data. The land use pattern has been studied through satellite imagery data. The following

8 Remote sensing satellite data were procured from National Remote Sensing Agency (NRSA), Hyderabad are given in Table-6

<table>
<thead>
<tr>
<th>S. No</th>
<th>Satellite</th>
<th>Sensor</th>
<th>Path and Row</th>
<th>Date of Imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.</td>
<td>Resourcesat-2</td>
<td>LISS-III</td>
<td>97-60</td>
<td>31-MAY-2016</td>
</tr>
</tbody>
</table>

The data was processed through ERDAS Imagine 2015 software package available with WAPCOS. Ground truth studies were conducted in the area to validate various signals in the satellite images and correlate them with different land use domains.

Land use pattern of Command Area for Mulwad LIS
The major landuse category in the Mulwad LIS command area is agriculture land, followed by area under barren land. The area under scrub is 3rd dominant land use category. The area under river/Water Body and is negligible.

The classified imagery of Mulwad LIS Command Area is shown in Figures-2

![Classified Imagery of Mulwad LIS Command Area](image)

**Figure-2: Classified Imagery of Mulwad LIS Command Area**

**Land use pattern of Command Area for Chimalgi LIS**

The major landuse category in the Chimalgi LIS project is agriculture land, followed by area under Scrub land. The area under river and Water Body is lowest among all the categories. Area under settlement is more than area under waterbodies.

The classified imagery of the Chimalgi LIS Command Area is shown in Figures -3.
Figure-3: Classified Imagery of Chimalgi LIS Command Area
Land use pattern of Command Area for Rampur LIS (Extension)
The major landuse category in the Rampur LIS (Extension) command area is
dustry land, followed by area under Settlement and barren land. The area under
t and Water is quite prominent. The classified imagery of Rampur LIS
(Extension) Command Area is shown in Figure - 4

![Classified Imagery of Rampur LIS (Extension) Command Area](image_url)

Figure-4: Classified Imagery of Rampur LIS (Extension) Command Area
Land use pattern of Command Area for Koppal LIS

The major landuse category in the Koppal LIS command area is agriculture land, followed by area under Scrub. The area under river and Water Body and Settlement are negligible. The 3rd dominant land use category is barren land. The classified imagery of the Koppal LIS Command Area is shown in Figures - 5

![Classified Imagery of Koppal LIS Command Area](image)

**Figure 5: Classified Imagery of Koppal LIS Command Area**
Land use pattern of Command Area for Narayanpur RBC (Extension)

The major landuse category in the Narayanpur RBC command area is agriculture land, followed by area under scrub land. The area under barren land is 3rd dominant land use category. The area under settlement is negligible. The classified imagery of Narayanpur RBC Command Area is shown in Figures-6

Figure-6: Classified Imagery of Narayanpur RBC (Extension) Command Area

Land use pattern of Command Area for Mallabad LIS

It can be observed that major landuse category in the Mallabad LIS command area is agriculture land, followed by area under Scrub. The area under river and Water is negligible. The 3rd dominant land use category is barren land. The command area has good settlement. The classified imagery of Mallabad LIS Command Area is shown in Figures-7
Figure-7: Classified Imagery of Mallabad LIS Command Area

Land use pattern of Command Area for Bhima Flank (Extension)
Major landuse category in the Bhima Flank (Extension) project is agriculture land, followed by area under barren land and Scrub land. The area under river and Water Body is fourth largest land use category in the command. Area under settlement is very less. The classified imagery of the Bhima Command Area is shown in Figures-8
Figure-8: Classified Imagery of Bhima Flank (Extension) Command Area
Land use pattern of Command Area for Herkal LIS

The major landuse category in the Herkal LIS command area is agriculture land, followed by area under Exposed rock/Barren land. The scrub land is 3rd dominant land use category. The area under river and Water Body and settlement are very less. The classified imagery of the Herkal LIS Command Area is shown in Figures 9.

Figure-9: Classified Imagery of Herkal LIS Command Area
Land use pattern of Command Area for Indi LIS
The major landuse category in the Indi LIS command area is agriculture land, followed by area under Exposed rock/Barren land. The area under river and Water Body is negligible. The area under settlement is quite prominent. The classified imagery of the Indi LIS Command Area is shown in Figures-10.
7.6 Terrestrial Ecology-Floral Accounts

7.6.1 Forest types

As per the revised survey of forest type of India Sir Harry G Champian and Shri S K Seth (1968), vegetation occurring in the area has been classified under two subgroup namely 5A-Southern tropical dry deciduous forests and 6A-Southern tropical thorn forests. Further each subgroup has been divided in to two categories.

Subgroup 5A: Southern Tropical dry deciduous forests

(a) Dry teak forest (5A/C1b)
(b) Southern dry mixed forests (5A/C3)

Subgroup 6A: Southern tropical thorn forests

(a) Southern thorn forest (6A/C1)
(b) Southern thorn scrub
(6A/DS1)

Southern Tropical dry deciduous forests (5A/C1b/C3): This type of forests is found throughout the study area but in small blocks where it merges with thorn forests where the area is drier. The trees are generally drought resistant and have greater adaptability and do not have any appreciable girth to promote economical use. Dry teak (Tectona grandis) forests are found scattered with other associate trees like Anogesus latifolia, Acacia chundra, and Terminalia alata etc. In dry mixed deciduous forests Anogesus latifolia is the dominant tree species found usually in association with Terminalia alata. Other characteristics of these forests are Acacia ferruginea, Albizia procera, Phoenix sylvestris, Chloroxylon swetenia, Hardwickia binata, Acacia chundra, Albizia amara, Tamarindus indica and Wrightia tinctoria. The shrubs found in this area include Cassia auriculata, Calotropis procera, Canthium dicoccum, Dichrostachys cinerea, Flacourtia indica, Cadaba fruticosa, Canthium parviflorum, Lantana camara, xeromphis spinosa etc. Bamboos are poor and confined to very restricted areas and represented by Dendrocalamus strictus. Climbers and clmbind shrubs are few in number and they are Ampelocissus tomentosa, Combretum ovalifolium, Cryptolepis buchananii, Jasminum auriculatum, Climatis gouriana and Argyrea pilosa. Common hers found in these forests are Gomphrena celosioides, Sida rhombifolia, Ageratum conyzoides, Parthenium hysterophorus Euphorbia hirta, Sida acuta etc.
Apluda mutica, Heteropogon contortus, Perotis indica and Chloris barbata are the grasses seen throughout the area. Other grasses sporadically seen are Cymbopogon fulvus, C. martini, Eragrostis tenella, Brachiaria reptans, Aristida adscensionis and Paspalidium flavidum. The common weeds observed along the cultivated fields, fallow lands and open wastelands mainly comprises of species like Acalypha indica, Achyrathus aspera, Alternanthera pungens, Tridax procumbence, Croton bonplandianum, Tribullus terrestris, Xanthium indica etc.

**Southern tropical thorn/scrub forest (6A/C1/DS1):** This is the most common type of forests which occurs in the area. These are open low forests in which thorny and hard wood species predominate. Actually biotic factors have been responsible to a considerable extent for the development of this type. Generally scrub forests occur along the fringes of dry and moist deciduous forests, due to intensive biotic interference. The plants here show xeromprphic adaptations and the vegetation is dominated by thorny species. The trees in this type of forests are generally short- boled, branched, and low and composed of comparatively a few species. Some of the dry deciduous species may occur here but their growth is much stunted. The tree species in these forests are constituted by Acacia chundra, Albizia amara, Ziziphus mauritiana, Z. xylopyrus, Acacia nilotica and deciduous species like Anogesus latifolia, Azhadirecta indica, Dalbergia paniculata, Soymida febrefuga etc. Shrubs are larger in number when compared with tree species and some of them are scadent in habit. These include Lantana camara, Flacourtia indica, Cadaba fruticosa, Canthium parviflorum Dichrostachys cinerea, Prosopis juliflora, Ziziphus oenoplia, Ziziphus mauritiana etc. The commonly occurring herbs of this forests includes Ageratum conyzoides, Acalypha indica, Gomphrena celosioides, Xanthium strumarium, Alternanthera sessilis, Cassia tora, Indigofera cordifolia, Sida rhombifolia, Argemone mexicana, Apluda mutica, Euphorbia hirta, Sida acuta, Croton bonplandianum, Aerva lanata, Rungia pectineta, Boerhavia diffusa, Tribulus terrestris, Tridex procumbens, and other grasses. Some invasive species includes Ipomea carne, Lantana camara, Parthenium hysterophorus and Chromolaena odorata are recorded in large number along the road side, agriculture land and in open area.

As a part of the CEIA Study, a detailed ecological survey was conducted at different sites in the project area for various seasons.
7.7 Findings of the floral diversity in the project area floristic diversity

During the field survey, a total of 190 plant species belonging to 160 genera and 62 families were recorded from the proposed project area. The findings of the present study reveals that herbaceous group of plant contributed highest number of species with 72 species (37.89%) followed by trees with 43 species (22.63%), shrubs with 31 species (16.32%), grasses with 26 species (13.68%) and climbers with 11 species (5.79%), sedges with 6 (3.16%) and parasite with single species (0.53%). The details of number of floral species recorded in various seasons covered as a part of the field studies is given in Table-7

Table -7: Vegetation status of the study area in various seasons

<table>
<thead>
<tr>
<th>Plant habit</th>
<th>No. of species</th>
<th>Percentage of species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herbs</td>
<td>72</td>
<td>37.89</td>
</tr>
<tr>
<td>Trees</td>
<td>43</td>
<td>22.63</td>
</tr>
<tr>
<td>Shrubs</td>
<td>31</td>
<td>16.32</td>
</tr>
<tr>
<td>Climbers</td>
<td>11</td>
<td>5.79</td>
</tr>
<tr>
<td>Grasses</td>
<td>26</td>
<td>13.68</td>
</tr>
<tr>
<td>Sedges</td>
<td>6</td>
<td>3.16</td>
</tr>
<tr>
<td>Parasite</td>
<td>1</td>
<td>0.53</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>190</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

7.7.1 Medicinally Important Plants

Plants are one of the most important sources of medicine in human life. Several medicinal plants are used to cure various types of disease. The common diseases which can be treated by using these plants like asthma, dysentery, cough, fever, headache, jaundice, toothache, sores, rheumatism, wounds, skin disease and other prevalent disease. As sources of medicines, plants have formed the basis for innovative and traditional systems and continuously providing mankind with new remedies. The most commonly used medicinal plants observed in the study area are *Boerhavia diffusa*, *Achyranthes aspera*, *Leucas cephalotes*, *Aloe vera*, *Bacopa monnieri*, *Datura innoxia*, *Centella asiatica*, *Sida cordata*, *Azadirachta indica*, *Acacia ferruginea*, *Cyperus rotundus* etc.

7.7.2 Economically Important Plants
Plants are extremely important in the lives of people throughout the world. In most of the areas, majority of people still depends on wild plants for their various requirements. Number of plant species is used for house construction, agricultural implements, carts, container for animal feeding, food, clothing, shelter, fibre, dye, gum resin, oil and other miscellaneous purposes. The traditional knowledge pertaining to use of plant species for various purposes depends on the surrounding plants.

*nucifera* which was the dominant species of the site followed by *Azadirecta indica* (IVI,44.49) and *Acacia nilotica* (IVI, 27.80). Frequency value ranged from 4% to 40%.

In shrub community layer, a total of 15 shrub species were recorded at this sampling site. The average density of this group of species was recorded to be 580 individuals/ ha. The highest value of IVI (73.02) as well as density (168 individuals/ha) was recorded for *Prosopis juliflora* which was dominant species of the site. *Cryptostagia grandiflora* (IVI, 52.15) and *Cassia auriculata* (IVI, 41.68) were the co-dominant species of this community. Frequency value ranged from 12% to 44%.

A total of 28 herbaceous species were recorded with an average density of 58.12 individuals /m² in monsoon season. In terms of importance value index (IVI, 26.96) and density (7.20 individuals /m²), *Hyptis suaveolens* was the dominant herbaceous species at this site closely followed by *Parthenium hysterophorus* (IVI,26.25) and *Chloris barbata* IVI (24.96).

In post-monsoon season, a total of 22 herbaceous species were recorded with an average density of 26.56 individuals /m². On the basis of importance value index, *Cynodon dactylon* (IVI, 43.46) was dominant herbaceous species of the site followed by *Aristida setacea* (IVI, 33.93) and *Brachiaria ramosa* IVI (24.50). Frequency ranged from 12% to 48%.

In pre-monsoon season, a total of 17 herbaceous species were recorded during field study. The average density of this group of species was recorded to be 22.08 individuals/m². The highest value of IVI (44.20) was recorded for *Crysoptodon gryllus* which was the dominant herbaceous species followed by *Parthenium hysterophorus* (IVI, 44.00) and *Cynodon dactylon* (IVI, 37.90).

The influence of life is viewed from different water bodies i.e. village ponds,
reservoirs and river system in five district of proposed upper Krishna project UKP-III. The existing Almatti dam reservoir, d/s Narayanpur reservoir and the vast spread Krishna river and its right bank tributaries like Ghataprabhah and Malprabhah and left bank river Bhima with other village water tanks are providing ‘niche’ large number of aquatic birds like open bill stork (Anastomus oscillans), lesser adjutant (Leptotilos javanicus), Brahminy Duck (Tadorna ferugineal), Common pochard (Anthiya farina), Tufted pochard (Anthiya fuligula), Pheasant-tailed jacana (Hydro phasianus chirugees), Bronze winged jacana (Meeto pidius indicus), Bar headed goose (Anser indicus), and the Indian river tern (Sterna aurantia) etc. However, most of the area in these five districts comes under dry zone and fauna present in the area are general in nature i.e. not specific to the area.

7.8 Mammals
No eco-sensitive area is present in the Project Influenced Area. Therefore, the wild animals which are sighted during present study belong to agriculture land with some scrub vegetation along the riverine ecosystem. Therefore, no specific wild animals have been sighted during study period except the commonly occurring species. The domestic animals are mainly mammals. Three species belonging Carnivora are reported for the Study Area. These include common Jungle cat, Jackal and common mongoose. Among order ungulates Indian Wild Boar, Spotted deer and Langours are common in nature and widely distributed. Rodentia is comprised of rats, squirrel, bandicoot, porcupine. Rats are widely distributed and are very common around the project sites and catchment areas. Indian porcupine is reported open areas. Squirrel is also commonly reported. Chiroptern are represented by bats. Among them, short nosed fruit bat is nocturnal in nature and is placed under the Schedule V. As per IUCN, all these are categorized as Least Concern Category.
Table 8: List of mammals reported in the area along with conservation status

<table>
<thead>
<tr>
<th>Species Name</th>
<th>Common Name</th>
<th>Family</th>
<th>WPA-S / IUCN Status</th>
</tr>
</thead>
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<td>Schedule V/ LC</td>
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<td>lakkarbhaga*</td>
<td>Hyaenadae</td>
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<td>Indian Hare</td>
<td>Leporidae</td>
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*Note: –Recorded only from Forest Working Plan, however, not direct cited, LC – Least Concern, NT- Near Threatened, VU- Vulnerable

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<th>6</th>
<th>Ass</th>
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<td>9</td>
<td>Pig</td>
<td>Sus cristatus</td>
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7.9 Avifauna

On the basis of field observation and literature studied the proposed project influenced area are having a variety of habitats for the terrestrial as well as the water bird species. The landscape within the proposed Upper Krishna Project stage III is mainly characterized by Krishna river basin, different reservoirs, agricultural land, settlement, and open scrubs, with vast stretches plains with scattered horticultural plantation, with busy vegetation and irrigated paddy fields and other agro-crops in the command area. A total of 106 bird species belonging to 40 families were recorded from the proposed site including all the habitats. The main agricultural crops species grown in the area are Cotton, Maize, Sunflower, Rice, Jowar, Ragi and Ground nut. The most of the area within the landscape is covered with agricultural land (70%). These agriculture crops support a number of resident bird species such as pipits, sparrows and Munia. The plantation along with roads and settlement, riparian zone along river banks and reservoir area also provides good habitat to various bird species. The wetlands in the area are utilized for irrigation, recreation purposes. The reservoirs, lakes, ponds and river / streams in the proximity of proposed propoject forms a suitable habitat for ducks species and drinking points for other birds along with the streams. Such areas are characterized with slow flowing water with tall emergent vegetation (Grasses grown in the vicinity of swampy, riverine and wet areas) in the surrounding; provide a good habitat for water birds such as grebes, lapwings, storks, heron, cormorant, water hen, wagtails, etc. The settlement also attracts a number of bird species in search of food. The crows, sparrows, drongo, etc are among the species found within the settlement areas. According to the habitat considerations, the majority of habitats are regarded as suitable terrestrial, woodland, scrubs and water bird species for foraging, roosting and as passage for migrating birds. The proposed project will improve the habitat conditions and therefore, no impact on avifauna has been anticipated.

Reptiles

The agriculture fields in the study area provide an ideal habitat for many snakes and reptiles. Reptiles such as cobra was found commonly in the project
influenced area. Monitor Lizard was observed along the roadside during the survey. The commonly observed herpeto-fauna in the study area includes Brook’s House Gecko, Indian Garden Lizard, South Indian Rock Agama, Indian Rat Snake etc. Among reptiles five species of snake are present. Out of these species of snakes, cobra is protected under schedule II of Indian wild life protection act (1972). As per IUCN status, they belong to least common or Data Deficient category. However, within the command area, no major faunals species are observed. This is mainly because of the fact that forests are largely degraded in the command area.

7.10 Fish Communities /Fisheries

The present investigation focused on freshwater fish faunals diversity and species richness in the study area of proposed project of irrigation scheme on Krishna river. Catches from Almatti reservoir, Narayanpur reservoir, Ghatprabah and Malprabah reservoirs and Krishna river are landed at different centres and a total of 77 fish species from 18 families are recorded from the study area, out of which 24 species listed from secondary data whereas remaining species reported during primary survey of river Krishna, Ghatakprabah, Malprabhah and Bhima including existing Almati dam and Naranyanpur dam. Cyprinids were the most dominant assemblage members in all study sites. The details of primary data and secondary information for fish species is given in the Table 8.31. The main groups of major fishes observed are Minnows like Puntius spp., Carps as Catla, Labio, Catfish, Murrels and Eels. The details of fish species observed in different water bodies in the study area along with their status is given in the Table as below. Among reservoir fishery, the predominant species in the catch are Spearota aor, S. seenghala, Rita sp, Labeo fimbriatis, Labeo calbasu, L.rohu and C.catla. Indigenous species such as of Tor khurdee, Puntius spp, P. kolus, P. pulchellus, Spearota aor, S. seenghala, Mystus cavusus, and Osteobrama vigorsii, and introduced major carps included C. catla, Labeo rohita, Cirrhinus mrigala, Cyprinus carpio, W.ottu, Osteobrama sp, M. armatus and Chana marulius. Several weed fishes especially Puntius spp., D. aequipinnatus, Mystus cavasius also occurred.

7.11 Aquatic Micro Flora and Fauna

The composition of phytoplankton and zooplankton of a particular aquatic
ecosystem are indicators of environmental stress. The phytoplanktons constitute bulk of primary producers and are the base of food chains in any water body. Though zooplankton was generally dominant, phytoplankton was also significant in the reservoirs and vice versa in Krishna river and its tributaries.

**Phytoplankton**

**Macrobenthic Fauna**
The benthic fauna of the study site is represented by Insecta, Annelida and Mollusca. The Insect population belonging to the order Diptera, Ephemeroptera, Odonata, Hemiptera, Trichoptera and Coleoptera were dominant. Some places occurrence of bivalves and other molluscs was also reported in the river course. Among hexapods, family Baetidae was found dominant where Baetis simplex was the most common species. Ephemeropterans are followed by plecoptern, odonata and trichipterns. Dipetarns were also present in abundance. Among molluscs snails, ghonghas, and bivalves was common in occurrence. Among the gastropoda group, Vivipara bengalensis and Bellamya bengalensis dominated the Molluscans fauna and are distributed from the shore line to 3 m depth in all types of sediments. Among pelecypoda the dominant species was Lymnaea sp.

**Macrophytes**

Aquatic macrophytes, in general, do not get a foot-hold in reservoirs due to steep water level fluctuation. In some reservoirs macrophytes appear during post-monsoon months in certain sheltered areas and disappear as the water level recede. Hydrilla, Vallisnerea and Potamogeton are the common hydrophytes encountered in lotic water and intermediate sectors. Lentic zone was devoid of any vegetation. Hydrilla, Vallisnerea and Potamogeton are the more dominant forms. Large number of insects, insect larvae and gastropods (Limnea, Planorbis) were found to be associated with the weeds. The macrophyte species are present in Krishna river banks and water pools of slow and shallow water zone and Ghatakprabha at upstream of Almatti dam and Bhima river and Don nulla in the command area. However, no macrophyte

**7.12 Eco-sensitive zones**
The project area is not located in any national park, sanctuary or ecological sensitive area. Such sites are also not located in the Study Area as well.

8.0 Prediction Of Impacts

Based on the project details and the baseline environmental status, potential impacts as a result of the construction and operation of the proposed Upper Krishna Stage-III Project have been identified. The impacts on following aspects of environment have been covered

- Land Environment
- Water quality
- Terrestrial Ecology
- Aquatic Ecology
- Noise Environment
- Air quality
- Public health

8.1 Impacts on Land Environment

a) Construction Phase

The construction of the proposed Upper Krishna Stage-III Project is expected to be completed in about seven (7) years. Majority of the environmental impacts during construction phase are temporary in nature, lasting mainly during the construction phase and for small duration beyond the construction period. However, if these issues are not properly addressed, impacts can continue even after the construction phase for a longer duration.

The major impacts anticipated on Land Environment during construction phase are as follows:

- Environmental degradation due to immigration of labour population.
- Operation of construction equipment.
- Soil erosion.
- Impacts due to construction of roads.

**Environmental degradation due to immigration of labour population**

The peak labour and technical staff congregation would be of the order of 800 and 100 respectively. For assessment of impacts, a total of 2200 labour and technical staff have been assumed to be involved in project construction and related activities.

Separate accommodation and related facilities for workers, service providers
and technical staff are to be provided as a part of the project. The congregation of labour force is likely to create problems of sewage disposal, solid waste management and felling of trees for meeting fuel requirements, etc. These aspects have been adequately covered in various Sections of this Chapter.

**Operation of construction equipment**

During construction phase, various types of equipment will be brought to the site. These include batching plant, earth movers, etc. The siting of these construction equipment would require significant amount of space. In addition, land will be required for storage of various construction material as well. However, land for this purpose will be temporarily acquired, i.e. for the duration of project construction phase i.e. 7 years.

**Soil erosion**

The runoff from various construction sites, will have a natural tendency to flow towards along with the natural drainage. The runoff from a construction site has a tendency to flow through natural drainage. The runoff for these sites will have high turbidity levels, i.e. of the order of 4,000-5,000 mg/l. Thus, the disposal of drainage effluent with such high turbidity levels is bound to affect the water quality, especially in the lean season.

**Solid waste management**

Adequate facilities for collection and conveyance of municipal wastes generated to the disposal site shall be developed. At each labour camp, covered trailers to collect the solid waste from the common collection point and transfer it to the disposal site needs to be put to service.

**b) Operation Phase**

The major impacts anticipated on land environment are as follows:

- Acquisition of land
- Change in land use pattern

**Acquisition of land**

The project envisaged raising of FRL of Almatti dam to make use of 130 TMC of water for irrigation of 5,30,475 ha to provide irriatiion facility in 20 talukas in 7 districts of Karnataka. The total land requirement for project is 58,375 ha. Out of which 564.08 ha is forest land and 57810.92 ha in private land. Total submergence area is about 31439.08 ha(30875 ha is private land + 564.08 ha is forest land.
Change in land use pattern
The introduction of irrigation will not only increase the cropped area, but would also increase the agriculture productivity as well. This would increase the agriculture production in the command area and is a significant positive impact.

8.2 Impacts on Water Resources and Quality
a) Construction Phase
Impacts due to sewage generation from labour camps
The major sources of water pollution during project construction phase are the sewage generated from the labour camps/colonies. The project construction is likely to last for a period of 7 years. As mentioned earlier about 800 workers and 100 technical staff are likely to migrate during project construction phase. The employment opportunities in the area are limited. Thus, during the project construction phase, many of the locals may get employment. It has been observed during construction phase of many of the projects, the major works are contracted out, who bring their own skilled labour. However, it is only in the unskilled category, that locals get employment.

Impacts due to runoff from construction sites
Substantial quantities of water would be used in the construction activities. With regards to water quality, waste water from construction activities would mostly contain suspended impurities. Adequate care should be taken so that excess suspended solids in the wastewater are removed before these are disposed into water body or over land.

b) Operation Phase
Impacts on downstream users
FRL of Almatti dam is to be raised from EL: 519.60 m to EL: 524.256 m in order to store and make use of additional water allocated to Upper Krishna Project by Government of Karnataka i.e. 130 TMC of water for irrigating 5,62,032.73 Ha under Stage III. Due to raising of FRL by 4.656 m, the additional land going to be submerged is 30,875 ha. So sufficient water is available for irrigation.

Impacts on waterlogging and soil salinity
Almatti dam to make use of 130 TMC of water for irrigating 5,30,474 ha to
provide irrigating facility in 20 talukas in 7 districts of Karnataka. The main cause of water logging in a command area of respective schemes due to introduction of irrigation could be as follows:

- Developmental activities such as construction of roads, bridges, railway lines, buildings etc. resulting in chocking of natural drainage.
- Poor natural drainage as consequences of topography or unfavorable sub-soil geology
  - like existence of hard pan at shallow depths.
  - Spilling of rivers resulting in submergence of agricultural lands.
  - Heavy storm and rainfall coupled with poor natural drainage.
- Hydraulic pressure of water from upper irrigated areas resulting in seepage and outcrop in low lying areas.
- Heavy losses of water due to seepage from canals, distributaries and water courses.
- Excess application of water particularly in the initial years when the command is not fully developed.
  - Poor on-farm water management resulting in poor application efficiencies.
- Inadequate drainage and poor maintenance of existing drainage system and outlets.
- Lack of conjunctive use of surface and ground waters.

**Impacts due to effluent from project colony**
The new colony comprising of temporary and permanent quarters will be established nearby of the schemes. During project operation phase, due to absence of any large scale construction activities, the cause and source of water pollution will be much different. Since, only a small number of O&M staff will reside in the area in a well-designed colony which will have a Sewage Treatment Plant (STP) and other infrastructure facilities, the problems of water pollution due to disposal of sewage are not anticipated.

**8.3 Impacts on Terrestrial Ecology**

**a) Construction Phase**

**Flora**

During project construction phase, labour population is likely to congregate near various construction sites. It can be assumed that the technical staff likely to
congregate will be of higher economic status and will live in a more urbanized habitat, and will not use wood as fuel. However, workers and other population groups residing in the area may use fuel wood (if no alternate fuel is provided) for whom firewood/coal depot could be provided.

**Fauna**

During construction phase, a large number of machinery and construction labour will have to be mobilized. This activity may create some disturbance to the wildlife population. The operation of various construction equipment is likely to generate significant noise. The noise may scare the fauna in the region and force them to migrate to other areas. Likewise, siting of construction equipment, godowns, stores, labour camps, etc. may generally disturb the fauna of the area.

**b) Operation Phase**

Various impacts to be covered are listed as below:

- Impacts on vegetal cover
- Impacts on wildlife

**Impacts on vegetal cover**

As a part of field studies, ecological survey was conducted at various locations in the study area. The forest area to be acquired is about 564.08 ha. It can be seen that *Acacia nilotica, Azadirecta indica, Ficus bengalensis*, were the dominant tree species. Amongst shrubs, *Lantana camara, Prosopis juliflora, Ipomoea carnea*, were the dominant species. The dominant herbaceous species in the submergence area were *Dactyloctenium aegypticum, Hyptissuaveolens, Parthenium hysterophorus, Cynodon dactylon*. No Rare, Endangered or Threatened species are reported in the project area. Thus, it can be observed that the tree density at various sampling sites in study area ranges from 176 to 280 trees/ha. The number of tree species observed at various sites ranged from 9 to 15.

**Impacts on wildlife**

The area to be brought under irrigation within the command area shall be devoid of forests. The project area is interspersed with settlements and agricultural land. In such settings large scale faunal population is not observed. Thus, no significant impact on wildlife is anticipated due to the project.
Impacts due to discharge of sewage from labour camp/colony
The proposed project envisages construction of a project colony, which would
result in emergence of domestic waste water which is usually discharged into the
river. However, it is proposed to commission appropriate units for treatment of
domestic sewage before its disposal in to the river. Thus, no adverse impacts on
water quality are anticipated due to discharge of sewage from labour

camp/colony.

8.4 Impacts on Noise Environment

a) Construction Phase

Noise due to construction equipment
In water resource projects, the impacts on ambient noise levels are expected only
during the project construction phase, due to earth moving machinery, increased
vehicular movement, etc. will have some adverse impacts.

b) Operation Phase

In a water resources project, noise pollution occurs mainly during project
construction phase. During project operation phase, no major impacts are

envisaged.

8.5 Impacts on Air Quality

- Pollution due to fuel combustion in various equipment
- Fugitive emissions from various sources.

a) Construction Phase

Pollution due to fuel combustion in various equipment
The operation of various construction equipment requires combustion of fuel.
Normally, diesel is used in such equipment. The major pollutant which gets
emitted as a result of diesel combustion is SO2. The SPM emissions are minimal
due to low ash content in diesel. The short-term increase in SO2, even
assuming that all the equipment are operating at a common point, is quite low, i.e.
of the order of less than 1μg/m^3. Hence, no major impact is anticipated on this
account.

Fugitive Emissions from various sources
During construction phase, there will be increased vehicular movement. Lot of
construction material like sand, fine aggregate is stored at various sites, during the
project construction phase. Normally, due to blowing of winds, especially when the environment is dry, some of the stored material can get entrained in the atmosphere. However, such impacts are visible only in and around the storage sites. The impacts on this account are generally, insignificant in nature.

**Impacts due to vehicular movement**

During construction phase, increase in number of vehicles is anticipated for transportation of construction material. The increase in number of vehicles is expected to be a maximum of 35/hour. Thus, it can be concluded from Table-9.6, that no major impacts on ambient air quality is anticipated due to increase in a vehicular movement during construction phase.

b) **Operation Phase**

In a water resources project, air pollution occurs mainly during project construction phase. During operation phase, no major impacts are envisaged.

### 8.6 Increased Incidence of Water-Related Diseases

a) **Construction Phase**

The construction phase of a water resources project, could lead to increased incidence of various water-borne and vector-borne diseases, if adequate precautions or control measures are not undertaken. The health risks specific to water resources projects emanate from congregation of labour at various construction sites. During construction phase, new groups come and go constantly keeping the human population in a flux. These groups are usually housed in temporary dwellings without proper sanitary conditions and water supply. In the final stages, colonies for project maintenance, townships are built. During construction phase or for permanent settlement, if adequate precautions are not taken, the vector-borne disease epidemiology may show sudden or long lasting change.

b) **Operation Phase**

**Increased incidence of water-related diseases**

Health risks include diseases hazards due to lack of sanitation, (lack of potable water, inadequate human waste disposal facilities) and hazards due to local carriers. Mitigation measures include provision of adequate sanitary health care and human waste disposal facilities near the construction sites and labour camp.
9.0 Environmental Management Plan

9.1 Biodiversity Conservation and Management Plan

For the promotion of the conservation and preservation the following measures are proposed for the Upper Krishna Stage-III Project:

**Forest Protection Plan**

About 564.08 ha of forest area is proposed to be acquired for Upper Krishna Stage-III Project. The following measures are proposed as a part of Forest Protection Plan:

- Improvement of vigilance by procurement of field vehicles and motorbikes.
- Organizing public awareness programmes, conducting training camps, preparation of, pamphlets, brochures, hoardings, etc.
- Provision of fire lines within critical areas to protect the forest from accidental fires.

An amount of Rs.50 lakh has been earmarked for this purpose.

**Safeguards during Construction Phase**

During the construction phase, to avoid and minimize the negative impacts from the activities project authorities are advised to prepare strict guidelines as follows:

- Strict restrictions shall be imposed on the workers at project sites to ensure that they do not harvest any species/produce from the forests and cause any danger or harm to the animals and birds in the wild.
- The fuel wood to the labourers shall be provided by the project proponents so that there is no pressure for cutting of trees to meet fuelwood requirements.
- The interference of human population would be kept to a minimum in the adjacent forest areas and it would be ensured that the contractors do not set up labour colonies/camps in the vicinity of forests and wilderness areas.
- Only well maintained/new equipment that produces lesser noise would be installed at the work sites.
• The best way to control the noise is at source. Certain equipment that needs to be placed permanently at one place like generators, etc. would be housed in enclosed structures to cut off the noise.

• The heavy equipment like rotating or impacting machines will be mounted on anti-vibration mountings.

• Wherever combustion engines are required they will be fitted with silencers.

• The traffic (trucks, etc.) used by the project works will be managed to produce a smooth flow instead of a noise producing stop and start flow. Necessary training/orientation will be provided to the traffic operators/drivers. Sounding of loud horns, etc. in the forested areas should be banned.

• Project authorities will use water sprinklers on the road to avoid the dust from construction activities.

**Measures to improve habitat of avi-fauna**

Forests are vital for the survival, foraging, breeding and nesting of avifauna. The first strategy of improvement of habitat for birds is avoiding nest predation or brood parasitism through maintenance of large contiguous forest tract. These areas have the ability to support the largest number of forest interior birds and will also be more likely to provide habitat for area sensitive species. It is more practicable to protect the existing forest area rather than creating new forest area.

Another measure for habitat improvement for avifauna is to be installation of artificial nest boxes in the influence zone and catchment area of the project after consultation with the forest department as well as local NGOs.

A lumpsum provision of Rs. 0.50 crore can be earmarked for this purpose.

**Anti-poaching Measures**

There are no ecologically sensitive areas around the project sites. However, the forests at the site and in the study area serve as a habitat for wildlife. Due to construction activities and increased human interferences, as a result of immigration of large labour population, it is recommended that check posts should be installed near major construction sites and labour camps which shall be operational during construction phase. It is proposed to develop 4 (four) check posts to implement anti-poaching measures during project construction phase.
An amount of Rs. 1.70 crore has been earmarked for this purpose.

**Improvement of Habitats**

With the change in nature of landscape, its aquatic and terrestrial vegetation will change due to global warming, silt deposits in the reservoir etc. there is a great change in the habits of the migratory birds, fishes. For fish eating birds, the fish culture of the requisite variety may be developed in addition to the income source of the would be fishermen.

The other measures recommended for improvement of habitats are:

- Fodder and wild fruit plantation for wild animals and for roosting, breeding and hiding cover for migratory birds etc.
- Annual bird count of migratory birds in winter by involving locals and bird experts.
- Removal of weeds and rehabilitation with local fruit bearing species in gaps.
- Anti-grazing drive in draw down area to protect the bird breeding areas in Wetland during the breeding season w.e.f. April to mid July.
- Removal of plastic waste from draw down area & shores
- Education and awareness tours/ visits for school children and celebration of wildlife week
- Construction of watch towers

An amount of Rs. 1.4 crore has been earmarked for this purpose.

**9.2 Fisheries Management Plan**

A water resources project may have adverse or beneficial effects on the fish fauna, depending upon the particular situation and the fish fauna inhabiting the concerned river.

**Sustenance and Enhancement of Fisheries potential**

The management of reservoirs is based on the stocking–cum capture fishery technique. The management techniques involve:

- Introduction of selected varieties of carps from extraneous sources, so as to develop a carp dominated fishery through self-propagation as well as regular stocking.
• A rational system of exploitation based on the concept of fishing effort and population dynamics of the fish stock.
• Conservation measures e.g. regulation of mesh size, imposition of size limits, observance of closed season, ban on destructive methods of fishing etc.
• Preservation, transport and marketing of fresh fish.

Management of Habitat

The initial trophic burst stage is the most critical stage of management. The reservoir is amenable for stock manipulation or correction during these initial crucial years by selective stocking with greater emphasis on fishes of short food chain (phytophagus) and close to primary producers like Indian major carps viz, Catla, Rohu, Grascarp, Common Carp and Mrigal, The Indian major carps are stocked as they find the environment suitable for growth and production, and their compatibility and non-cannibalistic trait, high fecundity and breeding success, etc.

Stocking in the medium and large reservoirs could be considered as successful only when the stocked fish are recaptured. Indian experience of stocking medium and large reservoirs suggests that by and large, the stocking becomes effective only when the stocked fishes propagate themselves. Moreover, this breeding population can be built-up only if the stocking is resorted to during the early phase of the reservoir formation.

Stocking Density

A number of methods are in vogue for calculating the stocking rate. Huet (1960) provided a general stocking formula, which can be applied universally irrespective of the size of the reservoir. The fish yield can be estimated from the primary productivity studies or trophodynamic models.

Fish seed requirement

Based upon experience gained in the past, a stocking rate of 300 fingerlings per ha. (above 100 mm.) for reservoir has been proposed in the initial years of development. The total requirement of advanced fingerlings will thus be 3.0 lakh (100 mm.).

Brood Stock Ponds
Adequate provision for maintenance of brood stock should also be made, preferably in close vicinity of the hatchery. In addition to the above rearing space, for raising advanced fingerlings, 3.0 ha of advance fingerling ponds would be needed. These grow out ponds should be managed and operated as far as possible with peoples participation preferably by the oustees for which necessary technical expertise will be provided by State Fisheries Department. Some of the village ponds situated along the periphery of the reservoir could also be used for raising advanced fingerlings.

The total cost estimates of the project works out to Rs. 11.42 crore.

9.3 Environmental Management In Labour Camps

Increase in labour camps
The aggregation of large number of workers in the project area during the construction phase is likely to put considerable stress on the prevailing biotic and abiotic environment of the area. The estimated peak labour force for the proposed project is around 800. The total increase in population shall be about 2,200.

Housing
The aggregation of large number of workers in the project area during the construction phase is likely to put considerable stress on the prevailing biotic and abiotic environment of the area. It is proposed that it should be made mandatory for the contractor involved in the construction activities to provide adequate facilities for water supply and sanitation. It is recommended that the contractor provides living units of 30-40 m² to each of the labour family involved in the construction activities.

Water Supply
Appropriate water supply sources need to be identified. Proper infrastructure for storage and if required treatment e.g. disinfection or other units, should also be provided.

Sewage Treatment
One community toilet needs to be provided for 20 persons. The sewage from the community toilets can be treated in a Sewage Treatment Plant (STP) comprising of aerated lagoon and secondary settling tank. The treated effluent can be used for meeting irrigation requirements of areas being afforested under greenbelt development. The total cost required shall be Rs.0.94 crore.
**Provision of free fuel**

The project proponents, shall make necessary arrangements for supply of kerosene/LPG. The fuel would be supplied at sub-sidised rates to the local/contract labour for which provision should be kept in the cost estimate. The total cost required for provision of fuel works out to Rs. 43.36 crore.

**Solid Waste Management**

The labour colonies will generate substantial amount of municipal wastes. In view of the condition that normally exists in the labour camps of such projects, the solid wastes is likely to contain mainly vegetable matters followed by papercans and glasses. About 2,200 persons are likely to congregate during the construction phase at various construction sites resulting in generation of about 0.5 tonnes of solid waste/day. Adequate facilities for collection and conveyance of municipal wastes generated to the disposal site shall be developed.

The total cost required for solid waste management is Rs.2.17 crore.

**9.4 Safety Measures During Construction Phase**

**Traffic Management during construction phase**

Temporary diversions will be constructed with the approval of the Engineer. Detailed Traffic Control Plans will be prepared and submitted to the Engineer for approval, at least 5 days prior to commencement of works on any section of road. The temporary traffic detours will be kept free of dust by frequent application of water.

**Measure to be taken during execution of earth**

While planning or executing excavation the contractor shall take all adequate precautions against soil erosion, water pollution etc and take appropriate drainage measures to keep the site free of water, through use of mulches, grasses, slope drains and other devices. The recommended measures are listed as below:

- Ensure unobstructed natural drainage through proper drainage channels/structures.
- Dispose surplus excavated earth at identified sites. Ensure minimum hindrance to locals.
• All excavations will be done in such a manner that the suitable materials available from excavation are satisfactorily utilized as decided upon beforehand. The excavations shall conform to the lines, grades, side slopes and levels shown in the drawings or as directed by the engineer.

**Safety practices during construction phases**

The Contractor is required to comply with all the precautions as far as possible for safety of the workers. The contractor will supply all necessary safety appliances such as masks, ear plugs, etc., to the workers and staff. The contractor shall comply with all regulation regarding, working platforms, excavations, trenches and safe means of entry and egress.

**Fire protection in labour camp and staff coloney**

It has been planned that all facilities to be constructed shall be fully equipped with the fire protection equipments as per IS standards.

**9.5 Public Health Delivery System**

**Development of medical facilities**

About 4500 labour and technical staff is likely to be deployed during the peak construction phase. In the project area districts, there are hospitals with adequate health care facilities. However, it is proposed to develop one dispensary and 9 first-aid posts.

**First-aid post**

A semi-permanent building shall be constructed for each first-aid post. These posts will have the following facilities:

- First aid post with essential medicines including ORS packets.
- First aid appliances, splints and dressing material
- Stretcher, wheelchair etc.

**Control of Malaria**

The increase in water fringe area provides suitable habitats for the growth of vectors of various diseases, which is likely to increase the incidence of water-related diseases. Malaria could be the major vector-borne disease in the area. Mosquito control measures aim at destroying the habitat and interrupting the life cycle by mechanical or biological or chemical means. The following actions need to be taken:
- All the private doctors in the area to be provided chloroquine tablets and arrangements for collection blood samples.
- Few of the Primary Health Centres to have Static Malaria Laboratory.
- Regular check up, surveillance and immunization of mobile populations.

**Health extension activities**

The health extension activities will have to be carried out in the villages situated within the command area. The health functionaries would undertake the following tasks as a part of health promotional activities:

- Collect water samples to ascertain the potability of water from different sources so as to monitor regular disinfection of drinking water sources.
- Maintain close surveillance on incidence of communicable diseases in these villages.
- Maintain close liaison with the community leaders and health functionaries of different departments, so that they can be mobilized in case of an emergency.

**Control of water – Borne diseases**

- It is recommended that details of incidence of various water-borne diseases in the command areas blocks be collected and analysed to detect any particular trend.
- A detailed water quality monitoring programme be designed and implemented. In areas showing incidence of water-borne diseases, intensive water quality monitoring shall be done.

A provision of Rs. 11.84 crores has been kept.

**9.6 Restoration and Landscaping of Construction Sites**

**Quarrying operations**

A project of this magnitude would require significant amount of construction material. The aggregate requirement for concrete is proposed to be met from nearby quarries. The proposed project would require significant amount of fine material, which shall be met by crushing the aggregates.

**Restoration plan for quarry site and barrow area**

The measures adopted for landscaping of these quarry sites are as follows:

**Measures to be adopted before quarrying**
The top 6-12” of soil will be removed before starting the quarrying activity or any other surface disturbance. This top soil will be kept separate and stock piled so that it can be reused after quarrying is over for rehabilitation of sites.

Measures to be adopted after quarrying

Diversion of run off

Effective drainage system will be provided to avoid the infiltration of run-off and surface waters into the ground of quarry sites.

Filling of depressions

Removal of rocks from quarry sites for different construction works will result in the formation of depression and/or craters. These will be filled by the dumping materials consisting of boulders, rock, gravel and soil from nearby plant/working sites.

Construction of retaining walls

Retaining walls will be constructed at the filled up depressions of quarry sites to provide necessary support particularly where there are moderately steep slopes.

Rocks for landscaping

After the quarrying activities are over, these sites will be splattered with the leftovers of rocks and boulders. The boulders of moderate size will be used to line the boundary of a path.

Laying of the top soil

The depressions/craters filled up with rock aggregates will be covered with top soil. The top soil will be further enriched by organic manure and Vesicular-arbuscularmycorrhizal (VAM) fungi. This will help in the process of soil reclamation and the early establishment of juvenile seedlings.

Revegetation

The revegetation of the dumping sites through ‘Integrated Biological and Biotechnological Approach’ A provision of 6.54 crore has been earmarked for quarry slope stabilization.

Landscaping and restoration plan
Area for landscaping

The working area of dam site, colony area has been selected for beautification of the project area after construction is over. The beautification in the colony area would be carried out by development of flowering beds for plantation of ornamental plant, creepers, flower garden and a small park, construction of benches for sitting, resting sheds, walk way and fountain. A provision of Rs.1.0 crore has been earmarked for landscaping and beautification of the area.

9.7 Greenbelt Development Plan

The general consideration involved while developing the greenbelt are:

- Trees growing up to 10 m or above in height with perennial foliage should be planted around various appurtenances of the proposed project.
- Planting of trees should be undertaken in appropriate encircling rows around the project site.
- Generally fast growing trees shall be planted
- Since, the tree trunk area is normally devoid of foliage upto a height of 3 m, it may be useful to have shrubbery in front of the trees so as to give coverage to this portion.

The recommended species for plantation under Greenbelt Development are Acacia nilotica, Albizia amara, Albizzia lebbek Albizia procera etc. The total cost works out to Rs.1.50 crore for green belt development.

9.8 Pollution Control at Construction Sites

Control of water pollution during construction phase

During project construction phase, sufficient measures need to be implemented to ameliorate the problem of water pollution from various sources. The sewage generated from various labour camps should be treated in septic tanks and disposed by discharging into nearest water body. The construction activities would require a crusher to crush large lumps of rocks to the requisite size for coarse as well as fine aggregates. The effluent generated from these crushers will have high-suspended solids. The effluent needs to be treated before disposal. Settling tanks of appropriate size for treatment of effluent from various crushers should be provided
Air Pollution control

The following measures are recommended to control air pollution:

- The contractor will be responsible for maintaining properly functioning construction equipment to minimize exhaust.
- Construction equipment and vehicles will be turned off when not used for extended periods of time.
- Unnecessary idling of construction vehicles to be prohibited.
- Effective traffic management to be undertaken to avoid significant delays in and around the project area.
- Road damage caused by sub-project activities will be promptly attended to with proper road repair and maintenance work.

Air Pollution control due to DG sets

The measures are recommended as below:

- Location of DG sets and other emission generating equipment should be decided keeping in view the predominant wind direction so that emissions do not effect nearby residential areas.
- Stack height of DG sets to be kept in accordance with CPCB norms, which prescribes the minimum height of stack to be provided with each generator set

Dust Control

To minimize issues related to the generation of dust during the construction phase of the project, the following measures have been identified:

- Identification of construction limits (minimal area required for construction activities).
- When practical, excavated spoils will be removed as the contractor proceeds along the length of the activity.
- When necessary, stockpiling of excavated material will be covered or staged offsite location with muck being delivered as needed during the course of construction.
- Excessive soil on paved areas will be sprayed (wet) and/or swept and unpaved areas will be sprayed and/or mulched. The use of petroleum products or similar products for such activities will be strictly prohibited.
• Contractors will be required to cover stockpiled soils and trucks hauling soil, sand, and other loose materials (or require trucks to maintain at least two feet of freeboard).

• Contractor shall ensure that there is effective traffic management at site. The number of trucks/vehicles to move at various construction sites to be fixed.

• Dust sweeping - The construction area and vicinity (access roads, and working areas) shall be swept with water sweepers on a daily basis or as necessary to ensure there is no visible dust.

**Noise control measures**

The contractors will be required to maintain properly functioning equipment and comply with occupational safety and health standards. The construction equipment will be required to use available noise suppression devices and properly maintained mufflers.

**9.9 Energy Conservation Measures**

The following energy conservation measures would be undertaken during construction works:

• Efficient work scheduling and methods that minimize equipment idle time and double handling of material
• Throttling down and switching off construction equipment when not in use
• Switching off truck engines while they are waiting to access the site and while they are waiting to be loaded and unloaded
• Switching off site office equipment and lights and using optimum lighting intensity for security and safety purposes
• Careful design of temporary roads to reduce transportation distance
• Regular maintenance of equipment to ensure optimum operations and fuel efficiency
• The specification of energy efficient construction equipment.

The following energy conservation measures would be implemented during operation phase:

• Use of CFL lights up to maximum possible extent.
• Awareness about the use of CFL lights by locals.
• Development of heating, cooling and lighting use in buildings through climate-responsive design and conservation practices.
• Employing renewable energy sources such as day lighting and passive solar heating.
• Optimizing building performance and system control strategies, such as controlling lights with occupancy sensors and controlling comfort.
• Maximizing the use of solar power for signage and pedestrian lighting.
• Designing roads on site to reduce transportation distances.

An amount of Rs.0.5 crore has been earmarked for implementation of Energy Conservation Measures.

9.10 Agriculture Improvement Plan
Integrated Plant and Nutrient Management (IPNM) approach would be useful for building soil productivity and improving crop yields. IPNM is an approach for maintenance or adjustment of soil fertility in relation to plant nutrient supply at an optimum level for sustaining desired crop productivity. This is done through optimization of the benefits from all possible sources of plant nutrients in an integrated manner.

Use of Agro-Chemicals

The following measures are recommended to prevent pollution and associated adverse impacts due to over-use of agro-chemicals:

• Soil should be tested to analyse the nutrients before each cropping season and the fertilizer dose shall be fixed considering the concentration of soil nutrients and the type of crops to be grown.
• Organic manures should be used in place of chemicals fertilizers, Agronomic practices such as crop rotation and green cover mulching which reduce the dependence on chemical fertilizers should be incorporated in the cropping pattern itself.
• Land conservation measures suggested as a part of watershed management are effective in controlling erosion by surface runoff. The agro-chemicals clinging to the eroded soil material is prevented from reaching the surface waters.
Control of weeds on agriculture lands
Measures against weeds comprise mechanical (cultivation and mowing), cultural or cropping, biological and chemical means.

Mechanical Methods
Hand weeding is the most efficient method, but it is back-breaking, time-consuming and costly. Further, high wages paid to the hired labour narrow down the profits of the cultivator.

Cultural or cropping methods
The farming practices are capable of changing the condition in such a way as to enable the crop plants to compete with weeds successfully or to reduce their interference to the minimum and thus preventing them from acting as impediments to increased crop production.

Chemical methods
The controlling of weeds in the growing crops with weedicides increases their yields and ensures the efficient use of irrigation, fertilizers and plant protection measures.

9.11 Catchment Area Treatment Plan
The Following Engineering and Biological measures have been suggested for the catchment area treatment.

1. Engineering measures
   - Nallah Bunding
   - Contour Bunding
   - Angle iron barbed wire fencing

2. Biological measures
   - Development of nurseries
   - Plantation/afforestation
   - Pasture development
   - Social forestry

An equivalent amount of 1% of total project cost i.e. Rs. 509.66 crore shall be earmarked for the CAT Plan for strengthening the ongoing Engineering and Biological

9.12 Disaster Management Plan
Emergency Action Plan

Once the Emergency situation is foreseen, the Emergency Action Plan may be put in operation, which may include:

- Areas likely to be evacuated with priorities to be notified.
- Safe routes to be used for evacuation. Such routes have to be identified, discussed and planned sufficiently in advance for proper implementation of the Plan.
- Means of transportation.
- Traffic Control.
- Shelters for evacuees.
- Procedures for evacuation of people from hospitals, public places, prisons etc.
- Procedures for care and security of property from evacuated areas from anti-social elements.
- Instructions regarding assignment of specific functions and responsibilities of various members of evacuation teams

Public Information System

During a crisis following an accident, the affected people, public and media representatives would like to know about the situation from time to time and the response of the emergency authorities to the crisis. It is important to give timely information to the public in order to prevent panic and rumors.

Spare equipment/material/Labour

The spare equipment/material, labor etc. should be available at pre-decided locations. The quantities of such equipment & places/locations should be reasonable & decided by Flood Control Authorities considering overall district requirement.

Management after receding of flood water

Some of the measures which need to be implemented are listed as below:

- Provision of various food items and shelter to the evacuees.
- Provision of fuel for various evacuees.
- Provision of adequate fodder supply.
- Arrangements for potable water supply.
- Commissioning of low cost sewage treatment and sanitation facilities, and disposal of treatment sewage.
- Expeditious disposal of dead bodies human and livestock.
• Immunization programmes for prevention of outbreak of epidemics of various water related diseases.
• Adequate stocks of medicines of various diseases, especially water-related diseases.

The budget for different activities required to be carried out implementation of DMP is Rs. 4.0 crore.

9.13 Command Area Deveoplemt Plan

Need for irrigation development

Development of irrigation and increase in agricultural production will act as a catalyst for development of industries, especially of agriculture produce processing including food processing

Existing cropping Pattern

The present agriculture practices are tuned to rainfall as such Kharif, Rabi and bi-seasonal crops. However the cropping intensities and the yield are low, it is mostly subsistence farming.

There may be small isolated pockets of Kharif paddy and Sugarcane where supplemental water is drawn from tube wells.

The red soils with low water holding capacity are generally cultivated during the Kharif and left fallow in Rabi. The moderately deep, fine textured black soils are also cultivated during Kharif season. Whereas the more common heavy black clay soils with high water holding capacity but with poor internal drainage are cultivated in Rabi season. The yields are low ranging from 0.74 tonne per hectare for maize to 0.25 tonne per hectare for pulses. The yield of Jowar, which is the major crop, is 0.5 tonne/ha.

Construction of Field channels

Apart from conserving seepage losses, following other benefits would also accrue to the shareholders as a result of lining of watercourses: -

a) Improved Command
b) Reduction in filling time
c) Equitable distribution of water
d) Improvement in areas already affected by water logging.
e) Better regulation & maintenance.
f) Reduction in maintenance cost.
g) Saving in animal, manpower or diesel and lubricants by removal of Jhullars.

**OFD Works**

In Irrigation projects, OFD works comprise of construction of field channels, land levelling/shaping, realignment of field boundaries, use of sprinklers/drip and field, intermediate and link drains etc. The initiative for capacity building of WUAs shall start prior to commencement of irrigation by the project authorities so ensure efficient management of water by inculcating a culture of participatory management of the water right from the beginning of canal irrigation practices.

**Mechanism for maintenance of OFD Works**

Terracing and land leveling in hilly terrains is an important activity requiring large funds for mechanized handling, which is beyond the limits of small and marginal farmers. At the request of certain states, a new component on full package OFD works is being introduced at higher cost norms in special category States. Similarly some of the other State prefers to perform land leveling and realignment of field boundaries at Government cost.

**Renovation of minor Irrigation Tanks**

In many cases of the projects, particularly in Southern and Central States, a large number of existing minor irrigation tanks within the irrigation commands of these projects have either been silted up or are encroached upon, thereby limiting their utility to augment supplies to the existing system within the commands. It has been decided to rehabilitate and remodel all such existing tanks and integrate them in the irrigation commands of the projects survey work is on in this regard. The rehabilitation and remodeling of these tanks has to be taken up at the last stage after all other CAD activities in the command have been completed.

**Training of farmers and technical staff**

The need for ensuring proper implementation of the programme has resulted in making training a very important activity under the CAD&WM Programme. The Ministry of Water Resources provides Central assistance for training of officials and farmers for implementing the CAD&WM Programme and Participatory Irrigation Management. The National level training programmes are to be organized by this
Ministry through Central State level organizations/institutions, WALMIs and other leading institutions.

9.14 Environmental Monitoring Programme

Water Quality

Construction Phase

It is proposed to monitor the waste water before and after treatment from sewage treatment plants. The frequency of sampling and analysis could be once per month. The sampling sites shall be labour camps area, Dam site. The parameters to be monitored include pH, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand Total Suspended Solids (TSS) and Oil & Grease. The total cost for analysis works out Rs. 1.44 lakh per year. Considering 10% as escalation per year, cost over a period of 7 years works out to Rs.13.66 lakh.

Operation phase

The surface water quality of the proposed reservoirs can be monitored during pre and post-monsoon seasons. The proposed parameters to be monitored include; pH, turbidity, total dissolved solids, calcium, magnesium, total hardness, chlorides, sulphates, nitrates, DO, COD, BOD, etc.

The total cost of analysis will be Rs.24,000 per year (2 times x 4 sites @ Rs 3000/- per sample). During project operation phase, a Sewage Treatment Plants (STPs) is proposed to be set up to treat the sewage from the power houses. It is envisaged to analyze a sample each before and after treatment from the STP, once every month. The parameters to be analyzed include pH, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Suspended Solids (TSS) and Oil & Grease. The cost of analysis of 24 samples @ Rs.3000/- per sample works out to Rs 72,000/year. Thus, total cost for analysis during project operation works out to Rs. 0.96 lakh/year.

Ambient Air Quality

Construction Phase

The ambient air quality monitoring during construction phase will be carried out by the self established an environmental lab or as per requirement by the external
agency, The frequency of monitoring could be twice a week for four consecutive
weeks at each station for each season. The parameters to be monitored are
Particulate Matter (PM$_{2.5}$) and Particulate Matter (PM$_{10}$), Sulphur dioxide (SO$_2$) and
Nitrogen dioxide (NO$_2$).

Every year, ambient air quality is to be monitored for (9 stations x 2 days/week x 4
weeks x 3 seasons) 216 days. A total cost of Rs. 10.08 lakh/year @ Rs. 5,000/- per
day can be earmarked for this purpose. Considering 10% as escalation per year,
cost over a period of 7 years works out to Rs.95.56 lakh.

**Noise**

**Construction Phase**

Noise levels from vehicular movement and operation of various construction
equipment will be measured during construction phase at major construction sites.
The frequency of monitoring could be once every month at various construction
sites. For monitoring of noise levels at construction sites and Integrating Sound Level
Meter will be purchased for which an amount of Rs. 1.5 lakh has been earmarked.

**Erosion and Siltation**

**Construction Phase**

Silt analysis is proposed to be carried out for project construction phase. The
frequency of monitoring could be done once every month from various sites in the
catchment area. The various parameters to be monitored include soil erosion rates,
stability of bank embankment, etc. The cost of analysis of 96 samples @
Rs.1500/sample works out to Rs.1.44 lakh/year Considering 10% as escalation per
year, cost over a period of 7 years works out to Rs.13.66 lakh.

**Operation Phase**

Soil erosion rates, slope stability of embankments of reservoirs, efficacy of soil
conservation measures, need to be closely monitored ones a month. The upper
Krishna Stage-III project staff at the site can do the study. The various parameters to
be monitored include soil erosion rates, stability of bank embankment, etc.

**Ecology**
Project Construction Phase

A detailed ecological survey covering forestry, fisheries, wildlife is recommended during entire construction phase. The survey can be conducted once every year for the entire construction period. The various aspects to be covered include:

- Qualitative and Quantitative assessment of flora and fauna.
- Monitoring of restoration of muck disposal area.

The monitoring can be conducted by a reputed external agency, for which an amount of Rs. 15 lakh/year can be earmarked. Considering 10% as escalation per year, cost over a period of 7 years works out to Rs.142.30 lakh.

Project Operation Phase

Status of afforestation programmes, changes in migration patterns of the aquatic and terrestrial fauna species should be studied. The study could be undertaken with a frequency of once per year for the entire design life of the Dam. A provision of Rs.10 lakh /year can be kept for this purpose. The monitoring can be conducted by a reputed external agency.

10.0 Cost Estimates

The total amount to be spent for implementation of Environmental Management Plan (EMP) is Rs. 1760.70 crore and the cost for implementing Environmental Monitoring Plan is Rs.4.55 crores.
COMPREHENSIVE ENVIRONMENTAL IMPACT ASSESSMENT STUDY FOR UPPER KRISHNA STAGE-III PROJECT, KARNATAKA

EXECUTIVE SUMMARY – SOCIAL IMPACT ASSESSMENT
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1.0 General
The Krishna Water Tribunal Award passed the order to achieve the reservoir level of Almatti Dam at Reservoir Level of 524.256 m. With the increase in level of Almatti Dam from FRL 519.60 to FRL 524.256 m, 22 villages are likely to be affected in Bagalkot and Bijapur districts of Karnataka. Based on the above water levels the baseline socio-economic survey was carried out in all the 22 villages across 4 Talukas of Bagalkot and 2 bordering Talukas of Bijapur in Karnataka. Based on data collection as a part of field studies, the total number of affected households is likely to be 20037.

2.0 Project Proposal for Stage III Schemes
The FRL of Almatti dam is to be raised from EL- 519.60 m to EL- 524.256 m in order to store and make use of additional water allocated to Upper Krishna Project by Government of Karnataka i.e. 130 TMC of water for irrigating 5,30,475 Ha under Stage III. Due to raising of FRL by 4.656 m, the additional land going to be submerged is 30,875 Ha and 22 villages are to be rehabilitated. 30,875 Ha of land which is going to be submerged, is to be acquired. The total land going to be submerged in the backwaters of the Almatti Reservoir is 74,742.15 Ha. Out of 74,742.15 Ha, 43,867.15 Ha have already been acquired upto FRL-519.60m. The total number of villages coming under submersion is 158 villages. Out of 158 villages, 136 villages have already been rehabilitated in Stage I & II of UKP and remaining 22 villages are to be rehabilitated in Stage – III of UKP. The following are proposed under Stage-III

- Raising of crest gates from RL 519.60 m to RL 524.256 m (providing and fixing new Radial Crest Gates) to store additional water and connected R&R works.
- The R & R for land acquisition, rehabilitation and resettlement of 22 villages and remaining part of Bagalkot Town which are going to be submerged in backwaters of Almatti Reservoir.
- Four lift schemes from the foreshore of Almatti reservoir.
- Five schemes consisting of extension of existing canals (flow/lift) from Narayanpur Reservoir in Stage III schemes.
- 115% Intensity of Irrigation is considered for planning and designing Stage – III Schemes.
Area Benefited

Area to be brought under Irrigation in Stage III schemes and the Districts and Taluk benefited are given in Table-1.

**Table1: List of Schemes and Districts and Taluks benefited**

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<th>Achkat (Ha)</th>
<th>Name of the District and Taluk</th>
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<td></td>
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<td>Bijapur, Muddebihal, B.Bagewadi,</td>
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<td>Mulwad</td>
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<td>Bhima Flank</td>
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The proposed Schemes under Stage III will have consumption of water of 625.68 mm which corresponds to 62,568 MCM (0.2209 TMC) per 1000 Hectare of irrigated area (Equivalent to 4,526.28 Ha/TMC). This is based on the overall irrigation efficiency of 0.50 (50%).

### 3.0 Profile of the District Affected Under UKP-III

**Bagalkot District**

As per Census 2011 Bagalkot district has a total population of 1,890,826. The population density of the district is 288 persons per square kilometer. The literacy rate of 69.39%. The district has 163 Gram Panchayats and 12 urban agglomerations. Bagalkot, with a decadal growth rate of about 19% is one of the ten fastest growing districts in Karnataka.

The district is positioned at 16°12’N and 75°45’E and covers an area of 6593 km².
Bagalkot district has six Talukas namely Bagalkot, Badami, Hungund, Mudhol, Jamkhandi and Bilgi. Each taluk is further subdivided into hoblies and villages and habitations. There are 21 hoblies in the district.

Bijapur District
According to the 2011 census, Bijapur district has a population of 2,175,102. The district has a population density of 207 inhabitants per square kilometer. Its population growth rate over the decade 2001-2011 was 20.38%. Bijapur District is divided into five talukas and 199 panchayats. The 5 talukas include Bijapur, Basavana Bagewadi, Sindagi, Indi and Muddebihal. Under the UKP – III only 2 talukas of the district have been affected i.e. Bijapur and Basawan Bagewadi.

4.0 Profile of the Villages Affected Under UKP-III

Ankali Village
The total affected population of Ankali village is 1781 and the total number of families enumerated is around 503. The total male and female population in the village is approximately 925 and 856 respectively. Majority of the land, approximately 390 acres (158 ha) in the village is irrigated land. Major crops grown in the villages include sugar cane, grapes, Sapota, Onion, pomegranate, maize, millets, etc. There is a sugar factory located at a distance of 4 kilometers from the village, where they are working for the livelihood. Given the close proximity to Bagalkot town the people of the village have good access to employment. Major occupation of the village is agriculture, agriculture labour and animal husbandry. Pomegranate, Sapota is also exported from this village. The village is well connected with an approach road to Bagalkot. Major towns close to the village are Hubli and Bagalkot. The village has 3 Samudaya Bhavans namely, laxmi Bhavan, Ambedkar Bhavan and Vittal Mandir which is very popular in the village. The village has some very good private educational institutions located in the village.

Gaddanakeri Village
Gaddanakeri, is a village located in Bagalkot District, Bagalkot Taluk and Kaladgi Hoobli falling under the jurisdiction of Gaddanakeri Panchayat. The village is located on the Hyderabad-Belgaum state highway. It is approximately 486 kilometers from the state capital, Bangalore and around 6 kilometers from district head quarters in
Bagalkot. According to the primary survey conducted the total population of the village is 3487 and the total number of families enumerated is around 950. The total males and female population in the village is approximately 1848 and 1639 respectively. Major social groups in the village constitute Hande Kurubar, Hadapad, Lingayat, Ambiga and Scheduled Castes and Tribes.

Major crops grown in the villages include cotton, maize, pulses, and millets etc. There is fairly good horticulture development in the village. Majority of the village members work within the village. Given the close proximity to Bagalkot town the people of the village have good access to employment.

Brick making has increased as an important cottage industry in Gaddanakeri village. There are approximately 30 brick making units in the village. This is also a major source of employment to the village population. Another important growing industry in the village is “Khadi Gram Udyog Bhandar”. There is a large Khadi Udyog Unit in the village which also providing employment to the village population.

Govinda Koppa Village

Govinda Koppa, is a village located in Bagalkot District, Bagalkot Taluk and Kaladgi Hoobli falling under the jurisdiction of Shellikeri Panchayat. The village is located on the Hyderabad- Belgaum state highway. It is approximately 485 kilometers from the state capital, Bangalore and around 21 kilometers from district head quarters in Bagalkot. The total males and female population in the village is approximately 1028 and 959 respectively. Major social groups in the village constitute Kuruba and Scheduled Castes and Tribes. It needs to be noted that more than 90 percent of the village is dominated by Kuruba community members.

Majority of the land in the village is irrigated land. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, sapota, pomegranate, maize and millets etc. There is fairly good horticulture development in the village. Majority of the village members work within the village. Given the close proximity to Bagalkot town the people of the village have good access to employment. Major occupation of the village is horticulture, agriculture cottage industry in blanket making. The horticulture in the village is well developed. Pomegranate, Sapota is also exported from this village. The animal
husbandry is also very well developed in the village. The village is well connected with an approach road to Bagalkot. Major town close to the village is Bagalkot. The village also has electricity connectivity and majority of the agriculture is dependent on the agriculture pump sets for irrigation purposes. There are around 60 street lights and 2 transformers for community and household lighting purposes.

**Hire Sansi Village**

Hire Sansi, is a village located in Bagalkot District, Bagalkot Taluk and Kaladgi Hoobli falling under the jurisdiction of Tulasigire Panchayat. It is approximately 481 kilometers from the state capital, Bangalore and around 16 kilometers from district head quarters in Bagalkot. According to the primary survey conducted the total population of the village is 1384 and the total number of families enumerated is around 263. The total male and female population in the village is approximately 689 and 695 respectively. Major social groups in the village constitute Reddy, Kuruba and Scheduled Castes and Tribes.

Majority of the land in the village is irrigated land. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, grapes, sapota, pomegranate, cotton, maize and millets etc. There is fairly good horticulture development in the village. The village is well connected with an approach road to Bagalkot. Major towns close to the village are Hubli and Bagalkot. The village also has electricity connectivity and majority of the agriculture is dependent on the agriculture pump sets for irrigation purposes. There are around 43 street lights and 2 transformers for community and household lighting purposes.

A) **Udagatti (Bagalkot)**

Udagatti, is a village located in Bagalkot District, Bagalkot Taluk and Kaladgi Hoobli falling under the jurisdiction of Kajjidhoni Panchayat. It is approximately 510 kilometers from the state capital, Bangalore and around 26 kilometers from district head quarters in Bagalkot. According to the primary survey conducted the total population of the village is 2398 and the total number of families enumerated is around 589. The total males and female population in the village is approximately 1246 and 1152 respectively. Major social groups in the village constitute Reddy,
Kuruba, Kumbara, Muslims and Scheduled Castes and Tribes. Majority of the land in the village is irrigated land. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, grapes, sapota, onion, pomegranate, maize and millets etc. There is fairly good horticulture development in the village. Major occupation of the village is agriculture, agriculture labour and animal husbandry. Like in the case of Ankalagi, villagers from Udagatti also export Pomegranate, Sapota to other countries. The animal husbandry is also very well developed in the village where the village population of milch animals is approximately 200-250.

F) Bavalatti (Bilagi)

Bavalatti, is a village located in Bagalkot District, Bilagi Taluk and Anagaawadi Hoobli falling under the jurisdiction of Kundaragi Panchayat. It is approximately 504 kilometers from the state capital, Bangalore and around 22 kilometers from district head quarters in Bagalkot. According to the primary survey conducted the total population of the village is 2477 and the total number of families enumerated is around 628. The total males and female population in the village is approximately 1300 and 1177 respectively. Major social groups in the village constitute Reddy, Kuruba and Scheduled Castes and Tribes. Majority of the land in the village is irrigated land. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, sapota, pomegranate, coconut, cotton, maize and millets etc. There is fairly good horticulture development in the village. There are 2 sugar factories located in the village. The villagers also are employed with these sugar factories for livelihood. Comparatively Udagatti is one of the interior villages in Bagalkot Taluk. Major occupation of the village is agriculture, private employment and animal husbandry.

G) Kundaragi (Bigali)

Kundaragi, is a village located in Bagalkot District, Bilagi Taluk and Anagaawadi Hoobli falling under the jurisdiction of Kundaragi Panchayat. It is approximately 497 kilometers from the state capital, Bangalore and around 22 kilometers from district head quarters in Bagalkot. According to the primary survey conducted the total population of the village is 7651 and the total number of families enumerated is
around 2040. The total males and female population in the village is approximately 3944 and 3707 respectively. Major social groups in the village constitute Brahmin, Kuruba, Lingayat, Reddy, Ambiga and Scheduled Castes and Tribes. Majority of the land in the village is irrigated. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, cotton, maize and millets etc. There is fairly good horticulture development in the village. There is 1 sugar factories located around 2 kilometers from the village. The villagers also are employed with these sugar factories for livelihood. We can also see that those families that are working in the sugar factories are also settled in this village. Major occupation of the village is agriculture, private employment and animal husbandry.

Another important observation made in this village is the local cottage industry of manufacturing Blankets (Kambali). According to the villagers, the Kudaragi Kabali is very popular and brings good income to those who manufacture the same. There is a society “Kurubara Unne Utpadana Sahakari Sanga” that caters to the purchases and marketing needs and extends necessary support to sustain this cottage industry. There is also a large sheep rearing activity in and in the surrounding areas of the village. The artisans who make the blankets get their raw material from these sheep rearing communities.

H) Katarki (Bigali)

Katarki, is a village located in Bagalkot District, Bilagi Taluk and Anagaawadi Hoobli falling under the jurisdiction of Katarki Panchayat. It is approximately 504 kilometers from the state capital, Bangalore and around 22 kilometers from district head quarters in Bagalkot. According to the primary survey conducted the total population of the village is 5086 and the total number of families enumerated is around 1361. The total males and female population in the village is approximately 2679 and 2407 respectively. Major social groups in the village constitute Kuruba, Lingayat and Scheduled Castes and Tribes. Majority of the households in the village belong to the Kuruba community. Majority of the land in the village is irrigated land. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, pomegranate,
grapes, sapota, wheat, sunflower, cotton, maize and millets etc. There is fairly good horticulture development in the village. There are a few sugar factories located around 5 kilometers from the village. The villagers also are employed with these sugar factories for livelihood. We can also see that those families that are working in the sugar factories are also settled in this village. Major occupation of the village is horticulture, agriculture, private employment and animal husbandry. Katarki also has a weekly fruit and vegetable market where the surrounding villages come to sell their agriculture products.

The village has local cottage industry of manufacturing Blankets (Kambali). There is a society “Kurubara Unne Utpadana Sanga” that caters to the purchases and marketing needs and extends necessary support to sustain this cottage industry. There is also a large sheep rearing activity in and in the surrounding areas of the village. The artisans who make the blankets get their raw material from these sheep rearing communities.

I) **Koppa SK (Bigali)**

S.K. Koppa, is a village located in Bagalkot District, Bilagi Taluk and Anagaawadi Hoobli falling under the jurisdiction of Chikka Alagundi Panchayat. It is approximately 520 kilometers from the state capital, Bangalore and around 45 kilometers from district headquarters in Bagalkot. According to the primary survey conducted the total population of the village is 3337 and the total number of families enumerated is around 877. The total male and female population in the village is approximately 1713 and 1624 respectively. Major social groups in the village constitute Reddy, Kuruba, Lingayat, Muslim and Scheduled Castes and Tribes. The village has around 2800 acres (1133 ha) of land of which around 2600 acres (1052 ha) is irrigated. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar-cane, wheat, cotton, sunflower, maize and millets etc. There are 6 sugar factories located in the village. The villagers also are employed with these sugar factories for livelihood. Major occupation of the village is agriculture, private employment and animal husbandry.

J) **Alagundi BK (Mudhol)**

Alagundi BK, is a village located in Bagalkot District, Mudhol Taluk and Lokapur Hoobli falling under the jurisdiction of Machakanur Panchayat. It is approximately
524 kilometers from the state capital, Bangalore and around 53 kilometers from district head quarters in Bagalkot. According to the primary survey conducted the total population of the village is 3574 and the total number of families enumerated is around 945. The total males and female population in the village is approximately 1841 and 1733 respectively. Major social groups in the village constitute Reddy, Lingayat, Kuruba, Muslims and Scheduled Castes and Tribes.

Majority of the land in the village is irrigated land. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, Pomegranate, Sapota, Grapes, Papaya, maize, wheat and millets etc. There are no major industries or economic centres, industries close to the village. Major occupation of the village is horticulture, agriculture and animal husbandry.

K) Machakanur (Mudhol)

Machakanur, is a village located in Bagalkot District, Mudhol Taluk and Lokapur Hoobli falling under the jurisdiction of Machakanur Panchayat. It is approximately 520 kilometers from the state capital, Bangalore and around 48 kilometers from district head quarters in Bagalkot. According to the primary survey conducted the total population of the village is 4256 and the total number of families enumerated is around 1019. The total males and female population in the village is approximately 2191 and 2065 respectively. Major social groups in the village constitute Brahmin, Ambiga, Hem Reddy, Lingayat, Kuruba, and Scheduled Castes and Tribes.

The village has approximately 3365 acres of land of which the irrigated land is approximately 3165 acres. Majority of the land in the village is irrigated land. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, cotton, pomegranate, maize, and millets etc.

There are no major economic centres close to the village. There are 2 small settlements within the village. Each located at a distance of 1 kilometer from the primary settlement. Major occupation of the village is horticulture, agriculture and animal husbandry. The SC colony pertaining to the village was submerged in Phase
- II of the UKP and a new location was identified and houses were constructed and a new resettlement colony was created to relocate these households from this colony using Zilla Panchayat funds. However, under Phase III of the UKP, this newly built resettlement colony is also getting submerged. Special care needs to be taken to ensure that these households who are affected twice in a single project are well protected.

L) Budhni BK (Mudhol)

Budhni BK, is a village located in Bagalkot District, Mudhol Taluk and Lokapur Hoobli falling under the jurisdiction of Machakanur Panchayat. It is approximately 530 kilometers from the state capital, Bangalore and around 40 kilometers from district head quarters in Bagalkot. According to the primary survey conducted the total population of the village is 1285 and the total number of families enumerated is around 311. The total males and female population in the village is 644 and 641 respectively. Major social groups in the village constitute Ambiga, Reddy, Lingayat, Kuruba and Scheduled Castes and Tribes. Majority of the land in the village is irrigated land. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, cotton, maize, wheat and millets etc. There are no major economic centres, industries close to the village. Comparatively is one of the interior villages in the Taluk. Major occupation of the village is agriculture.

M) Chikkur (Mudhol)

Chikkur, is a village located in Bagalkot District, Mudhol Taluk and Lokapur Hoobli falling under the jurisdiction of Bantanur Panchayat. It is approximately 524 kilometers from the state capital, Bangalore and around 50 kilometers from district head quarters in Bagalkot. According to the primary survey conducted the total population of the village is 3455 and the total number of families enumerated is around 871. The total males and female population in the village is approximately 1735 and 1720 respectively. Major social groups in the village constitute Ambiga, Hem Reddy, Lingayat, Lambani, Kuruba, Muslims and Scheduled Castes and Tribes. Majority of the land in the village is irrigated land. However, due to the submergence created by the Almatti Dam total land under the village is reduced. The village settlement is located in the centre and is surrounded by the village
lands. Major crops grown in the villages include sugar cane, cotton, grapes, pomegranate, maize, sunflower and millets etc. There are no major economic centres close to the village. There is a small Lambani Thanda located around 2 kilometers from the village. Major occupation of the village is agriculture and private employment and animal husbandry. It needs to be noted that women in the Lambani Tanda, are pursuing their traditional occupation of sewing traditional clothing, sarees, cloth purses etc.

**N) Bantanur(Mudhol)**

Bantanur, is a village located in Bagalkot District, Mudhol Taluk and Lokapur Hoobli falling under the jurisdiction of Bantanur Panchayat. It is approximately 524 kilometers from the state capital, Bangalore and around 35 kilometers from district head quarters in Bagalkot. According to the primary survey conducted the total population of the village is 4766 and the total number of families enumerated is around 1297. The total males and female population in the village is approximately 2434 and 2332 respectively. Major social groups in the village constitute Reddy, Kuruba and Scheduled Castes and Tribes. There is a small settlement within Bantanur village that is located at a distance of 2 kilometers from the main settlement. However, there is no proper connectivity with this settlement.

Majority of the land in the village is irrigated land. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, pomegranate, maize and millets etc. There is fairly good horticulture development in the village. There is a sugar factory located at a distance of 6 kilometers from the village. The people in the village also work there for livelihood. Major occupation of the village is agriculture, agriculture labour and animal husbandry.

**O) Hire Padaslagi(Jamkhandi)**

Hire Padasalagi, is a village located in Bagalkot District, Jamkhandi Taluk and Savalagi Hoobli falling under the jurisdiction of Hire Padasalagi Panchayat. It is approximately 546 kilometers from the state capital, Bangalore and around 75 kilometers from district head quarters in Bagalkot. According to the primary survey conducted the total population of the village is 8538 and the total number of families enumerated is around 1993. The total male and female population in
the village is approximately 4478 and 4060 respectively. Major social groups in the village constitute Jain, Lingayat, Uppar, Marathi, Muslim and Scheduled Castes and Tribes.

Majority of the land in the village is irrigated land. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, wheat, cotton, turmeric, vegetables maize and millets etc. There is a sugar factories located about 3 kilometers from the village. Large number of villagers are employed with these sugar factories for livelihood. Major occupation of the village is agriculture, private employment and animal husbandry. The animal husbandry business is the village is also well developed and the population of milk animals is more than 300-400 in the village. There is also a “Haalu Utpada Sanga” in the village that cater to milk production and marketing needs of milk producing farmers. Given that Jamkhandi is very close to the village a fairly large population in the village seeks employment in this town. The village is said to be very powerful politically as 2 MLAs from this village were elected in the previous state regimes.

The village is not well connected to the district head quarters in Bagalkot. The connecting road was submerged under the UKP – II. New road is being constructed to connect the village with the district head quarters. Major towns close to the village are Jamkhandi and Bijapur.

**P) Sanala (Jamkhandi)**

Sanala, is a village located in Bagalkot District, Jamkhandi Taluk and Jamkhandi Hoobli falling under the jurisdiction of Kumbarahallim Panchayat. It is approximately 634 kilometers from the state capital, Bangalore and around 83 kilometers from district head quarters in Bagalkot. According to the primary survey conducted the total population of the village is 3039 and the total number of families enumerated is around 695. The total males and female population in the village is approximately 1602 and 1437 respectively. Major social groups in the village constitute Reddy, Jain, Muslim and Scheduled Castes and Tribes.

Majority of the land in the village is irrigated land. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, pomegranate, grapes, sapota, wheat, sunflower,
cotton, turmeric, maize and millets etc. There is fairly good horticulture development in the village. There are a few sugar factories located around 7 kilometers from the village. The villagers also are employed with these sugar factories for livelihood. Major occupation of the village is horticulture, agriculture, private employment and animal husbandry. The animal husbandry business is also well developed in the village and the population of milch animals is more than 200 in the village. There is also a “Haalu Utpadakara Sanga” in the village that cater to milk production and marketing needs of milk producing farmers.

Q) Kumbarahalla (Jamkhandi)

Kumbarahalla is a village located in Bagalkot District, Jamkhandi Taluk and Jamkhandi Hoobli falling under the jurisdiction of Kumbarahalla Panchayat. It is approximately 630 kilometers from the state capital, Bangalore and around 80 kilometers from district head quarters in Bagalkot. According to the primary survey conducted the total population of the village is 6169 and the total number of families enumerated is around 1538. The total males and female population in the village is approximately 3255 and 2914 respectively. Major social groups in the village constitute Kurubar, Lingayat, Rajput, Jain, Muslim and Scheduled Castes and Tribes.

Majority of the land in the village is irrigated land. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, wheat, sunflower, cotton, turmeric, maize and millets etc. There are a few sugar factories located around 6 kilometers from the village. The villagers also are employed with these sugar factories for livelihood. Major occupation of the village is agriculture, private employment and animal husbandry. The animal husbandry business is the village is also well developed and the population of milch animals is more than 300-400 in the village. There is also a “Haalu Utpadakara Sanga” in the village that cater to milk production and marketing needs of milk producing farmers. Given that Jamkhandi is very close to the village a fairly large population in the village seeks employment in this town.

R) Chikka Galagali (Bijapur)

Chikkagalagali is a village located in Bijapur District, Bijapur Taluk and Mamadapura
Hoobli falling under the jurisdiction of Hosur Panchayat. It is approximately 553 kilometers from the state capital, Bangalore. According to the primary survey conducted the total population of the village is 3625 persons and the total number of families is around 870. The total males and female population in the village is approximately 1847 and 1778 respectively. Major social groups in the village constitute Ambiga, Reddy, Lingayat, Muslims and Scheduled castes.

The village has a total land of around 600 acres and majority of the land is irrigated. The village settlement is located in the centre and is surrounded by the village lands. There are also farm houses in the village where horticulture activity is taken up. Major crops grown in the villages include sugar cane, grapes, maize, sunflower, millets etc. There is economic activity visible in the village due to a sugar factory located close to the village. People from the village are employed in this sugar factory. Major occupation of the village is agriculture, private employment (due to the sugar factory) and dairy and animal husbandry.

S) Shirabur (Bijapur)

Shirabur, like in the case of Chikkagalagali is a village located in Bijapur District, Bijapur Taluk and Mamadapura Hoobli falling under the jurisdiction of Gunadala Panchayat. It is approximately 553 kilometers from the state capital, Bangalore. According to the primary survey conducted the total population of the village is 2460 and the number of families has been enumerated to 615. The total males and female population in the village is approximately 1275 and 1185 respectively. Major social groups in the village constitute Ambiga, Reddy, Lingayat, Muslims and Scheduled castes.

The village has a total land of around 1200 acres and majority of the land is irrigated. However, due to the submergence created by the Almatti Dam total land under the village is reduced. The village settlement is located in the centre and is surrounded by the village lands. There are also farm houses in the village where horticulture activity is taken up. Major crops grown in the villages include sugar cane, grapes, maize, sunflower, groundnut and millets etc. There is economic activity visible in the village due to a sugar factory located close to the village. People from the village are employed in this sugar factory. Major occupation of the village is agriculture, private employment (due to the sugar factory)
and dairy and animal husbandry.

T) Vandala (Basavan Bagewadi)
Vandala, is a village located in Bijapur District, Basavan Bagewadi Taluk and Nidagundi Hoobli falling under the jurisdiction of Vandala Panchayat. It is approximately 496 kilometers from the state capital, Bangalore and is around 60 kilometers from Bijapur where the district head quarters is located. According to the primary survey conducted the total population of the village is 7432 and the number of families enumerated is around 2253. The total males and female population in the village is approximately 3790 and 3642 respectively. Major social groups in the village constitute Kurubar, Nekaru, Lingayat, Devanga, Muslims and Scheduled castes. Majority of the land in the village is irrigated. The village settlement is located in the centre and is surrounded by the village lands. Major crops grown in the villages include sugar cane, pulses, sunflower, groundnut and millets etc. There is no major industry and factories in the vicinity of the village. Major occupation of the village is agriculture, dairy and animal husbandry and weaving. It needs to be noted that a fairly good population of weavers exists in the village. The clothing and weaving business is a flourishing occupation in the village. The village also has “Khadi Gram Udyog Kendra”. The unit employs approximately around 150-200 persons. Given that weaving is a major occupation in the village the Khadi Udyog Kendra encourages the villagers by providing the necessary support to weavers. The dairy business in the village is also well developed. The total number of miltch animals in the village is around 350-400. The village also has a Milk Federation Society that helps and supports animal husbandry farmers.

5.0 Profile of the Bagalkot Town Affected Under UKP –III
Bagalkot is one of the major town in Northern part of Karnataka State, which is affected in Phase-II and Phase-III of Stage-I of Upper Krishna Project. Bagalkot town will be submerged under back water of Almatti reservoir at different elevations. Bagalkot Town has an approximate population of 1 lakh people. It is anticipated that different portions of Bagalkot town will be affected gradually as the storage level of Almatti dam increases. Almatti Dam a part of U.K.P. is already constructed with
FRL of 524.256 m across the river Krishna. The gates are erected and storage is restricted upto RL 519.60 m as per Supreme Court order issued during April 2000. The Dam is located immediately below the confluence of river Ghataprabha with river Krishna. Bagalkot Town is on the right bank of Ghataprabha River situated at a distance of about 40 Km., by road with South west of Almatti Dam. The lowest portion of the town is at an elevation of 512.19 m and the maximum elevation being at about 533.53 m. A substantial portion of this town will get submerged in the back waters of Almatti Reservoir when the dam is raised to its ultimate FRL of 524.256 m.

For the present FRL of Almatti reservoir i.e. 519.60 m., the back water effect at Bagalkot is up to RL 521.00 m. Accordingly, the structures in Bagalkot town are acquired up to RL 521.00 m and submerged portion of the city is re-located and resettled in Unit-I Navanagar Bagalkot. In the Krishna Water Dispute Tribunal – II, pronounced on 30th December 2010, it is permitted to store the water in Almatti reservoir up to RL 524.256 m. When the water is stored to FRL 524.256 m in the Almatti dam the Backwater effect at Bagalkot will be up to RL 527.00 m. Therefore now it is right time to take the steps to resettle the PAF, lying between RL 521.00 m to RL 527.00 m, in stages in the new township of Navanagar.

For speedy implementation the state Government has enacted a special legislation called “Baglakot Town Development Authority Act, 1983”. vide Notification No. LAW 7 LGN 85 Bangalore dated 30.04.198. The act provides for establishment of separate autonomous authority to plan, develop and manage the resettlement and rehabilitation of PDF’s of the old Bagalkot town as well as to create a modern township. The authority is headed by a non-official Chairman, 3 non-official representatives having local area knowledge, MP, MLA of Bagalkot and President of City Municipal Council, Bagalkot as its members. A Chief Engineer, is designated as its Chief Executive Officer and Member Secretary. The board of the B.T.D.A also has Secretaries to the Government Finance, Housing & Urban Development, Public works & CADA, Joint Director (Town Planning) Deputy Commissioner, Bagalkot, Chief Engineer Dam Zone Almatti as official members. So far BTDA has mainly dealt with resettlement and rehabilitation of PDFs. Funds have been provided for this project by the State Government up to 1995 and afterwards the KBJNL Bangalore has been funding.
With regard to the urban area, the Full Reservoir Level has been fixed at 525.00 meters for the purpose of this study. Based on this around 10 wards in Bagalkot Town are being submerged due to the reservoir storage water.

6.0 Key Observations

The following are some of the key observations and impressions derived at after community level consultations in all the villages. These observations were the outfall of inputs provided by the community as well as specific observations made by the field team while undertaking the baseline socio-economic survey.

6.1 Break up of Community Cohesion: This aspect would refer to aspect of togetherness and bonding exhibited by members of a community. Community cohesion are evident within a give community that attempt social integration of multicultural societies. Through the ethnicity of the community is much similar in the affected areas this one of the important aspects of the affected families life that is immediately affected. While planning the rehabilitation measures it is important that this aspect is considered to reduce social disorientation amongst the affected families. Most households affected are already informed and can judge the impact of the UKP as they have witnessed the implementation of the earlier 2 phases. A lot of suggestions may also be elicited from the community by involving them as to how best such sensitive issues that may rise due to their displacement may be addressed. The following may be considered while planning the mitigation and identifying alternatives.

- There should be a clearly defined and widely shared sense of the contribution and acceptance of rehabilitation measures by different individuals and communities.
- It is important to ensure that there is a strong sense of individual’s rights and responsibilities when living in a particular place or when relocated to a new location.
- Even though the persons affected come from different socio-economic background they should be provided with similar life opportunities and access to services and treatment.
- It is important to ensure that there is a strong sense of trust in institutions locally to act fairly in arbitrating between different interests of the affected
population and for their role and justifications to be subject to public scrutiny.

- It is important to ensure that a strong recognition of the contribution of both those who have newly arrived and those who already have deep attachments to an existing place is created. Gelling of newly relocated community and host community is very important.
- There are strong and positive relationships between people from different backgrounds in the workplace, in schools and other institutions within neighbourhoods once the affected families are relocated or rehabilitated.

6.2. Disintegration of Social Support Systems: The possibility of disintegration of social support systems is a definite possibility when displacement is as high and complete as in the case of UKP – III. Capacities, abilities, assets, networks established over a period of time are immediately impacted when displaced. Disintegration of social support systems especially at the asset level, family level, relationship level, networks developed over a period of time with institutions etc., would be disturbed and hence planning to minimize such an impact is of utmost importance. Reestablishing community based associations, faith based networks, cultural cohesion, political orientation is important.

6.3. Disruption of Women's Economic Activities: it was observed during field work that this is an immediate impact on women in the villages. In the rural areas as well as in the urban areas women are involved in a number of activities thrift, credit and other economic activities. For example, almost all the villages have established Self Help Groups. Dairy Development Groups, Weavers Groups which are the main source of vocation as well as livelihood. Though they may not be the primary bread earners to the family, their contribution to the family income however cannot be overlooked. In the urban areas most worn are working as domestic helps, private agencies and are also members in Neighbourhood Thrift Groups. Villages like Hire Padasalagi, Kumbarahalla, Sanala, Ankalagi etc., which have huge dairy and animal husbandry activity provide livelihood to women in these villages. Almost all villages have SHGs and “Shri Shakti Sanghas” which are involved in credit and thrift activities. Villages like Govinda Koppa, Kataraki and Kundaragi provide employment to almost 80 percent of the Kuruba community women. Such economic activities of where women support their household income need to be protected and sustained.
6.4. Loss of Cultural Properties, Temples & Archeological Sites: Given that most communities are closely associated and are sensitive towards their cultural and religions orientations, it is important that such properties and practices are protected. During the survey it was observed that a number of such properties are being affected. A concrete plan to this extent needs to be drafted and executed. In many villages there is incidence of “Community Muths” like Lingaya Mutt, Kuruba Mutt, Vitthala Mutt etc. that are associated with specific communities. Temples like Hole Basaweshwara Temple in Machakanur, Chiranti Mutt in Kundaragi, Rameshwara Mutt in Shirabur, Purnananda Mutt in Bavalatti, Pawada Basaweshwara Mutt in Vandala, Ramalingeshwara Temple in Kundaragi, Ranganatha temple in Bavalatti etc., are some examples of the cultural and religious properties that are being affected due to the project.

6.5. Involvement of Local Institutions: This is one of the important aspects where the local governments and agencies have to be involved in the implementation and management of resettlement and rehabilitation activities. The panchayats in the villages and the councilors in the urban locations can make support the entire R&R implementation in the affected areas. Coordination with community, civil society organizations, oversight over rehabilitation activities, approvals and necessary ratifications from the local governing bodies etc. can be undertaken with the support of these institutions.

6.6. Incidence of Non-Governmental Organizations: It is found that there are not many NGOs or civil society organizations that are operating at the village level. However there are NGOs operating at the Taluka and District level. Given that UKP has had R&R implementation experience under UKP – I and II, some of the good NGOs that have worked under the previous phases may be collaborated with during the R&R implementation phase. Furthermore a number of NGOs are operating at the State and country level that possess the capacity to implement large scale R&R activities. Such NGOs may be involved in the project through concrete procurement procedures.

The detail information collected through the baseline socio-economic survey. Based on the survey results the total number of households enumerated the rural area (20 villages) is approximately around 20,037 households and around 3,524
households in the urban area (affected 11 wards of Bagalkot Town) of which around 2,186 are owner and around 1,338 households are tenants.

7.0 Resettlement and Rehabilitation Plan

The Krishna Water Tribunal Award passed the current to achieve the reservoir level of Almatti Dam at Reservoir Level of 524.256 meters. With the increase in storage level of Almatti Dam from FRL 519.60 to FRL 524.256 meters around 22 villages are getting affected by the storage waters in Bagalkot and Bijapur districts of Karnataka. Based on the above water levels the baseline socio-economic survey was carried out in all the 22 villages across 4 Talukas of Bagalkot and 2 bordering Talukas of Bijapur in Karnataka (Two villages namely, Yadahalli K and Sangondi villages have been removed from the list as the R&R and activity has already been completed in these villages as part of UKP Stage – II).

The details of the affected Homestead are 23561 is given in the Table 2. This information is based on the primary socio-economic baseline survey undertaken as part of this study.

<table>
<thead>
<tr>
<th>S. No</th>
<th>Description</th>
<th>Total Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Rural Households</td>
<td>20037</td>
</tr>
<tr>
<td>2.</td>
<td>Urban Households</td>
<td>2186</td>
</tr>
<tr>
<td>3.</td>
<td>Urban Tenants Households</td>
<td>1338</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>23561</strong></td>
</tr>
</tbody>
</table>

Source: Primary Study

For the purpose of this project, the R&R plan has been devised using the norms and guidelines of the “Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013”. The Consultant based on past experiences in similar projects, in the area have suggested/specified/ augmented/ enhanced the R&R provisions. The objective of the R&R Plan is to enable project planners to take appropriate measures to devise suitable compensation as a part of resettlement and rehabilitation package for the PAFs.
7.1 **Measures for Compensation of Loss of Private Properties**

**Compensation for Land**

Of the total land coming under submergence area, private irrigated land accounts for 8425.64 ha. About 23561 families are likely to lose land in submergence area of the project. On the other hand, compensation for acquisition of private land would be paid to the respective land owners/land titleholders as per the provisions of “Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013”.

7.2 **Compensation for Homesteads**

It is envisaged that this proposed project is also likely to evict a number of families from their homesteads as well. As per the assessment, in all there are 23561 homestead structures are likely to get affected as a result of land acquisition.

7.3 **Compensation of Other Properties**

Other properties such as trees, wells, ponds, temples, cremation grounds, public utility buildings and spaces, electric and telephone poles and cables, etc., would be assessed, evaluated and compensation rates would be fixed as per the prevalent guidelines/norms. The compensation amount shall be disbursed to the concerned department, agency, individuals, etc.

7.4 **Measures for Resettlement**

There are 23561 families that are likely to be evicted from their homesteads as a result of the process of land acquisition due to construction of dam and subsequent submergence area. These families would be eligible to receive resettlement benefits, in addition to compensation of homestead plot and structure. The provisions “Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013” have been taken into consideration. Further, it is suggested that these families be resettled/relocated at one place as a group, in one or more of the existing nearby villages.

Summary of amenities and facilities to be provided in resettlement sites are summarized in Table 3. An amount of **Rs. 10790.0 lakh** has been kept for providing civic amenities and infrastructure facilities in the resettlement sites.

**Table-3: Summary of amenities and facilities to be provided in resettlement sites**
<table>
<thead>
<tr>
<th>S. No.</th>
<th>Amenities &amp; Infrastructure facilities to be provided in resettlement sites</th>
<th>Cost (Rs. lakh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Internal village roads</td>
<td>880.0</td>
</tr>
<tr>
<td>2</td>
<td>Drainage network</td>
<td>1100.0</td>
</tr>
<tr>
<td>3</td>
<td>Sanitation network</td>
<td>1760.0</td>
</tr>
<tr>
<td>4</td>
<td>Drinking water supply</td>
<td>2200.0</td>
</tr>
<tr>
<td>5</td>
<td>Footpath</td>
<td>220.0</td>
</tr>
<tr>
<td>6</td>
<td>Public transportation – Construction of bus stop</td>
<td>110.0</td>
</tr>
<tr>
<td>7</td>
<td>Drinking water trough for cattle</td>
<td>110.0</td>
</tr>
<tr>
<td>8</td>
<td>Place of worship</td>
<td>440.0</td>
</tr>
<tr>
<td>9</td>
<td>Cremation ground</td>
<td>220.0</td>
</tr>
<tr>
<td>10</td>
<td>Fair price shop and 4 other shops</td>
<td>220.0</td>
</tr>
<tr>
<td>11</td>
<td>Construction of Post office</td>
<td>110.0</td>
</tr>
<tr>
<td>12</td>
<td>Construction of Panchayat Ghar</td>
<td>550.0</td>
</tr>
<tr>
<td>13</td>
<td>Construction of Community Hall</td>
<td>440.0</td>
</tr>
<tr>
<td>14</td>
<td>Primary Health Centre</td>
<td>1000.0</td>
</tr>
<tr>
<td>15</td>
<td>Garden and children’s playground</td>
<td>220.0</td>
</tr>
<tr>
<td>16</td>
<td>Primary school along-with anganwadi building</td>
<td>1100.0</td>
</tr>
<tr>
<td>17</td>
<td>Space for weekly market</td>
<td>110.0</td>
</tr>
<tr>
<td>18</td>
<td>Total</td>
<td>10790.0</td>
</tr>
</tbody>
</table>

7.5 Measures for Rehabilitation

In the proposed project, majority of the population depends on land for their livelihood. Privately owned land is also expected to be acquired. The rehabilitation plan would be formulated in line with the norms of “Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013”. The provisions for Rehabilitation Plan for families losing land. The provision for Rehabilitation measures shall be taken as per the Rehabilitation parameters mention in Schedule-II of “Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013”. The details of total land being lost by the project affected families and the details of the land to be acquired are given in Table-4.

Table-4: Compensation for Private land being acquired

<table>
<thead>
<tr>
<th>S.No</th>
<th>Total Market value of the area</th>
<th>Total Private land being acquired (Acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>3.0 lakh per acre for submergence</td>
<td>43319.19</td>
</tr>
<tr>
<td>2.</td>
<td>3.0 lakh per acre for canal alignment</td>
<td>18758.68</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>62077.87</td>
</tr>
</tbody>
</table>

The Compensation for the private land being acquired for the Project shall be decided by the Competent Authority not less District Magistrate.
8.0 Monitoring and Evaluation

Monitoring and Evaluation (M&E) must be simultaneous with the implementation of Rehabilitation Plan. It requires specialized skill for application of general project monitoring procedures to the process of land acquisition and rehabilitation. Conventional monitoring, normally carried out by the Government machinery, often misses focus on certain vital aspects and does not identify certain shortcomings, which may otherwise prove very important. While the conventional government monitoring will continue, an external M&E agency will also be engaged to help in proper monitoring of land acquisition and rehabilitation programs. The main purpose of involving such an agency is to bring the problems and difficulties faced by the PAFs to the notice of Administrator R&R on a regular basis for their redressal as well as to help in formulating and undertaking corrective measures. The external Monitoring and Evaluation (M&E) agency can submit half yearly reports on the progress of implementing Rehabilitation Master Plan (RMP) along with suggestions and corrective measures required for improvement in the implementation of Rehabilitation Plan.

For Land Acquisition and rehabilitation program, M&E system will consist of:

i) Administrative monitoring;

ii) Socio-economic performance, and

iii) Impact evaluation.

Administrative monitoring will be conventionally carried out by SLAO, project authorities, Resettlement Commissioner and other concerned government agencies/departments. The focus will be on physical (like number of land holders affected and land based resettlement, area identified for allotment to Village Level Committee, etc.) and financial (like compensation paid, payment to M&E agency, office establishment cost, etc.) parameters.

The socio-economic monitoring which will be carried out concurrently is the crux of M&E exercise to provide interim measures based on the field level situations. This along-with impact evaluation at the end of plan period will be carried out by the M&E agency. While covering the affected community, monitoring will focus on the vulnerable groups like women, physically handicapped, etc. The household information collected through the socio-economic survey will form the benchmarks for comparison. However,
these benchmarks will be supplemented in order to create new reference points against performance, effects and objectives.

8.1 Monitoring and Evaluation Guidelines

Monitoring of the progress of R&R is important because of the sensitivity of these issues. The objective of monitoring is to assess the progress of resettlement activity, to identify difficulties, ascertain problem areas, and provide indication for the need of calling attention to some specific issues at an early stage. Following tasks have to be performed by the group at different stages of the project:

- Establish baseline information on individual PAFs and their pre-project standards of living, health conditions, nutritional patterns, etc. This should precede resettlement in general by a year.
- The planning of the resettlement monitoring studies could cover disbursement of compensation and grants.
- Monitoring of resettlement sites regarding, preparation of land, construction activities, water and other facilities required before the actual resettling of PAFs.
- The resettlement monitoring system could cover transport of people, belongings and allocation of replacement assets. Their report should also include information on performance of field staff and concerned official's participation of the PAFs and host community reactions.
- After resettlement, a few sensitive indicators using sample survey techniques should be measured, mainly to understand how effective the R&R plan has been in reality.
- The monitoring and evaluation can continue for several years after actual relocation. The frequency of monitoring can be reduced after the completion of R&R work. The monitoring reports need to be submitted periodically to assess progress of resettlement and its effects compared with established policy and specific timetables and benchmarks at each phase.

8.2 Post-Project Monitoring

Status of availability of alternative homestead for project affected persons, development of infrastructural facilities such as schools, sewer networks, roads, etc. are some of the aspects which could be considered for monitoring and modifications may be suggested
if required. It needs to be appreciated that R&R issues are politically and socially sensitive issues and need timely attention. For such reasons, it is suggested that the monitoring be conducted by an independent agency not connected with the project. Therefore, an independent Consultant having experience in monitoring & evaluation of implementation of Resettlement & Rehabilitation Plans in similar areas and not connected with the project, can be appointed for monitoring the project. The Consultant will review the rehabilitation and resettlement programme after 2nd, 4th and 6th year from the completion of the R&R activity.

8.3 Participation of PAFs

Involvement of affected communities in planning and implementation of rehabilitation programs according to their felt needs and socio-economic conditions is of vital importance. To obtain co-operation, participation and feedback, PAFs need to be systematically informed and consulted during preparation and implementation of resettlement plan about their options and rights. In the proposed project, co-operation and participation of PAFs in the resettlement process could be ensured through their involvement in each of the following stages.

- **Involvement in preparation of Rehabilitation Master Plan**
  As a part of participatory planning, community meetings should be held on a routine basis to explain about the project and the R&R policy of the project. Direct communication with the PAFs will negate the politicization of the R&R Process. The communication with the PAFs can be through the Village Level Committee.

- **Involvement of PAFs in implementation process**
  The Village Level Committee can be involved in the implementation of Rehabilitation Plan particularly during the identification of forest land to be allotted to Village Level Committee. They shall also be consulted in finding out alternative economic opportunities to supplement their household income. However, some NGO groups can also be associated which can interact directly with the project authorities and the affected population.

8.4 Parameters for Monitoring and Evaluation of R&R Plan

Once the R&R Plan is implemented, affected families should not be forgotten. Their progress should be monitored, evaluated and recorded. This would greatly help the government or other organizations for further improving the Rehabilitation and
Resettlement guidelines. It would form a basis of evaluating whether the resettlement has been a success or not. If the resettlement has not been successful, the answers would come out at this stage and the same mistakes can be avoided for other resettlement schemes.

9.0 Local Area Development Plan

The present chapter outlines the Local Area Development Plan (LADP) for UKP-III Project. The objective of the plan is to empower the families of the study area villages and partially affected villages. Villages that would be fully affected, which need to be relocated, shall be provided R&R benefits as per the Policy and also other resettlement benefits. Contrarily, it is the project affected families residing in partially affected who are not likely to benefit from the proposed project except for compensation of their acquired properties, which would be mostly part of their lands. Thus, LADP is being framed to extend benefits to not only the residents of the partially affected villages, but also to residents of the villages adjoining to project area which are also within the study area villages.

The budget of 0.5% of the project cost has been earmarked for implementation of the Local Area Development Plan (LADP). The provision allotted for implementing of Local area Development Plan is Rs.254.83 Crore.

The following aspects have been covered under the Local Area Development Plan:

- Educational Facilities
- Health Care and Medical Facilities
- Infrastructure Development
- Economic Development
- Social and Cultural Development

10.0 Cost for Implementing Management Plan for Social Aspects

- The total amount to be spent for implementation of Management Plan for Social Aspects is Rs. 1097.0 crore. The details are given in Table-3

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Item</th>
<th>Cost (Rs.Crore)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Resettlement &amp; Rehabilitation Plan</td>
<td>841.00</td>
</tr>
<tr>
<td>2.</td>
<td>Local Area Development Plan</td>
<td>254.83</td>
</tr>
<tr>
<td>3.</td>
<td>Monitoring and Evaluation Aspects</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>1096.83 say 1097.00 crore</strong></td>
</tr>
</tbody>
</table>