JAMUNA BRIDGE PROJECT
ENVIRONMENTAL ASSESSMENT

(Compilation of Summaries)

August 22, 1993
Explanatory Note

1. The attached documents consist of summaries of studies prepared by the Government of Bangladesh and its consultants over the period 1989-1993 relative to the environmental analysis and resettlement aspects of the Jamuna Bridge project. The environmental and resettlement work is continuing; presented here are the studies and recommendations available to date. The recommendations of the studies done early in the time period were in some instances implemented, incorporated into the design of the project or superseded by the studies done later in time. A comprehensive environmental assessment overview is under preparation and would be contained in the staff appraisal report.

Environment

2. The initial environmental work was carried out in 1989 as part of the project feasibility study. This study produced an environmental chapter (presented here as Attachment 1) and an environment annex. The study recommended additional environmental work on drainage, fisheries, wildlife and land use, and the development of a plan to mitigate the impacts of closing the northern intake of the Dhaleswari River. The recommended studies with the (exception of a drainage study), including the development of management plans, were carried out in 1991 to 1993.

3. The fisheries plan is presented as Attachment 2, the wildlife plan as Attachment 3. Both plans are under review by IDA and are subject to revision.

4. The land use master plan was prepared by a consulting firm in 1992-1993, its summary is presented as Attachment 4. This plan was deemed to require modification, therefore a revised plan, termed the Bridge End Integration Study, was prepared in 1992 and is presented as Attachment 5.

5. The Dhaleswari Mitigation Plan is presented as Attachment 6. The recommendations of this plan are under review by the Government of Bangladesh and IDA staff. Of particular concern is the recommendation for the construction of an embankment south of the bridge to limit overbank flow and consequent erosion—cause land loss because the embankment solution has its own adverse impacts on fisheries and water resources.

6. The drainage problem cited in Attachment 1 can not be addressed until the river training works and bridge abutments are in place and the land form reconfigures to a new natural state. At that time topographic surveys will be conducted and drainage facilities will be designed and built. The project budget includes funds for this purpose.
7. In discussions with the Government in August 1993, agreement was reached that an environmental cell would be created for monitoring environmental parameters during construction and when the bridge is operational, and that the broadly representative Jamuna Bridge Environmental Management Committee would play a larger role in providing environmental oversight. Government also agreed that an environmental specialist would be added to the existing Panel of International Experts associated with the project.

8. At present an environmental specialist is assisting the Government of Bangladesh in consolidating the various environmental studies and mitigation plans. The appraisal of the project would not be considered complete until management and monitoring plans which are satisfactory to IDA are in place.

Resettlement

9. The resettlement action plan is presented here as Attachment 7. Resettlement experts are assisting the Government of Bangladesh in refining the plan. As with the environment plan, the appraisal of the project will not be considered to be complete until the resettlement plan is acceptable to IDA.

A. Bruestle, TWUWS
August 22, 1993
JAMUNA BRIDGE PROJECT
ENVIRONMENTAL ASSESSMENT

Attachment 1
11. ENVIRONMENTAL IMPACT ASSESSMENT

11.1 Scope of the Study

In the course of the feasibility study several questions have been raised with respect to possible side effects of the bridge project. Some concern was expressed about the hydraulic and morphological changes induced by the project and their possible adverse effect on agriculture, fisheries and navigation. In particular the complete closure of one of the Dhaleswari intake channels by the approach embankment was expected to have a significant impact on the environment as a whole.

In view of these concerns the Consultants were requested to determine whether or not the proposed project can be expected to result in significant environmental impacts and if so to indicate which additional studies will be required to ensure that the project will give due consideration to these impacts.

A first assessment of all possible effects (both positive and negative) caused by the bridge project was made and it was determined where measures would be required to remedy significant and unacceptable adverse effects. All significant physical and socio-economic effects due to the project were considered and are discussed in Annex M. Direct and indirect quantifiable costs or benefits are discussed in Appendix H-15. This environmental impact assessment (EIA) is not intended to study the feasibility of alternative mitigatory measures, but rather to indicate which further studies will be required to determine the most feasible solution.

It was not the purpose of this study to modify the basic concept of the bridge project, nor its design. The study however indicates which minor modifications might be desirable in order to prevent environmental damage.

The study enables the Authorities to determine:

(i) whether the project has significant environmental impacts or not;

(ii) whether such significant impacts are acceptable from a socio-economic, cultural and technical point of view;

(iii) and if not, what further actions are required to determine the most feasible measures to conserve and protect the environment.

11.2 Methodology

Given the very short time available for this EIA, most of the study was based on secondary data and information collected in Bangladesh in August 1988.

Some additional information was collected in the field mainly with respect to:

- demographic and socio-economic situation in the impact area;
agriculture;
- fisheries;
- navigation and water transport.

A sample household survey was carried out in the areas directly affected by the proposed project works. Due to the severe flood condition during the study period, this survey was limited to the most accessible places only, and cannot therefore be considered as a purely random sample.

Further, the scheduling of the EIA also precluded that an adequate analysis of the rail project be taken into consideration as the alignment and characteristics of the rail embankments were unknown. As a result of the analysis carried out of the road approaches and their effect on agriculture and on flooding, it is generally considered acceptable to assume that the costs and benefits to the environment caused by including a rail link on the bridge are equal. The environmental effects include the change of use of the land from agriculture to rail embankment and the effects on agriculture of an altered flooding regime.

11.3 Definition of Impact Area

The environmental impact area of the Jamuna bridge is defined as all areas where physical changes in the existing environment may be expected. It excludes more distant areas where economic changes occur as a result of the improvement of the transport network (regional development effects).

In this study the following types of impact area are distinguished:

(i) land that will be occupied by permanent structures;

(ii) land that will be acquired for temporary use or occupation during construction;

(iii) land in the vicinity of project works, where changes in land use are expected as a result of the road construction (settlements, industries, etc.);

(iv) land where water management, agricultural and fishing practices will change as a direct result of the bridge project (e.g. backwater effect, disrupted drainage, navigation etc.);

(v) land where ecological changes (flora, fauna, soil, water, air) will occur as a result of the infrastructural works;

(vi) the North West zone, where wood fuel consumption and deforestation will be reduced as a result of the gas pipeline which may cross the Jamuna on the bridge.

11.4 Environmental Effects during Construction

No major environmental effects are expected during the construction period of about 3.5 years, except the normal construction hazards.
Minor effects identified include:

- limited disruption of drainage, groundwater and waste water discharge;
- interruption of agricultural practice due to temporary occupation of land (40ha);
- some disturbance of wildlife, mainly migratory birds and reptiles (unavoidable during construction);
- pollution of soil and water, which can be avoided by careful handling and storage of chemical waste and other potential contaminants.

In order to avoid social unrest and health hazards in the construction area, adequate housing and sanitary facilities should be provided for about 1,500 to 2,000 labourers and staff.

It is recalled in this respect that the Consultants have proposed that a flood free housing site be created from dredged sand at the beginning of the construction period. After completion of the project, part of the housing and sanitary facilities could be used by the Jamuna Bridge Authority for housing of its own staff.

All dredged material (25 to 30 million m³) may be used for the construction of bridge end facilities, approach roads and working areas. Only dredge spoil from temporary access channels across chars may have to be disposed of in the river. The embankments will be raised above flood level by means of hydraulic fill. When normal 'standard' procedures are followed no environmental impact is expected.

It is unlikely that dredged material from the Jamuna river will be contaminated by toxic chemicals or heavy metal, because as yet no heavy industries exist upstream of the bridge site. It is nevertheless recommended that the fill material be analysed prior to reclaiming the housing and residential areas. The likelihood of contaminated material in the Padma river is much greater because of the heavy industries along the Ganges in India. Samples should be analysed prior to the selection of dumping sites.

11.5 Flood Protection

Maximum backwater effects after river training works during average floods are less than 10 cm, and during standard high water almost negligible. The frequency of failure of the Brahmaputra flood embankment would theoretically increase as a result of the backwater effect. For a 1 in 50 year design flood, the height should be increased by 0.25 metres. Furthermore river training works would also provide some additional protection to the flood embankment, resulting in less erosion damage.

11.6 Closure of the Dhaleswari River

Closure of the northern intake channel of the Dhaleswari river by the construction of the east approach embankment is expected to have a
significant hydrological impact on the upper Dhaleswari basin (700km\(^2\)) and a minor impact on the middle basin (1,860km\(^2\)) but no impact on the lower basin (beyond Savar). The total impact area amounts to 256,000ha. It is estimated that maximum flood levels in the upper basin would be reduced by 0.25 to 0.50m and by less than 0.1m in the middle basin.

Water level reduction in the pre and post monsoon period would be more important, i.e. up to 1.25m in the upper basin and 0.6m in the middle basin. Maximum flow reduction in the Dhaleswari middle reach would be 35 percent in an average year.

Navigation on the upper Dhaleswari river will be disrupted by the closure of the northern intake channel. Navigation downstream of the bridge site will be adversely affected by the flood reduction in the Dhaleswari basin. It is estimated that the navigable period will be reduced from 3 months at present to about 1.5 month.

Closure of the Dhaleswari river and the resulting flood reduction is expected to have a significant impact on fish resources in the impact area:

- disruption of longitudinal fish migration;
- reduction of spawn fry fish collection in the Dhaleswari-Kaliganga system; this loss of spawn represents 30 tons of fish;
- flood reduction causes a loss of fish grounds of about 1500ha which represents a loss of fish of about 300 tons/year.

The annual agricultural benefits due to flood reduction in the monsoon season are estimated to significantly outweigh the combined disbenefits due to (i) yield reductions of the dry season crops as a consequence of flood reduction and reduced availability of water, (ii) disturbance of navigation, (iii) reductions of spawn fry fish collection and loss of fish grounds and (iv) the loss of land to other users.

Potential irrigation development, both ground water and surface water, will be reduced by the changing flood regime.

11.7 **Drainage**

Drainage and runoff from the floodplain land upstream of the bridge would be severely disrupted as a result of the construction of the road embankments across the flood plain. The area affected is some 4,000ha. The number of affected households is approximately 1,500. The consequent income reduction is estimated to be Tk10,600 per family. Remedial drainage measures should be further investigated.

11.8 **Navigation on the Jamuna River**

In order to assess the navigation clearance and width in relation to the designed bridge profile, an analysis has been made of the river channels
that occurred during the last 20 years. The results of this analysis show that a minimum channel width of 170m which meets the requirements for Class A waterways is always available.

11.9 Pollution

Pollution hazards related to the increased traffic system flow are limited because of the relatively low traffic densities. Adequate road drainage is imperative in order to prevent contamination of water resources and agricultural land by polluted highway runoff and spill of hazardous materials.

11.10 Gas Transmission

Gas transmission to the North West zone of Bangladesh is not expected to have a significant impact on reforestation and wood fuel consumption, because,

- the total forest area in the North West zone is small, probably less than two percent (including village forest) of total area;
- the wood fuel demand is much higher than actual consumption; for the year 2000 the wood fuel deficit is estimated at some 1,000,000 tons/year.

The maximum saving of wood fuel due to gas distribution is estimated at some 300,000 tons per year, which is the same order of magnitude as the present wood fuel production in the North West zone.

11.11 Loss of Agricultural Lands

It is estimated that 1,150ha of agricultural land will be lost to the project, affecting about 724 households or 4,300 people. The number of houses to be moved from the right of way of the project works is estimated at 202. It is further estimated that about 90 percent of the affected households will lose more than 80 percent of their cropped land and hence their means of living. The total number of households to be resettled therefore amounts to 652.

11.12 Summary of Benefits and Costs

Table 11.1 provides a summary of the costs and benefits of the environmental effects of the bridge. The values incorporated in the table have been extracted from results discussed in Appendix H-15. The most significant benefit is the improvement to agricultural yields during the monsoon period in areas affected by the closure of the Dhaleswari river. Agriculture in other seasons is adversely affected but not as significantly. Additional embankment protection provided by the river training works also make a contribution to protecting the environment. The net value of agricultural production foregone because of changes in land use is estimated at Tk8.3 million a year which represents some 15 percent of the net gain in the value of agricultural production.
The above analysis excludes the consequences of the railway approaches to the bridge, as discussed in section 11.2 above. A brief analysis of the effects of the railway approaches has led to the conclusion that the value of agricultural production foregone is at least compensated by the additional protection from flooding offered by the rail embankments.

11.13 Mitigatory Measures

The following specific mitigatory measures are recommended:

- drainage facilities for agricultural land in the Jamuna flood plain upstream of the bridge;

- construction of carp hatcheries to replace the loss of spawn collection areas (investment costs estimated at Tk3.0 million) and to improve the fish extension services and the spawn collection technology;

- resettlement programme for about 650 farming families, including a training programme to provide skills for alternative employment;

- impose and monitor standard control measures during the construction period to prevent pollution hazards and sanitation risks;

- impose security measures to reduce construction accidents and to prevent social unrest and other incidents during the construction period.

For each of these recommended measures detailed studies and plans are required.

In addition to these mitigatory measures it is recommended that:

- a masterplan should be prepared for future urban and industrial development prior to the implementation of the project and surplus dredge spoil should be used to reclaim the areas for future settlement and immediate resettlement of displaced families;

- an inventory should be made of the wildlife in the impact area with a view to assessing the impact after the completion of the project. This study is recommended because very little is known about the wildlife situation in general in Bangladesh (e.g. migratory birds) and useful data may be acquired for similar projects elsewhere.
Table 11.1

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Source: Consultants' estimates, based on discussion in Appendix H-15
JAMUNA BRIDGE PROJECT
ENIRONMENTAL ASSESSMENT

Attachment 2
Jamuna Multipurpose Bridge Authority
Fisheries Mitigation Action Plan

1.0 Jamuna Multipurpose Bridge, because of its size, has been classified under category 'A' project requiring full environmental impact assessment in line with Operational Directive (OD 4.00) set forth by the World Bank. Among the environmental studies, "Resettlement of the Project Affected Persons" and "Fisheries Mitigation Action Plan" are the most important.

Construction of Jamuna Multipurpose Bridge, especially the closure of the northern intake of the Dhaleswari river, will entail certain impacts over the river system of the area within and surrounding the project. Some negative impact on the fish production and fish catch in the area is expected to occur which will require adequate mitigatory measures to restore the loss of fish production and fish catch in the affected areas. This plan aims at restoring the present condition of the affected people and, if possible, improve their present condition.

2.0 The main objectives of the fisheries mitigation action plan is "To identify as well as to quantity the impacts on fisheries resources" due to the construction of JMB which, among other activities, include the closure of the northern intake of the Dhaleswari river the principal water body in the region, and "To initiate adequate mitigatory measures' through management & mitigation plan of which Department of Fisheries is the nucleus providing leadership for training NGOs and its extension services' personnel to enable them to organize and motivate the affected fishermen and landless groups & unemployed youth in modern aquaculture technology so as to derive the maximum benefits and thereby, not only neutralize the negative impacts of the project, but also improve the lot through mainly (a) Pond culture techniques imparted by trained NGOs who will assisted by fish and environmental expatriate personnel & (b) Restocking beel area with fingerlings.

3.0 a) Results of different studies - The project impact area:

The GHK/MRM study shows that due to closure of the northern intake of Dhaleswari, the surrounding river system comprising the rivers Pungli, Lohajang, Elanjani, Jugini will be affected. The beels fed by the river system will also suffer for want of water. The impact area will, therefore, extend right up to Mirzapur of Tangail District which is about 30 km east of the bridge. In all, about 8 nos. of Thanes will be affected in district Tangail and Manikganj. The Dhaleswari river extends from Bhuapur immediately upstream of the proposed bridge site through Munshigonj to Meghna river. Out of two principal intakes of Dhaleswari, the northern one is located slightly upstream of proposed bridge and the southern intake is located at about 20 km downstream of proposed Jamuna Bridge Project.
The Jamuna Bridge Consultant, RPT/NEDECO/BCL, while conducting the feasibility study of the project, determined the location of the bridge at about 8 km downstream of Sirajganj. The Consultant found that for safety of the river-training and other allied works of the main bridge, the northern intake of the river Dhaleswari will have to be closed. Dhaleswari river is in the eastern bank of the river Jamuna and is about 8 km northward of the east bridge-end area. According to the consultant such closure is inevitable for safety of the main bridge. Sudden onrush of flood water which enters through the northern intake of Dhaleswari may outflank and can cause irreparable damage to the bridge itself. Of course, flow of water through Dhaleswari river hardly remains perennial for continuous siltation specially at the intake-point. (Appendix "A" explains the reason for closure).

It, therefore, follows that the Jamuna bridge project having to close the northern intake of the Dhaleswari river apart from putting up embankment and bridge-end facilities will have definite impact on the fishery at the site of the bridge, the adjacent river courses, floodplains, canals, ponds and depressed areas directly fed by the Dhaleswari river. The main impact area is the upper Dhaleswari river basin. The middle Dhaleswari river basin mostly fed by the southern intake, will be little or less affected as the Dhaleswari river-system has a few more prominent link channels with the Jamuna, south of the Bridge. Of them, Makerkhal is getting wider & deeper day by day indicating the reduced flow in the Dhaleswari on account of closure will be considerably compensated. Other than this, one plus point of closure is that because of impeded drainage, shallow water depth offering shelter for fish fry shall increase by 70% and will partially offset the fish loss. Although the flood embankment prevents spill to the floodplain, there are openings in embankment in the form of sluices at intervals which will allow floodwater with fish fry to get in & get out as and when sluices are in operation. Besides, inundated ponds in the impact area will present opportunity of improvement for reduced flood depth in the area.

**Actual projected impact area within the affected districts:**

<table>
<thead>
<tr>
<th>District/Water Body Type</th>
<th>Potential Impact Area (ha)</th>
<th>Estimated Percent Impact</th>
<th>Projected Actual Impact Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tangail</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ponds</td>
<td>480</td>
<td>100%</td>
<td>480</td>
</tr>
<tr>
<td>Open Water</td>
<td>16,463</td>
<td>30%</td>
<td>4,939</td>
</tr>
<tr>
<td>Sub-Total</td>
<td>16,943</td>
<td></td>
<td>5,419</td>
</tr>
<tr>
<td><strong>Manikganj</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ponds</td>
<td>664</td>
<td>100%</td>
<td>664</td>
</tr>
<tr>
<td>Open Water</td>
<td>52,253</td>
<td>10%</td>
<td>5,225</td>
</tr>
<tr>
<td>Sub-Total</td>
<td>52,917</td>
<td></td>
<td>5,889</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>69,860</td>
<td></td>
<td>11,308</td>
</tr>
</tbody>
</table>
The projected actual impact area covers a total of 11,308 ha in the two districts, which includes 1,144 ha of aquaculture ponds and 10,164 ha of open water fisheries area.

<table>
<thead>
<tr>
<th>District</th>
<th>Thana</th>
<th>Collection Centre</th>
<th>Name of River</th>
<th>Quantity of Hatchlings harvested (kg)</th>
<th>Sale rate Tk/Kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tangail</td>
<td>Tangail (Sadari)</td>
<td>Charabari ghat</td>
<td>Dhaleswari</td>
<td>3.25</td>
<td>4,000.00</td>
</tr>
<tr>
<td></td>
<td>Kalihati</td>
<td>Kesnabpur, Botua, Alipur</td>
<td></td>
<td>49.00</td>
<td>4,900.00</td>
</tr>
<tr>
<td></td>
<td>Nagarpur</td>
<td>Nisondo ghat, Penchhara ghat, Agadiquila</td>
<td></td>
<td>38.00</td>
<td>4,000.00</td>
</tr>
<tr>
<td>Sub-Total</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td>90.25</td>
</tr>
<tr>
<td>Tangail</td>
<td>Gopainul</td>
<td>Zagatkara, Nolinc</td>
<td>Jamuna</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bhujpur</td>
<td></td>
<td></td>
<td></td>
<td>13.45</td>
</tr>
<tr>
<td>Sub-Total</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td>18.45</td>
</tr>
<tr>
<td>Sirajganj</td>
<td>Sirajganj (Sadari)</td>
<td>Sirajganj ghat, Kazipur, Kazaknai</td>
<td>Jamuna</td>
<td>7225.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kazipur</td>
<td>Khudbangri, Tangleghera</td>
<td>Jamuna</td>
<td>143.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Chouhan</td>
<td>Solajana</td>
<td>Jamuna</td>
<td>4.80</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Reikachi</td>
<td>Dolua, Khedramaria</td>
<td>Jamuna</td>
<td>175.75</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sahajdpur</td>
<td>Sonatani, Gopaipur, Bangiachar</td>
<td>Jamuna</td>
<td>81.00</td>
<td>3500.00</td>
</tr>
<tr>
<td>Sub-total</td>
<td>11</td>
<td></td>
<td></td>
<td>7629.55</td>
<td></td>
</tr>
<tr>
<td>Manikganj</td>
<td>Shivalaya</td>
<td>J. Kulia, Kowora, Tabla</td>
<td>Jamuna</td>
<td>50.00</td>
<td>2000.00</td>
</tr>
<tr>
<td></td>
<td>Dawlatpur</td>
<td>Aricha, Taraghat</td>
<td>Jamuna (Bachamara)</td>
<td>2000.00</td>
<td></td>
</tr>
<tr>
<td>Sub-total</td>
<td>5</td>
<td></td>
<td></td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td>Total Dhaleswari</td>
<td>7</td>
<td></td>
<td></td>
<td>18.45</td>
<td></td>
</tr>
<tr>
<td>Total Jamuna</td>
<td>18</td>
<td></td>
<td></td>
<td>7769.80</td>
<td></td>
</tr>
<tr>
<td>Grand Total Dhaleswari + Jamuna</td>
<td>25</td>
<td></td>
<td></td>
<td>7787.25</td>
<td></td>
</tr>
</tbody>
</table>
In addition to the capture fishery, there is a carp spawn and fry collection industry in the impact area (See table for the species involved). The collection of carp spawn is important because fresh water aquaculture in closed water bodies is largely dependent on the supply of captured fry and fingerlings which will get entrance into the flood plains through the link channels.

Table-I provides information on the affected districts, the area affected, population dependent on the open water fishery of the Jamuna river system and the total area of fish ponds in the districts. In the impact area, riverine water bodies covers potential area of about 69,860 ha of which about 11,308 ha will be actually affected by the Jamuna Bridge Project (Map attached). In addition to the loss of permanent fishing grounds comprising rivers and cattures, beals and ponds there is an additional loss of seasonal floodplain fishery areas which in flooded area is calculated as about 20% in the upper and 10% in the middle Dhaleswari basins respectively.
As already stated the initially Feasibility Studies for the Construction of Jamuna Multipurpose Bridge by RPT/NEDECO/BCL, GHK & others indicated closure of Northern intake of Dhaleswari river which lies across the flood embankment & in close proximity to the bridge approach (Map attached). In order to obviate the possibility of outflanking of the bridge, it was technically established that the closure is a must.

Table 1 - Potential Affected Districts, Thana and Impact Areas

<table>
<thead>
<tr>
<th>District</th>
<th>Upazila</th>
<th>Ponds Status</th>
<th>Population (1981 Census)</th>
<th>District wise open water bodies (river, ox-bow lakes, beels etc)</th>
<th>Estimated impact</th>
<th>Impact area</th>
<th>Estimated loss of fish ground</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number</td>
<td>Area (ha)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tangail</td>
<td>Bhuapur</td>
<td>593</td>
<td>98</td>
<td>137,115</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Kalihati</td>
<td>937</td>
<td>132</td>
<td>258,992</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nagarpur</td>
<td>984</td>
<td>139</td>
<td>259,198</td>
<td>16,483</td>
<td>30</td>
<td>4,638</td>
</tr>
<tr>
<td></td>
<td>Tangail</td>
<td>787</td>
<td>111</td>
<td>408,617</td>
<td></td>
<td></td>
<td>20  928</td>
</tr>
<tr>
<td>Manikryan</td>
<td>Daulatpur</td>
<td>1,637</td>
<td>207</td>
<td>143,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ghochar</td>
<td>1,036</td>
<td>131</td>
<td>114,000</td>
<td>52,225</td>
<td>10</td>
<td>5,223</td>
</tr>
<tr>
<td></td>
<td>Saturea</td>
<td>1,187</td>
<td>148</td>
<td>142,000</td>
<td></td>
<td></td>
<td>10  522</td>
</tr>
<tr>
<td></td>
<td>Sibaleya</td>
<td>1,411</td>
<td>178</td>
<td>200,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>8,651</td>
<td>1,144</td>
<td>1,682,922</td>
<td>67,698</td>
<td></td>
<td>9,861 1,480</td>
</tr>
</tbody>
</table>


The impact assessment on Fisheries due to closure of the northern intake of Dhaleswari was extensively & comprehensively studied by GHK/MRM International Ltd followed by "Fisheries impact and Mitigation Study" done by Agrodev Canada Inc./Shamolina Ltd. in the year 1993. Furthermore, based on the "Fish Catch Statistics of Bangladesh", a TFP study was undertaken by Dept. of Fisheries in the year 1987-88. All these studies concluded with the findings that due to closure of the northern intake there will be significant impact on fish production.
Impact on Fisheries following the construction of JMBP is mentioned below:

<table>
<thead>
<tr>
<th>Study - Report</th>
<th>Fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>According to Mrs. RPT/NEDECO/BCL (Feasibility Study Report)</td>
<td>1,260 mt.</td>
</tr>
<tr>
<td>According to M/s. GHK/HRM. (Dhaleswari Mitigation Plan)</td>
<td>500-1,000 mt.</td>
</tr>
<tr>
<td>According to Bangladesh Bureau of Statistics (BBS)</td>
<td>1,246 mt. Not calculated</td>
</tr>
<tr>
<td>According to Fish Catch Statistics of Bangladesh (FCSB)</td>
<td>11,800 mt. Not calculated</td>
</tr>
<tr>
<td>According to Fisheries Project (TFP)</td>
<td>Do 3,300 mt. (28%)</td>
</tr>
<tr>
<td>According to M/s. Agrodev/Shamolima Report</td>
<td>11,380 mt. 9,240 mt. (Potential Loss) 1,130 mt. (Actual Loss)</td>
</tr>
</tbody>
</table>

Weight of hatchlings collected from the Jamuna and Dhaleswari Rivers at centres located within the project impact area, 1986-87 to 1988-89.

<table>
<thead>
<tr>
<th>District And River</th>
<th>Production (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1986-87</td>
</tr>
<tr>
<td>Tangail</td>
<td></td>
</tr>
<tr>
<td>Jamuna</td>
<td>305.00</td>
</tr>
<tr>
<td>Dhaleswari</td>
<td>174.00</td>
</tr>
<tr>
<td>Sub-total</td>
<td>524.00</td>
</tr>
<tr>
<td>Manikganj</td>
<td></td>
</tr>
<tr>
<td>Dhaleswari</td>
<td>27.97</td>
</tr>
<tr>
<td>Sirajganj*</td>
<td></td>
</tr>
<tr>
<td>Jamuna</td>
<td>3,750.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4,301.97</td>
</tr>
</tbody>
</table>

* Sirajganj Sadar Thana only

Source: DOF Statistics
Fishermen Affected

According to M/s. RPT/NEDECO/BCL

According to M/s. GHK/MRM

According to M/s. Agrodev/Shamolima Ltd.

Impact on Hatchlings

According to M/s. RPT/NEDECO/BCL 50 kg of fingerlings are likely to be lost following construction of the JMBP ending in the closing of the Northern intake of the Chaleswari river. But, M/s. Agrodev/Shamolima Ltd. calculated this loss to the tune of 122.75 kg. This loss has to be compensated by renovating existing Hatchery.

3.0 (b) Impact Evaluation:

As stated earlier the impact on Fisheries evaluated by the consultants varies to a large extent ranging from 1000 ton to 3300 ton per year. However, the most exhaustive studies have been done by GHK/MRM and M/s. Agrodev, Canada Inc./Shamolima Ltd. Bangladesh and according to them the loss of fish in the impact area would amount to 1000 to 1260 ton & the loss of hatchlings will be 122.75 kg. The Third Fisheries Project calculated the loss of fish to the tune of 3300 tons on the basis of one in 20 years drought conditions which will be about 28% of the average fish production of the non-stocked fish area. Jamuna Multipurpose Bridge Authority (JMBA) assumes the actual figures may be much less. In view of the requirement a few mitigatory measures recommended by M/S Agrodev/Shamolima Ltd. as mentioned below are therefore, planned to make good the loss of fish production.

Potential fish production from the three districts

<table>
<thead>
<tr>
<th>Seed during 1988-89</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Source</th>
<th>Number of Hatchlings</th>
<th>Equivalent Number of Fingerlings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Spawn</td>
<td>2,154,184,000</td>
<td>161,563,800</td>
</tr>
<tr>
<td>Govt. Hatcheries</td>
<td></td>
<td>15,000</td>
</tr>
<tr>
<td>Private Hatcheries</td>
<td>280,000,000</td>
<td>21,000,000</td>
</tr>
<tr>
<td>TOTAL</td>
<td>2.4 billion</td>
<td>183 million</td>
</tr>
</tbody>
</table>
a) **Pond Aquaculture**

With 2.5 ton per hectare per year & 810 hectares available pond out of 1141 hectares;
Total yield = 2025 ton (2.5 x 810).

b) **Restocking of the Beel area**

The rest (3300-2025) = 1275 ton would be recouped by restocking the beel area. Beel area required to be restocked = 1275/0.075 = 17,000 hectares, considering 0.075 ton production per hectare from the beel area (potential beel area available 56,742 hectares).

c) **Improvement of the Hatchery**

For supply of fingerlings existing hatcheries shall have to be improved and one demonstration hatchery has to be made for training.

JMBA considers the target of production of fish of 2.5 ton per hectare per year from pond and 0.075 ton/ha from beel is quite rational and can be achieved with moderate efforts. The high yield variety (HYV) fish now available in Bangladesh can produce 2.5 ton per hectare per year.

4.0 **Mitigation Action Plan**

The mitigation action plan aims at, not only, compensating the loss suffered by the potentially affected fishermen but also improving their condition. GHK/RRM, Agroderv/Shamolima Ltd. and DOF though differed in their opinion about the magnitude of loss of fish production in the impact area, JMBA agreeing with Mr. Ronald Zweig of IDA holds that it will be safe to consider the high side of the probable estimated loss which is about 3300 ton per year. Therefore, the mitigation measures should be aimed at compensating 3300 ton per year.

Mr. Ronald Zweig of IDA recommended three options for potential mitigation:

- Construct an approach bridge over Dhaleswari river,
- Develop a stocking programme along the line of IDA's third Fisheries Project (TFP) or ADB's Second Aquaculture Project (SAP) and/or,
- Expand pond Aquaculture in the project area.

5.0 The first option i.e construction of an approach bridge over the river Dhaleswari would have been a good option had it been a technically viable proposition. This could have kept alive the Dhaleswari river sub-system. But JMBA as well as consultants have great concern about this option. In addition to serious technical objection, the cost for the bridge of this kind resembles that of the Jamuna bridge proper and far outweighs the viability of the main bridge. This option therefore is not acceptable.
6.0 Stocking Programme:

As a broad national policy, the deptt. of fisheries have been vigorously pursuing stocking programme all over Bangladesh in low-lying beel areas and in flood plain areas and found it technically feasible, financially viable in general. But the success of such project in specific areas remains yet to be demonstrated and further expansion of the project should wait till positive results from TFP and SAP accrue; JMBA considers that stocking programme in low lying areas can run concurrently with the pond aquaculture. In northern districts of Bangladesh the stocking programme in beel areas have acquired momentum and positive results have emerged out of this experiment.

7.0 Pond aquaculture:

Of the three options, pond aquaculture appears to be most viable and can be achieved. A recent estimate of M/S Agrodov/Shamolima Ltd. shows that there are about 1144 hectares of unused ponds in Tangail and Manikgonj District of which 810 hectares would be developed. A field level survey undertaken jointly by DOF and NGOs would identify & develop these ponds numbering 5720 out of 8651 and equal number of associated groups would need to be developed and formed respectively. Taking the total loss of fish production of 3300 ton per year, the mitigatory measure by pond aquaculture & beel stocking along with estimate of Hatchery improvement & supply of fingerlings to feed the ponds and the beel is shown below:

(a) Pond Development 810 hectares Tk. 911.25 lac
(b) Beel Restocking 17,000 " Tk. 112.50 lac
(c) Hatchery improvement 8 nos at the rate of 25.00 lacs = Tk. 200.00 lac
(d) Supply of Fingerling at the rate of 1.25 lacs per ton = Tk. 2,073.75 lac

8.0 JMBA accepts the option of pond aquaculture to be the best in all respects and the DOF has prepared a project concept paper (PCP) for obtaining approval of GOB. The methodology to be adopted to handle this project efficiently and in a timely manner is described in subsequent chapters. Of course, the beel stocking programme can also run concurrently. Developing of mini hatchery now existing at p(Hare level with the help of DOF can be a good answer for supplying fingerlings. Reputed NGOs will also be invited by JMBA/DOF to pursue the programme by motivation, training and providing the affected groups with post-training loan. The cost estimate also covers such activities. The post-training loan will enable the affected fisherman to continue his aquaculture practice which he has been doing traditionally and the landless group will thereby get opportunity to improve their livelihood.
9.0 Socio-Economic Development Plan

The consultants study show that there are about 5,600 - 9,000 fishermen going to be adversely affected. Since the flow of water in the river Dhaleswari is always seasonal (5 to 6 months in a year), the income loss of each fisherman has been estimated to be varying from Tk 1,000 to Tk 2,000 per annum. Development/re-excavation of unused ponds will enable the affected fishermen to find a new source of livelihood and this can be done with ADB's financial support.

JMBA anticipates that leasing of this developed ponds among the affected fishermen will have to be systematically organized and motivated by NGOs. The 'Khas' water areas can be leased out immediately to the affected fishermen either individually or in groups. The group formation will be done by NGOs. But in case of private ponds such proposition for leasing among affected fishermen may need motivation. This can also be suitably done by NGOs. DOF will enter into an agreement with NGOs on commencement of work. The NGOs will carry out the work on payment to be made by DOF. The initial estimate shows that about Tk 144 (lac) will be required for this purpose.

10.0 JMBA along with DOF and NGOs will undertake a wide ranging training programme for the potentially affected fishermen and landless groups. The main objective of the training programme will be to educate the fishermen about modern pisciculture concept as well as improving the traditional methods. NGOs will train the fishermen in groups at DOF's cost. The cost as has been estimated now is Tk 25 lacs.

11.0 Objectives of Management and Monitoring Plan

The primary functions of the fisheries management in the impact area that will devolve upon DOF are mentioned below:

a) Collection of fisheries data in the impact area.

b) Conducting training programme for the field level fisheries officers and fishermen by expatriate personnel & NGOs.

c) Imparting training to the aquaculture group in fisheries technology and extension service.

d) Organise fishermen and landless groups & unemployed youth.

e) Distribute fisheries equipment among the trained people groups.

f) Processing of the credit documents by NGOs.
Monitoring Programme

a) Collection of environmental data relating to fisheries during construction and afterwards.

b) Periodic report on fisheries related affairs, during and after the project is completed.

c) Evaluation of fisheries management.

It is proposed that the aquaculture programme in the project area will be achieved with financial support of ADB and in collaboration with the ADB Second Fisheries Project and the extension services of DANIDA and FAO/UNDP.

12.0 The mitigatory measures aims at, not only, compensating the loss suffered by the fishermen but also improving the socio-economic condition of the fishermen. DOF intends to provide post-training loan to the trained fishermen so that they can continue their fish culture which they have been doing for generations. It has been estimated that Tk 144 lacs will be required for post-training loan. The priority of giving loan will be determined according to the loss suffered by each fisherman due to the closure of Dhaleswari.

13.0 Afforestation

Department of Forest will take up afforestation in the pond area at JMB's cost.

Cost Estimate for Development Plan

1. Manpower:
   a) Officers 11 Nos. 42.00
   b) Staff 35 Nos. 53.00

2. a) Pond development 810 hectare 911.25
     b) Improvement of the Hatcherries 8 unit 200.00
     c) Soil/Rivers development 100 hec. 112.50

3. Transport:
   a) Jeep/Pickup 2 Nos. 20.00
   b) Motor Cycle 30 Nos. 18.00
   c) Bicycle 50 Nos. 2.50

4. Office Furniture & Equipment
   40.00

5. Land Development
   960 ha 144.00
   (Leasing of Land for two years)
6. **Foreign Consultant**
   (Fisheries Expert 24 man-months: Environmental Specialist 24 man-months each)
   
   - 2 Nos. x 94.60 = 189.20

7. **NGO/Local Consultant:**
   - Fisheries Expert 1 Nos. 7.50 = 7.50
   - Environmental Specialist 1 Nos. 7.50
   - Fisheries Co-ordinator 1 Nos. 4.80
   - Agro-Fisheries Expert 8 Nos. 25.00 = 200.00
   - Field Assistant 6 Nos. 10.00 = 60.00

8. **Production Cost:**
   - Hiring of Houses 10.00
   - Fuel and maintenance of vehicles 40.00
   - Training cost 25.00
   - Purchase of Fingerlings for aquaculture and stocking baell area 850.00
   - Fishing Equipments 720.00
   - Medicine and Chemicals 30.00
   - Survey and Supervision 60.00
   - Miscellaneous 30.00

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**Total Amount:** 3,577.65
**Implementation Procedure**

The above action plan shall cover a five-year programme:

1. **Budgetary provision for pond renovation and execution.**
2. **Renovation of**
   - Demonstration Farm, including purchase of equipment
   - Mini Hatchery
3. **Utilization of the credit by different target groups assisted by NGOs.**

3rd year shall witness the rearing of fish in the pond (2000 Nos.) with purchased fingerlings and Monitoring Programme continued.

In the 4th year, the 3720 ponds shall be commissioned for fish culture and Monitoring Programme for post evaluation shall commence.

5th year-completion of remaining activities.
The decision of closing the northern intake of the Dhaleswari river was taken after proper and detailed study by GHK/MBM International Limited in association with Hunttings Technical Services Ltd. & Uniconsult International Ltd. which are reflected in article 4.8, 5.3.1, 5.3.2 in the final report of Dhaleswari Mitigation Plan, January, 1992. Consultants RPT/NEDECO/BCL strongly subscribe to the same view.

In article 4.2.3 (GHK report) both JICA & RPT/NEDECO/BCL studies considered that retention of northern intake would be highly expensive for the approach Road/Embankment and a major risk to the stability of the main bridge structure because of the possibility that a secondary or even the main channel of the Jamuna River may outflank the bridge approach rendering the conception of an approach bridge untenable. The question of providing link-channel further north may be deferred till such time the flow at the bridge-point (Jamuna) stabilizes and the development of the other intake channels located at southern site of the bridge is closely observed.
INSTITUTIONAL ARRANGEMENTS FOR FISHERIES MANAGEMENT PLAN

JAMUNA MULTIPURPOSE BRIDGE AUTHORITY

LOCAL NON GOVERNMENTAL ORGANIZATION (NGO) & CONSULTANT

DIRECTORATE OF FISHERIES

ENVIRONMENTAL ADVISOR & FISHERIES ADVISOR

GROUP LEADER TRAINING GROUP

GROUP LEADER AQUACULTURE + FISHERMEN GROUP

EXTENSION SERVICE
GOVERNMENT OF BANGLADESH
JAMUNA MULTIPURPOSE BRIDGE AUTHORITY

WILDLIFE ACTION PLAN
IN
JMBP AREA


Allenbury, Tejgaon
Dhaka 1215, Bangladesh.
ACTION PLAN
FOR
MONITORING THE WILDLIFE OF THE JMB AREA, INCLUDING THE STUDY OF
THE ECOLOGY AND BREEDING BIOLOGY OF THE SPOTBILL DUCK,
ANAS POCILLOPHYLHOSCHIA
(A THREE-YEAR PROJECT)

1. OBJECTIVES:

1.1. Monitoring the migratory and resident birds and other wild
animals of the JMB impacted area during the bridge-construc-
tion and post-construction which would be a follow-up
of the study undertaken by the 'Wildlife Study-Group'
earlier.

1.2. Study of the ecology and breeding biology of the Spotbill
Duck, and selection of a protected site as its breeding
ground.

1.3. Creating public awareness about the importance of biodi-
versity and the need for the protection of wild animals
and their environment.

1.4. Make recommendations for plantation of shelter and fruit-
trees for the protection of birds and other wild animals
of the area.

2. PROPOSED ACTION PLAN:

2.1. FIRST YEAR

2.1.1. General preliminary survey of the area to demarcate the
boundary of the impacted area of the JMB for the proposed
regular study.

2.1.2. Regular daily/weekly/monthly data collection on the sta-
tus and local distribution of wildlife taking the exist-
ing report of the Wildlife Study-Group as a basis.

Contd......P/2.
2.1.2.1. Identification of resident breeding birds, their food and habitats.

2.1.2.2. Identification of resident but non-breeding locally migratory birds, their food and habitats.

2.1.2.3. Identification of winter migrants, their food and habitats.

2.1.3. Study of the other wild animals.

2.1.3.1. Collection of data on the habitats and other aspects of the aquatic, terrestrial and aerial mammals.

2.1.3.2. Collection of data on the habitats and other aspects of lizards, snakes and tortoises (Reptiles).

2.1.3.3. Collection of data on the habitats and other aspects of amphibians.

2.1.4. Locating the roosting and feeding grounds of the Spotbill Duck in the non-breeding as well as breeding seasons, and also locating its breeding grounds within the impacted area.

2.1.5. Selection of suitable breeding ground/grounds of the Spotbill Duck for the collection of data on:

2.1.5.1. Nesting.

2.1.5.2. Egg-laying.

2.1.5.3. Incubation.

2.1.5.4. Hatching.

2.1.5.5. Parental care.

2.1.5.6. Breeding success.

2.1.6. Spot-counting at fixed times and places for information on the size and density of birds and, if possible, other animals.

2.1.7. Special attention to be given to sudden and unexpected biological and ecological hazards (if any) during dredging and bridge-construction and suggest immediate mitigation.

Contd......2/3.
tory measures (if needed).

2.1.8. All possible efforts would be made to involve the local people in the study process to get information about the past history of the fauna and flora of the impacted area. Awareness would be developed through discussions, lectures and other friendly persuasion about the importance of protecting the 'kansh grass' (*Saccharum spontaneum*) and other 'char vegetation' (River island vegetation) at least till the breeding of the Spotbill Duck and other birds of the selected areas is over.

2.1.9. A few ducks and other waders, migratory and resident, would be collected, subject to the approval of the Ministry of Environment and Forestry (MOEF), to collect stomach contents, parasites, etc.

2.1.10. A comprehensive annual report, in addition to monthly reports, would be prepared at the end of the first year.

2.2. SECOND AND THIRD YEAR

2.2.1. The same programme would be repeated in the second year. However, adjustments, amendments, etc., would be made to it, if necessary, for getting better information in the second year. Like the first year, reports will be made in the second year also.

2.2.2. The programme for the third year would also be improved upon, if necessary.

2.2.3. A final and comprehensive final report would be prepared at the end of the third year, analysing the records of the entire project period.

2.2.4. In order to implement the above plan, the proposed organogram is shown in annexure 'A' and the proposed man month is shown in annexure 'B'.

2.3. THE JOB DESCRIPTION OR THE RESPONSIBILITIES OF THE
2.3.1. Project Director (PD): He would be responsible for the whole project: planning, implementation, recommendations, preparation of the final report, etc. He may have to make more visits and spend more days in the project-areas than specified in the programme, to get desired success, as and when necessary.

2.3.2. Wildlife Expert (WE): He would help the P.D. in planning, implementing, and analyzing the findings. He may accompany the PD or may visit the project area independently. He too may have to make more visits and spend more days in the project-areas than specified in the programme, as and when necessary.

2.3.3. Research Fellow (RF): A full-time employee, he will stay in the project-area throughout the project period, except for the approved holidays/vacations, and would be responsible for executing programme as instructed by the PD and WE. He will keep records and prepare reports for the PD and WE. He may have to make preliminary analysis of the field-data, and make suggestions based on the collected information and his on-the-spot field experiences.

2.3.4. Research Assistant (RA): He will assist the RF in all his field works. He too would stay in the project-area for the whole project period, except for the approved holidays/vacations.

2.3.5. Wildlife Scouts (WS): They will stay in the project area for the whole project period, except for the approved holidays/vacations. They will keep watch on the project area, help the RF and follow his directions.

2.3.6. Wildlife Guards (WG): They will be engaged from time to time, especially during the breeding seasons, and would help in the project work as directed by the PD/WE/RF etc.

Contd......P/5.
2.3.7. The proposed year wise budget to implement the action plan in shown in Annexure 'G'.

3. RECOMMENDATIONS:

3.1. Status of the wild animals (e.g. rare, endangered, threatened, common) of the and impacted area will be evaluated in the context of local, regional and global population sizes of the individual species. Protective measures, if and where necessary, would be suggested as per the schedule of the Bangladesh Wildlife Preservation Act, 1974.

3.2. A revised inventory, if needed on the basis of a three-year study, would be prepared for future reference.

3.3. A breeding ground of the Spotbill Duck would be selected for declaration as 'protected area' and would be handed over to the WARS/DNR authority for conservation.

(Kazi Zaker Hussain)
Professor,
Department of Zoology
University of Dhaka,
&
President,
Wildlife Society of Bangladesh,
Dhaka.

N.B.: Suggestions and recommendations made by Mr. Ismail Mobarak of the World Bank, and my subsequent meeting and discussion with him, were extremely useful in preparing the present document on action programme. I am extremely grateful to him.
Annexure 'A'.

JAMUNA MULTIPURPOSE BRIDGE AUTHORITY

WILDLIFE ACTION PLAN

MANPOWER ORGANOGRAM

PROJECT DIRECTOR

WILDLIFE EXPERT

RESEARCH FELLOW

1x Research Assistant

2x Wildlife Scout

2x Field Guard
JAMUNA MULTIPURPOSE BRIDGE AUTHORITY
WILDLIFE ACTION PLAN
MANPOWER STRENGTH (AT IMPLEMENTATION)

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<th>TOTAL</th>
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<td>2.</td>
<td>WILDLIFE EXPERT</td>
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</tr>
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<td>3.</td>
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<td>5.</td>
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<td>6.</td>
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Note: The project director and Wildlife Expert shall work at site for 8 (eight) days in each month. Additional contingent staff to work in the field will be recruited as and when necessary.
### Annex

Project: Monitoring the wildlife of the JN3 area (including the study of the ecology and breeding biology of the Spotted Duck, *Anas poecilorhyncha*)

(Item-wise breakdown of expenses for a three-year period)

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<th>2nd Year</th>
<th>3rd Year</th>
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<td>60,000/-</td>
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<tr>
<td>2. Wildlife Expert: 5 days X 8,000/-</td>
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<td>96,000/-</td>
<td>96,000/-</td>
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<tr>
<td>3. Research Assistant (B.Sc.) 5 days X 2,500/- p.m.</td>
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<td>30,000/-</td>
<td>30,000/-</td>
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<td>4. Wildlife Scouts 5 days X 1,000/- p.m.</td>
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<td>24,000/-</td>
<td>24,000/-</td>
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<td>5. Field Guides 5 days X 1,000/- (6 months)</td>
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<td>6. Project Director 5 days X 24,000/- (2 days a month)</td>
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<td>2. Van/Rickshaw/Scooter: 10 days X 200/- per day</td>
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<td>3. Vehicle (Land Rover/Cruiser): 5 days X 2,000/- per day</td>
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<td>1,92,000/-</td>
<td>1,92,000/-</td>
<td>5,76,000/-</td>
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<td>3,06,000/-</td>
<td>9,18,000/-</td>
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| Equipment (text, hides, etc.), chemicals, journals | 15,000/- | 5,000/- | 5,000/- | 25,000/- |
| Photography, stationaries, clericals, etc. | 15,000/- | 7,000/- | 5,000/- | 27,000/- |
| Miscellaneous (invisible expenses) | 6,000/- | 4,000/- | 3,000/- | 13,000/- |
| **Total** | 5,000/- | 5,000/- | 30,000/- | 40,000/- |

| Overhead (2 3%) | 25,710/- | 25,710/- | 24,770/- | 76,290/- |
| (Excluding Vehicle) | 8,82,710/- | 8,82,710/- | 8,82,770/- | 26,49,590/- |
| (overhead 2 3%) | 20,721/- | 20,721/- | 20,723/- | 61,165/- |

**Total** | 7,11,431/- | 7,11,431/- | 7,11,433/- | 21,34,697/-
JAMUNA BRIDGE PROJECT
ENVIRONMENTAL ASSESSMENT

Attachment 4
EXECUTIVE SUMMARY

The Land Use Master Plan (LUMP) consultants conclude in this report that the construction of the Jamuna Bridge offers opportunities to encourage and plan for the economic and urban development of the bridge-ends and the surrounding Study Area.

In brief, we conclude that a self-sustaining township of about 20,000 people could be established at one bridge-end, and that a series of supporting physical action plans and related institutional programmes are required to ensure the spread of benefits and the efficient implementation of the plan.

Following this summary, Chapter One (Introduction) briefly outlines the objectives of the Study and outlines the importance of adopting a flexible response to the issue of uncertainty in plan preparation. This is because the bridge may not open until five years hence and certain decisions may have to be held in abeyance until then or even later.

Chapter Two (The Regional Setting) is a description of the context for development in the Study Area and the surrounding region. The chapter shows that natural growth within 50 kilometres of the bridge would produce a population of 10.5 million by 2016. However, of these, some 0.9 million would be expected to migrate from the countryside for urban locations elsewhere in the country or the region. Such a figure indicates the magnitude of the urbanisation potential of the Bridge Area.

Chapter Three (Generated Development at the Bridge-ends) considers the basic development required to operate the bridge and concludes that after the construction period a "Minimal Scenario" resident population of about 1,800 would be required at both bridge-ends. This figure may increase to about 4,300 within five years of bridge opening as a "Service Centre Scenario" develops.

It is further concluded that although some of the population displaced by the bridge works may take up urban occupations it is not a viable option to rehouse these people at the bridge-ends given the
included a more modest economic internal rate of return of about 12.4 percent is forecast.

The Study Area Land Use Plan presented in Chapter Six suggests the preparation of several Action Plans designed to focus on junctions and corridors in the Study Area at which pressures for development may be found. These include:

- linkages from the approach roads and integration of the resettlement sites;
- the newly created junctions at Hatikamrul and Elenga;
- a reinforced corridor linking Sirajganj to the west bridge-end;
- a by-pass for Tangail.

Chapter Seven (Supporting Infrastructure Projects) reviews the range of infrastructural provision likely to be required and makes clear recommendations for appropriate standards at the bridge-ends, the resettlement areas, the approach roads and junctions, and also for Tangail and Sirajganj.

Supporting Institutional Arrangements are reviewed in Chapter Eight and these are seen to parallel and correspond to the evolution of the Study Area described in Chapters Three, Four and Five. It is recommended that the JMBJA should retain responsibility for the operation of the bridge and the implementation of the bridge end land use plan is undertaken by an internal Urban Development Section (UDS).

Financial Management of the proposed UDS and UDA is discussed in Chapter Nine but the final chapter (Chapter Ten: Proposed Technical Assistance Requirements) identifies four technical assistance packages required for the successful implementation of the plan, and these are:

- resettlement and identification survey;
- assistance to the proposed UDS in JMBJA;
- detailed engineering and layout studies for priority projects;
- assistance to JMBJA UDS or the proposed JBUDA.
Dear Dr. Mobarek,

We have pleasure in enclosing 4 copies of our draft report on the above Study.

As you know the Jamuna Bridge Co-financiers meeting in Washington on 27th - 29th Apr 1992 instructed RPT/NEDECO/BCL to integrate the GHK/MRM International (GMI) Land Use Master Plan with their own bridge-end designs and tender documents.

The Consultants subsequently invited GMI to join them in a single Study Team in order to carry out the integration work in the most efficient manner possible.

The underlying aim of the Study has been to ensure that township development can be promoted without detriment to the efficient and effective operation of the bridge. We are pleased to report that the Study Team reached unanimous agreement on all issues and have prepared new draft land use master plans to be known as the "Integrated Master Plans". The Study Team believe that the new Plans:

i) provide for the efficient operation of the bridge-end;

ii) achieve the most effective use of limited and valuable flood free land;

iii) minimise the need for land acquisition and, therefore, resettlement;

iv) minimise development costs;

v) achieve an adequate separation between essential operation areas and the township and service community;

vi) provide an attractive and efficient town layout.
One of the most fruitful outcomes of the Study has been the reduction in the requirements for fill material on the west bank of the Jamuna (where a shortage of fill is expected), with a potential saving to the main project of US$ 1 to 2 million. Other adjustments to layouts and land use allocations have also been achieved without any increase in overall project costs.

A presentation of our draft proposals was made to JMBA in Dhaka on 11/07/1992 and the recommendations met their broad approval.

Adjustment to the Integrated Master Plans may be required once the precise quantities of dredge spoil are known and the final location of the guide bunds fixed.

We look forward to receiving your comments in due course.

Yours sincerely,

J. van Duivendijk
Project Manager
Jamuna Bridge Phase II Studies

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   1.2 Report Outline and Outputs 3

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Fig. 4.3 East Bridge-End - Fill Distribution Priority

Fig. 4.4 Sketch Layout of Employer and Engineers Facilities, East Bridge-End

Fig. 5.1 Integrated Master Plan West Bridge End 1:12,500

Fig. 5.2 Integrated Master Plan West Bridge End 1:5,000
1. INTRODUCTION

1.1 Study Background

The construction of a bridge across the Jamuna river represents one of the most significant development opportunities for the Government of Bangladesh. Following Feasibility Studies carried out by the Bridge Consultants (RPT-NEDECO-BCL), it was established that the Jamuna Multipurpose Bridge is technically feasible and economically viable. Nevertheless this viability has always depended upon construction costs being tightly controlled. In carrying out detailed design and in preparing Tender Documents, the Bridge Consultants have therefore endeavoured to ensure that all bridge and associated works are kept to the absolute minimum consistent with the effective operation of the bridge.

Notwithstanding this, the Bridge Consultants have always recognised that the Bridge could provide additional developmental opportunities and in their detailed designs have sought to allow eventual urban development at the Bridge-Ends.

Following acceptance of the Bridge Consultants scheme in 1989, the World Bank commissioned GHK/MRM International Ltd (GMI) to prepare a strategic plan to guide urban and economic development for an area within a radius of 30 km around the proposed Jamuna Bridge.

In addition, they were instructed to prepare land use master plans for the two Bridge-Ends in order to establish comprehensive plans and development programmes for all the flood free land created as a result of the bridge design and river training works.
The underlying aim of the strategic and detailed land use master plans has been to maximise the opportunities for development at the bridge ends and, therefore, increase the economic benefits of the whole Jamuna Bridge Project. The GMI Study recommended that urban development should be concentrated at one end of the bridge only, because of the greater economic impact that one large township would have rather than two separate and smaller settlements.

Because there is likely to be substantially more dredge spoil available for fill purposes at the East Bridge-End than at the west, it was proposed that a township of up to 20,000 people be established on the east side of the river and that development on the West Bridge-End be kept to a minimum.

In order to achieve the most efficient township design, and to maximise development opportunities, GMI recommended a number of small, but nevertheless significant changes to the original design and layouts at the Bridge-Ends. In particular they suggested:

- changes to the operational layouts
- the location and re-use of contractors facilities
- the distribution of fill material
- the integration of the resettlement sites with the bridge-ends.

It was recommended that these issues be resolved through a short study which integrated the Bridge-End layout with the Land Use Master Plan. At the Co-financing Meeting in Washington in April 1992, the Government of Bangladesh and the Co-financiers accepted the underlying objectives of the GMI Study, particularly as it applied to the east end of the bridge. It was agreed that "modest reconfiguration of bridge end facilities at both
ends of the bridge ends should be undertaken and that the proposals of the land use plan and the original layout and design of bridge end facilities should be fully integrated. The meeting instructed the Bridge Consultants to carry out this task, and they subsequently invited GMI to work alongside their land use planner and engineers as part of a single Study Team.

This report comprises the combined considerations of the integrated Study Team and draws on the experience of all consultants previously involved in the project.

1.2 Report Outline and Outputs

The Report is divided into the following sections:

Section 2 Study Approach and Methodology
3 Key Issues
4 The East Bridge-End
5 The West Bridge-End

The key outputs of the Study are separate Integrated Master Plans for the East and West Bridge-Ends. The Plans are produced in detail at 1:5,000 scale and at a smaller scale of 1:12,500 to indicate the wider planning context of the Bridge-Ends.

These plans supersede the former GMI Land Use Master Plans at 1:5,000 and 1:15,000 respectively.

Tender drawings (to be issued as part of final Tender Document in September 1992) will be amended in accord with the Integrated Master Plans.

---

2. STUDY APPROACH AND METHODOLOGY

2.1 Consultants Approach

The Consultants' aim in this Study has been to integrate engineering and land use designs with a view to achieving an optimal balance between the following key objectives:

i) Cost
ii) Operating flexibility
iii) Technical feasibility
iv) Socio-economic impact
v) Maximisation of development potential

These objectives are discussed briefly below:

i) Cost - In order that the Jamuna Bridge project remains economically viable, the Bridge Consultants have sought to ensure that its construction cost including bridge, river training, land filling, and the provision of bridge-end facilities is kept to the absolute minimum. Any alterations to the Bridge-End layout or engineering should not, therefore, entail an additional cost to the main project.

ii) Operating flexibility - The existing bridge-end layout is robust and capable of catering for a wide range of future demands and operating conditions. It is vital that any changes or modifications to the existing designs retain a similar degree of flexibility.

iii) Technically feasibility - Any modifications to the existing scheme should be capable of achievement without undue technical or other problems.
iv) Socio-economic acceptability - The integrated plan should seek to minimise the need for land acquisition, thus reducing the loss of productive agricultural land and the necessity to resettle local inhabitants.

v) Maximisation of development potential - The development stimulus that the Jamuna Bridge will give to the national sub-regional and local economies needs to be fully exploited by urban development at the bridge in order to realise all potential benefits from the project.

2.2 Methodology

The methodology adopted to carry out the Study was, briefly, to:

- Define study objectives;
- Define key issues;
- Evaluate key issues and the detailed implications of each course of action;
- Prepare new layout plans incorporating the preferred solutions;
- Identify Tender Document drawings to be modified or amended.

It is proposed that the new land use master plans for the two bridge ends will be known as "Integrated Master Plans" (IMPs), to distinguish them from the existing Land Use Master Plans (LUMPs). It is intended that the Integrated Master Plans at 1:5,000 scale and 1:12,500 scale will supersede the Land Use Master Plans at the 1:5,000 and 1:15,000 scales. However, the detailed design of internal township industrial and housing modules, together with the standards of service provision for educational, health and social facilities will remain as specified in the Land Use Master Plans.
3. SUMMARY OF KEY ISSUES

Following the identification of Study objectives, the Study Team carried out a thorough evaluation of the bridge-end layouts and Land Use Master Plans. A substantial number of issues were found to require resolving at both bridge-ends, of which some were clearly more crucial than others. They are all closely interrelated and a course of action adopted in one area has a knock-on effect elsewhere. Issues have been addressed in this Study in a logical sequence, the more crucial issues which have wide implications for all planning and engineering work being assessed first. The following is a brief summary of the main issues:

- the availability of fill material at either bridge-end, including the problems of dealing with possible shortages or surplus of spoil;
- the precise shape and distribution of filled areas in relation to existing land acquisition boundaries;
- integration of major infrastructure elements such as roads and drainage, particularly in terms of standards and networks;
- the location and layout of operational facilities, particularly fire, police and rescue services at the east bridge-end;
- the size of the township (east bridge-end) and support settlement (west bridge-end);
- separation between the operational bridge-end areas and the township and settlement areas;
road connections between the operational areas and the townships and other residential areas, including the resettlement sites:

- the location and re-use of engineer/employer and contractors facilities and the phasing of township development;

- provision of future expansion areas for the second stage bus stations and the rail interchange facilities;

- the routing of the overhead electricity lines and the gas pipeline beyond the operational areas;

- the problems of dealing with the large areas of land created as a result of reclamation work which are not required for immediate development but which are very susceptible to informal or illegal occupation e.g. land for future grade separation of roads;

Although many of these issues are common to both river banks, the engineering and land use constraints are very different. It is proposed, therefore, to evaluate and address the problems of the east and west bridge-ends separately.
4. EAST BRIDGE-END

4.1 Landfill

4.1.1 Determining Factors

The Jamuna Bridge design involves the construction of major guide bunds at each river bank to protect the bridge abutments, approach viaducts and embankments from the erosive force of the river, and to prevent the bridge from being outflanked. The guide bunds, each about 2.5 km in length, will be created by dredging trenches in order to create the underwater slopes to be protected. The resultant dredge spoil (mainly sand) will be used to create the flood bunds, approach viaducts, land for bridge-end facilities and fill for approach roads and other uses.

It is important to note that dredged material supply is essentially a by-product of the creation of the guide bunds, and has not been determined by fill requirements. Nevertheless, a balance between supply and demand has been sought in the Phase II Feasibility Study and subsequent Tender Documents. As a result of the Land Use Master Plan (GMI) the demand for urban development land has been more clearly defined and it is now necessary to determine in more detail the likely range of possible surplus or shortfalls of fill available.

The original estimates of the quantities of dredge spoil likely to become available as a result of the bund construction work, were based upon the following criteria:

- Existing average ground level in the floodplain at PWD + 12 metres;

- Specified gradients for the permanent slopes of the guide bunds;
Assumed gradients for temporary slopes necessary for construction of the trenches in which the slope protection works can be made.

Three important additional points need to be made. Firstly, it has been assumed that a certain amount of the dredged material will be unsuitable for fill purposes, for example, because it is too fine. An allowance of 5% has, therefore, be allowed for this loss in any calculations.

Secondly, material will be pumped directly onto the adjacent designated fill areas during dredging operations, so that to transfer surplus spoil from one bank of the Jamuna to the other would involve a separate operation. Because of the distance and difficulty of crossing the Jamuna by barge and the double handling involved, this is considered to be an uneconomic proposition. For calculation purposes, the total spoil arising from the construction of each guide bund is, therefore, considered separately.

Lastly, the possibility of returning dredged material from bridge building operations has also been investigated but was considered likely to be impractical for many reasons, for example because of the distances involved and disruption to dredging operations that the operation would entail. This option has therefore, been discounted as uneconomic.

4.1.2 Dredge Spoil Quantities

Based upon the criteria described above, the following table indicates the amounts of dredge spoil estimated to be available for reclamation work. For calculation purposes it is assumed that minimum dredged quantities are unlikely to differ more than 10% from maximum quantities, because of the precisely defined profiles of the guide bunds.
JAMUNA BRIDGE PROJECT
ENVIRONMENTAL ASSESSMENT

Attachment 6
EXECUTIVE SUMMARY

This volume and related Annexes present the Final Report of the Dhaleswari Mitigation Plan Study which has been prepared as part of the Dhaleswari Mitigation Plan and Land Use Master Plan Study undertaken by GHK/MRM International Ltd. in association with Hunting Technical Services Ltd. and Uniconsult International Ltd. on behalf of the Jamuna Multipurpose Bridge Authority. Annex VI was prepared by Mott MacDonald International Ltd.

The objectives of the study were to identify the impact of the proposed closure of the northern intake of the Dhaleswari river and to initiate a process to mitigate and monitor the adverse effects, including the social, economic, and health impacts on the population of the area together with an assessment of the impacts on agriculture, navigation and other resource and economic benefits.

The area potentially affected by the closure of the northern intake of the Dhaleswari river was identified at inception stage as the catchment area of the Dhaleswari extending from the northern intake to the confluence with the Meghna and Padma rivers. The eastern and western boundaries of the affected area were defined by the Turag and Jamuna rivers respectively.

Subsequent hydraulic modelling studies demonstrated that the principal impacts would be confined to an area of approximately 60,000 ha comprising the catchment areas of the upper Dhaleswari, Pungli, Louhajang and Elangjani rivers and described in this report as the Impact Area.

The study concludes that direct impacts of the closure would be:

- a reduction in average depths of flooding ranging from one metre in the upper Dhaleswari and Pungli rivers decreasing southwards to a negligible amount in the vicinity of Mirzapur town and the southern Dhaleswari intake.

- total annual discharges in the upper Dhaleswari, Pungli, Louhajang and Elangjani would be significantly reduced in both volume and duration. The most affected channels would include the Upper Dhaleswari and Pungli where annual discharges would be reduced from 40,000 Mm$^3$ and from 15,000 Mm$^3$ to 22,000 Mm$^3$ and 7,000 Mm$^3$ respectively, with the duration of flow reduced from six to four months.
overbank and spill channel discharges from the Jamuna to the upper Dhaleswari would be increased by 83 per cent from 12,000 to 22,000 Mm³ which is likely to give rise to increased erosion of areas of land supporting rainfed cropping between the Jamuna and Dhaleswari rivers.

ground water recharge would be not be reduced significantly and maximum depths of pumping lift would remain unchanged although potential recharge would be reduced by 40 per cent.

a reduction in the area available for fish spawning and refuge of 11,000 ha and a corresponding reduction in annual fish production from 1250 to 750 tonnes.

the effect on river transport would be limited as commercial traffic has already ceased and much of the country boat through traffic will transfer to road and rail services provided by the Jamuna bridge.

The indirect impacts of the closure would be:

the reduction in flooding would enable an improvement in agricultural productivity through the adoption of higher yielding cropping systems over an area of about 15,000 hectares. Rainfed crops of mixed broadcast aus and aman rice crops would be replaced by broadcast aus or jute followed by transplanted deepwater aman. Under irrigation, HYV boro followed by transplanted deepwater aman would be replaced by HYV boro followed by transplanted aman.

the environmental impacts, other than fisheries, are be difficult to assess given the present degraded status of the terrestrial habitat. Increased dryland areas would provide an improved monsoon habitat for the very limited surviving mammal and bird populations.

the benefits to the 20,000 farming households in the impact area would represent an average increase in income of 50 per cent or Taka 6,000 per year, although the range would vary considerably. This would also increase employment opportunities for the landless and poorer sections of the community.
the net annual economic benefits of the intake closure are estimated to stabilise at Taka 25 million from Year 5 onwards after allowing increases in agricultural output of Taka 48.8 million to be offset by losses in fish production of Taka 17.5 million and the loss of agricultural production of Taka 6.3 million from land lost to increased erosion between the Jamuna and Dhaleswari rivers.

the loss of income to the 9000 or so professional fishermen would be of the order of Taka 1000 to Taka 2000 each depending on the location of their fishery. This compares to average incomes of about Taka 4000 to 6000 each.

A range of mitigation measures have been considered to reduce the negative impacts of closure on the present surface water regime and eliminate the risks of erosion of lands lying between the Jamuna and Dhaleswari rivers.

The options studied for the maintenance of the present surface water regime included the retention of the present northern intake channel, the provision of an alternative intake channel and the enlargement of the southern intake channel. It was concluded that these options would not provide a technically acceptable solution in view of the unstable characteristics of the Jamuna river and the uncertainties regarding the geomorphological conditions following the construction of the Jamuna bridge.

A mitigation plan based on the construction of a guide embankment between the Jamuna and Dhaleswari rivers is recommended. Implementation of the plan would reduce the risks of the loss of land through erosion due to overbank spill between the Jamuna and Dhaleswari although it would have little effect on the normal erosion taking place along the east bank of the Jamuna.

Agricultural benefits would be increased and benefits would also arise from reduced flood damage in the impact area. The impact on fish production would be negative with annual yields reduced by 75 per cent although a fisheries support component may reduce the overall loss to about 30 per cent.

The project would support a Project Monitoring Cell (PMC) for a period of five years. The PMC would coordinate the monitoring of the mitigation plan including the commissioning of base line and annual surveys of surface and groundwater resources, agriculture, fisheries, and socio-economic effects including health and nutrition. The PMC would be attached to the office of the Deputy Commissioner, Tangail District. As an alternative arrangement, the PMC could be attached to the proposed Jamuna Bridge Development Authority as recommended by the Land Master Plan report.
The overall impact of the mitigation plan would be:

- A reduction in average depths of flooding ranging from two metres in the upper Dhaleswari and Pungli rivers decreasing in a southerly direction towards Mirzapur and the southern Dhaleswari intake.

- Total annual discharges in the upper Dhaleswari, Pungli, Louhajang and Elangjani would be further reduced in volume and duration. The most affected rivers would be the Upper Dhaleswari and Pungli.

- Overbank and spill channel discharges from the Jamuna to the upper Dhaleswari would be eliminated thus protecting areas of rainfed cropping between the Jamuna and Dhaleswari rivers.

- Ground water resources and pumping levels would remain unchanged. Future increases in the use of irrigation will increase pumping lifts and may necessitate the use of deep set shallow tube wells, particularly in the areas of F0 and F1 land. This will not be a direct consequence of the mitigation plan but due to the increased use of groundwater for irrigation.

- A reduction in the area available for fish spawning and refuge of 26,500 ha and but the provision of a fishery support component would reduce the loss in production to only 450 tonnes.

The indirect impacts of the mitigation plan would include:

- The reduction in flooding would enable agricultural productivity to be increased through the adoption of higher yielding cropping systems over an area of about 29,200 hectares.

- The environmental impacts, other than fisheries, are difficult to assess given the present degraded status of the terrestrial habitat. Increased dryland areas would provide an improved monsoon habitat for the very limited surviving mammal and bird population.
The benefits to the 36,500 farming households in the impact area would represent an average of Taka 6,000 per year or a 50 per cent increase in income, although the range would vary considerably. This increase in agricultural activity would also increase employment opportunities for the landless and poorer sections of the community.

The net annual economic benefits of the intake closure are estimated to be Taka 107 million after allowing for increases in agricultural output of Taka 98 million and reduced flood damage of Taka 25 million to be offset by decreases in fish production of Taka 16 million and land lost to construction of the embankment of Taka 0.13 million.

The full social impact of the closure is difficult to evaluate in detail because of the limitations of the present data base and the natural demographic changes are already occurring within the structure of rural society in Bangladesh. There will be income losses to the profession fishermen and to rural households involved in opportunistic fishing. Increased agricultural production and the generation of 2.3 million man-days of employment may compensate for these losses, although clearly the losers may not be entirely identical to the gainers. The detailed social impact can only be assessed as the result of the activities to be undertaken by the proposed Project Monitoring Cell.

The total cost of the Dhaleswari Mitigation Plan including physical and financial contingencies is estimated to be Taka 129.3 million (US$ 3.60 million) of which Taka 76.9 million (US$ 2.15 million) would be in local currency and Taka 52.4 million (US$ 1.45 million) in foreign exchange.

The anticipated level of benefit flows are very substantial in relation to the additional costs incurred and indicate that it would be well worthwhile making the recommended investments suggested within the scope of the Mitigation Plan. Since net incremental benefits are positive from Year 1, it is not possible to calculate an appropriate internal rate of return. However, assuming a 12 per cent discount rate and a 25 year project life, the net present values of the net cash flow would be around Taka 715 million (US$ 19.86 million).
JAMUNA BRIDGE PROJECT
ENVIRONMENTAL ASSESSMENT

Attachment 7
GOVERNMENT OF BANGLADESH

JAMUNA MULTIPURPOSE BRIDGE AUTHORITY

RESETTLEMENT UNIT

RESETTLEMENT ACTION PLAN
FOR
PROJECT AFFECTED PERSONS (PAPs)

July 1993

Allenbari, Tejgson
Dhaka 1215, Bangladesh
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JAMUNA MULTIPURPOSE BRIDGE AUTHORITY
RESETTLEMENT UNIT
RESETTLEMENT ACTION PLAN

1.0 Jamuna Multipurpose Bridge construction along with approach roads, flood protection embankments, hard point, river training works, etc will involve acquisition of 5,681 ac of land on both sides of the Jamuna River. The villages, unions and thanas where land will be acquired can be seen in Annex-A. In all 58 villages/mouzas will be affected in whole or in part.

2.0 In view of the size of the project and number of PAPs, the project has been classified category 'A', requiring full environmental impact assessment, by the World Bank and other participating development agencies. WB Operational Directives (OD) 4.00 and 4.03 have been closely followed by the JMBA in preparation of the Resettlement Action Plan (RAP). The RAP aims at not only compensating PAPs for the loss suffered due to compulsory land acquisition and consequent involuntary resettlement, it also aims at improving their condition.

3.0 A detailed survey of project affected persons (PAPs) has been conducted by the Bangladesh Rural Advancement Committee (BRAC). It was conducted during the months of October, November and December 1992. Because of the uncertainty of final locations of West bridge-end, West bank guide-bund and bridge-end facility areas have not been surveyed. The draft final report of the socio-economic survey was sent to World Bank and other donors for their respective comments/observations. World Bank and JMBA made some comments on BRAC's draft report for further modification. BRAC submitted a detailed census of all PAPs and the final report on 31 May 1993. The land acquired in the JMBP (except 117 households at Tangail and west bank guide bund and bridge end facility areas) is shown below (in decimals):

<table>
<thead>
<tr>
<th></th>
<th>Tangail</th>
<th>Sirajganj</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural Land</td>
<td>269,628</td>
<td>61,666</td>
<td>331,294</td>
</tr>
<tr>
<td>Homesteads (Land)</td>
<td>31,308</td>
<td>8,305</td>
<td>39,613</td>
</tr>
<tr>
<td>Fallow Land</td>
<td>20,595</td>
<td>423</td>
<td>21,018</td>
</tr>
<tr>
<td>Other Land</td>
<td>5,920</td>
<td>308</td>
<td>6,228</td>
</tr>
<tr>
<td>TOTAL</td>
<td>327,451</td>
<td>70,702</td>
<td></td>
</tr>
</tbody>
</table>
4.0 The survey has been able to establish the nature and magnitude of loss being suffered by each category of PAPs together with the change taking place in pre and post acquisition status. 6,156 households are being directly affected due to loss of land with 5,906 being indirectly affected. In all 32 public institutions and community facilities will be acquired and 90 businesses/industries will be affected. Table 1 to 51 (annexe) show major classifications.

5.0 Among the land-losers there are four groups: (A) Homestead-Losers. (B) Agricultural Land-Losers. (C) Both Homestead and Agricultural Land-Losers. and (D) Fallow and Other Land-Losers. Excluding the 117 households of Tangail, the number and percentage of these households are:

<table>
<thead>
<tr>
<th></th>
<th>Tangail</th>
<th>Sirajganj</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>470 (11.71)</td>
<td>330 (16.30)</td>
<td>800 (13.25)</td>
</tr>
<tr>
<td>B</td>
<td>2,453 (61.11)</td>
<td>1,359 (67.11)</td>
<td>3,812 (63.12)</td>
</tr>
<tr>
<td>C</td>
<td>1,070 (26.66)</td>
<td>296 (14.62)</td>
<td>1,366 (22.62)</td>
</tr>
<tr>
<td>D</td>
<td>21 (0.52)</td>
<td>40 (1.97)</td>
<td>61 (1.01)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>4,014 (100.0)</td>
<td>2,025 (100.0)</td>
<td>6,039 (100.0)</td>
</tr>
</tbody>
</table>

Not all PAPs were agriculturally-landed before the JMBP acquisition (these PAPs belong to the groups 'A' and 'D'). And the households in their respective groups still have various amounts of residual homesteads and/or agricultural land. Detailed information provided in BRAC report. The salient aspects of loss and residuals are given below.
<table>
<thead>
<tr>
<th>Landless Before Acquisition:</th>
<th>Tangail</th>
<th>Sirajganj</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lost No Agri Land:</td>
<td>141</td>
<td>108</td>
<td>24</td>
</tr>
<tr>
<td>Lost 100% Agri Land:</td>
<td>818</td>
<td>351</td>
<td>1,16</td>
</tr>
<tr>
<td>Lost &lt; 100% Agri Land:</td>
<td>2,705</td>
<td>1,304</td>
<td>4,00</td>
</tr>
<tr>
<td>Lost No Homestead:</td>
<td>2,474</td>
<td>1,399</td>
<td>3,87</td>
</tr>
<tr>
<td>Lost 100% Homestead:</td>
<td>1,269</td>
<td>424</td>
<td>1,69</td>
</tr>
<tr>
<td>Lost &lt; 100% Homestead:</td>
<td>271</td>
<td>202</td>
<td>47</td>
</tr>
<tr>
<td>Pre-Acquisition Agri Land:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per Capita &gt; 33 dec:</td>
<td>1,059</td>
<td>418</td>
<td>1,47</td>
</tr>
<tr>
<td>Per Capita &lt; 33 dec:</td>
<td>2,605</td>
<td>1,345</td>
<td>3.95</td>
</tr>
<tr>
<td>Post-Acquisition Agri Land:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per Capita &gt; 33 dec:</td>
<td>691</td>
<td>288</td>
<td>97</td>
</tr>
<tr>
<td>Per Capita &lt; 33 dec:</td>
<td>2,979</td>
<td>1,475</td>
<td>4.45</td>
</tr>
<tr>
<td>Landless Tenants Losing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Entire Homesteads:</td>
<td>69</td>
<td>38</td>
<td>10</td>
</tr>
<tr>
<td>One-Person Households:</td>
<td>49</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>Households Already Relocated:</td>
<td>418</td>
<td>313</td>
<td>73</td>
</tr>
</tbody>
</table>

6.0 The indirectly affected persons/households are as below:

<table>
<thead>
<tr>
<th>Tenant Cultivators:</th>
<th>Tangail</th>
<th>Sirajganj</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>312</td>
<td>249</td>
<td>56</td>
</tr>
</tbody>
</table>

| Farm Workers:       | 1,645   | 816       | 2,46  |
| Non-farm Workers:   | 88      | 530       | 61    |
| Businesses/Industries: | 40     | 50        | 90    |
| Squatters & Uthulis²| 743     | 1,432     | 2,17  |

| TOTAL               | 2,828   | 3,077     | 5,905 |

Not all tenant cultivators are agriculture-dependent, or cultivate the rented-in land only. Some are not the daily labourers dependent on farm or non-farm works, or on daily labour alone. Many of these people are landowners, tenant farmers, and farm and non-farm workers - all at the same time. This is also true for many households that have lost their properties.

² People who lost their land due to river erosion and now living on land not owned...
The following table presents the summary information on the number of affected households in the different categories suggested by the World Bank for the Resettlement Policy Matrix of the JIMBA:

### Resettlement Policy Matrix, 03 March 1993

<table>
<thead>
<tr>
<th>Description of PAP Category</th>
<th>Number of Households</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Tangail</td>
</tr>
<tr>
<td>1. PAPs Losing Homestead Land and Agricultural Land</td>
<td>1,070</td>
</tr>
<tr>
<td>2. PAPs Losing all or Parts of Agricultural Land, But Not Homestead</td>
<td>2,474</td>
</tr>
<tr>
<td>3. PAPs Losing Homestead Only</td>
<td>470</td>
</tr>
<tr>
<td>4&amp;7. Weaving, Business, Industries, Shop-keepers Losing Place of Employment</td>
<td>40</td>
</tr>
<tr>
<td>5. Tenant Farmers</td>
<td>312</td>
</tr>
<tr>
<td>6. Farm labourers</td>
<td>1,645</td>
</tr>
<tr>
<td>8. Squatters and Uthulis</td>
<td>743</td>
</tr>
<tr>
<td>9. People Affected Due to Unforeseen Reasons</td>
<td>Unknown</td>
</tr>
<tr>
<td>10. Households Already Relocated</td>
<td>418</td>
</tr>
<tr>
<td>11. Non-farm Labourers</td>
<td>88</td>
</tr>
</tbody>
</table>

8.0 Compensation and mitigatory measures proposed in the RAP aim at not only rehabilitating PAPs in their old profession or economic activity, but proposes imparting new skills with new economic and employment opportunities. A tabular presentation of the resettlement package, in the form of a matrix, is at Annex-B. Adverse impacts have been classified into eleven categories while as many as twelve types of benefits will be available under the RAP.

9.0 While adverse impact varies from complete loss of homestead, agricultural land and occupation to loss of part time employment only, the benefits available from JIMBA (other than land acquisition compensation under 1982 and 1989 acquisition acts) will range from payment of extra premium for purchase of replacement land to allotment of commercial sites for trading etc. Entitlement to these benefits will not only relate to losses suffered but also to the needs of PAPs keeping in view their ability to benefit from them. A PAP will be able to claim multiple benefits as per entitlement under the RAP. RAP als...
aims to benefit the indirectly affected persons to tide up their immediate difficulties. These benefits will range from one time cash grant to various vocational trainings and subsequent post training loan to acquire new opportunities. The unforeseen effects, any, due to construction of Jamuna Multipurpose Bridge will also be monitored systematically by JMBA-RU. A reserve fund to the extent of Taka fifty million has been kept to meet such unforeseen effects.

10.0 To allow smooth operation of the resettlement action plan it will be imperative to establish efficient liaison and grievance redressal procedure through formation of village committees with participation of representatives of PAPs, social leaders, village elder interested NGO's, UP Chairman and members and local administration. Acquisition of land for this project covers 58 villages spread over 12 Union Parishads. It is proposed that these committees be set up one in each union having relatively smaller number of PAPs. At Unions having larger number of PAPs more than one committee will be needed. These committees will be set up for PAPs leaving their original areas and need relocation. List of village/grievance redressal committee is at Annex-A1.

On final acceptance of the resettlement action plan a resettlement brochure (R incorporating the provisions and procedures will be prepared in Bangla and distributed widely by the RU.

11.0 It has been identified a total number of 12,062 H/H except the West side bund area which has not been surveyed in view of uncertainty of its location. The PAPs can be broadly classified as follows:

(a) Loss of land owned by the H/H 6,039 of whom 2,166 are homestead loser, a. 90 institutions.

(b) PAPs residing in the area as squatters/uthulis 2,175 H/H.

(c) PAPs living outside the area but working in the area 1,721.

(d) PAPs who have moved out of the area are also included in the classes mentioned above. JMBA - RU will prepare registers of PAPs and issue ID card to each H or family. ID card would be issued to head of H/H for those living in the area the individual affected if the PAP lives outside the area. The English translation of the forms used for registration and ID card can be seen at Annex-C. Issue of cards will start soon after finalisation of RAP.
Out of 5,681 acres to be acquired for the project, substantial quantum of land beyo
d the permanent structures will become surplus after the bridge is completed. It is propos
to undertake an intensive plantation programme along the road and embankment slop
and periphery of other structures. A preliminary estimate indicates that about 300 ac
 can be put under plantation. The vegetation will be mixed consisting of short maturati
and long maturation trees as well as fruit trees, fuel wood and timber. All land beyo
the tree belt will be retained by the bridge authority to meet future requirements of t
bridge but will be used for agriculture or pisciculture depending on topography. I
expect an area in excess of 1,000 acres to be available to agriculture. These will
leased out on short term renewable lease at nominal annual rent to PAPs, mainly sh
croppers and landless agricultural labour. Lease will be given jointly to husband and wi
the wife having right of lease in case of separation or death of husband. Subdivision
sublease of leased area of land will not be permitted. Leaseholders along the tree belt v
be expected to maintain the plantation in lieu of usufruct thereof. We hope to accomm
date 1,000 PAP H/H in this manner. Plantation will be planned and supervised by t
Forest Department, while plantation and subsequent maintenance will be done by PA
to be paid for by JMBA.

Plantation programme is tentatively estimated to cost Tk 30 m. Renewable lease
surplus and road side land is likely to accommodate up to 1,000 share-croper/agricultural households. A similar number of jobs will be created for afforestation.

The benefit package will be as described below. This is in addition to cash compensati
to which they are entitled under the land acquisition laws. The relevant extracts of t
laws are at Annex-D. Cost for detailed benefit package is given at Annex-K.

(a) JMBA/GOB agree in principle with the World Bank that a PAP, being adverse
affected by the acquisition of his property, can not be expected to go into de
in order to replace his/her assets by borrowing money from any bank, whatev
soft the terms of loan might be. So JMBA/GOB have agreed to enhance t
premium (from 20% of 1982 and 25% of 1989 act) to 50% for all land losi
PAPs, whether agriculture or homestead land. Further, there will be a safety r
provided by JMBA for the PAP in the event that the total cash compensati
provided for his land is not adequate to purchase an equivalent parcel of land. T
Deputy Commissioners would use their discretion under the Acts and use th
safety net.
The socio-economic survey has identified 6,156 directly affected HHs. The payment of premium and provision for safety net would cost Taka 200 mill.

(b) The socio-economic survey has identified 504 nos. HHs who had pre-acquisition more than 33 decimals agricultural land per person but have post-acquisition residual land of less than 33 decimal per person. This group of PAPs is considered as most vulnerable. Compensation received by this group has to be used to purchase equivalent land. If the replacement land chosen by a PAP of this group is evaluated by the RU to be more (e.g., in area, quality etc) than the land acquired, then JMBA-RU will arrange loan for them through Bangladesh Krishi Bank and Rajshahi Krishi Unnayan Bank to meet the additional cost. The bank will disburse loans to PAPs as per their existing procedures. JMBA proposes to keep a fixed deposit of Taka 32 million in these two banks as guarantee for the loans to be given to PAPs. This policy will automatically result in the holding becoming uneconomic by virtue of acquisition to become economic and allow the PAP to remain a full-time farmer. All endeavour would be made by RU to motivate, encourage and monitor all land-losing PAPs, specially the most vulnerable group, to purchase replacement land. Draft operational procedure is at Annex-E. A copy of draft agreement with BKB and RKUB is at Annex-F.

(c) The socio-economic survey conducted by BRAC indicates that there are about 2,745 numbers of PAP HH who have expressed their willingness to be relocated at their own place of choice. JMBA-RU intends that these affected HH be given enhanced cash compensation to purchase homestead plots of their own choice. The RAP aims to assist the homestead losers some financial assistance to build their houses which will be in addition to the cash compensation received for the homestead. Such self relocation by PAPs will bring opportunities for them to relocated with their kith and kins. This will also greatly facilitate the profession groups, the landless women and other vulnerable groups to choose their own places of resettlement. The enhanced compensation rate (50% premium instead of 20% of 1982 and 25% of 1989 Act) along with some house building loans combined together will enable a PAP to make his new house. JMBA-RU would assist in transportation during migration from one place to RS site or to the place where a PAP wants to relocate. The cost of transportation will be borne by JMBA-RU. A preliminary cost estimate of Tk 1.00 million has been kept.
Serviced plot at resettlement site: Two resettlement sites, one on each bank of the river located at village Saratia, Jamtaildas, Jamtaikhidirpur and Dukhiabari. Sirajganj thana (216 acres) and village Palsia & Nikrail in Kalihati thana (316 acres) will be established. Plots of 300 and 600 sq. meters will be allotted for homestead at a price of Tk 4,000/- and Tk 8,000/- respectively payable in 10 years. The allottees will be expected to build their homesteads within one year and settle therein. No sale or transfer other than by inheritance will be permitted before the price is paid in full. JMBA will have a right to resume the land in case of violation of this condition. Families having 6 members or more will be allotted the bigger plots.

Portions of RS sites will be earmarked for squatters and uthulis now living in the JMBA area. They will be allotted squatting sites of 10' x 10' size for each HH. They will not be expected to pay any price for the land but no sale, sublease would be permitted. If they move outside the area the land will be taken over by JMBA.

The socio-economic survey has identified 3,014 nos. of land losing PAP HHS who have expressed their willingness to move to RS site and 397 nos. of land losing PAPs found indecisive to move to RS sites. There are 2,175 squatter and uthul HHs in the project area.

The resettlement site will be elevated by digging ponds. If necessary, dike will be constructed to keep RS site flood-free. Common services and facilities like primary school, secondary school, road, mosque, madrasha, health centre including maternity and child care centre, tubewell, etc will be provided by RU in RS site. Space for graveyard, playground, park, bazar, market, industry, etc will be developed and earmarked in the RS sites. Such services and facilities will be provided/extended by RU in the host population areas where concentration of migrating PAPs would be dense. This will perhaps ease tension among the host and the new settlers. To protect the environment from deforestation due to sudden influx of new population, systematic plantation in host areas will be organized by RU in consultation with forest department. Development of RS site and host areas would cost Taka 70 million.
The squatters and uthulis who will be moving to squatting place at RS sites will be attached to NGOs who are experienced in "cluster village" or "ideal village" an established concept in Bangladesh. Interested NGOs may participate plantation programme of host area and RS sites.

Due to closure of northern intake of Dhaleswari and Hurasagar rivers about 3 acres of khas land will be reclaimed which will be leased out to land losing PA permanently in blocks up to 2 acres per family. In case land lost is more than 3 acres, he may be entitled to cash compensation. Allotment of khas land will attractive to the land losing PAPs and this will reduce the pressure on local land market which is already over-saturated.

It is expected that the allottees of khas-land can not transfer/sale/sub-lease the land other than by inheritance. The allotment will be given jointly in the name of husband and wife, the wife having right to lease in case of separation or death of husband. The JMBRA-RU will resume possession of the land in case of violation conditions by PAPs. The annual lease will be fixed at Taka 100/- per year per acre payable yearly. JMBA may increase the rental at the time of renewal but such increase should not exceed more than 10% per year over the preceding rate.

There are 561 sharecroppers among the PAPs. This category is also a priority group and in addition to one time cash grant for 45 days' wage (Tk 40 x 45 = Tk 1,800), he will get preference in allotment of JMBA's surplus land. Renewal lease of surplus land @ 1 acre per H/H will be given to them at a very nominal rent and they will become virtually landholders thus improving their status from tenant farmers to lessees of the government, a status almost permanent in nature. Allotment of commercial plots, jobs under project contractors, training and subsequent self-employment assistance will be their additional gains. Draft lease agreement is at Annex-G.

Weavers, industrial workers, shopkeepers and artisans will be given cash compensation to move business and establish their enterprises elsewhere. Shopkeepers will be given preferential allotment of commercial plots at bridge areas. JMBA expects that a good number of commercial plots can be made available for shopkeepers. Weavers are expected to relocate plants collective and will get all benefits so entitled. There are 90 affected business/industry (4
The socio-economic survey has identified 613 nos. non-farm workers of which 496 nos. are handloom workers. These non-farm workers will be given one time cash grant for 45 days' wage (Taka 1,800/-) and training with subsequent self-employment assistance.

(h) Farm labourers and tenant shopkeepers who will be losing their seasonal income will be given one time cash grant amounting to 45 days wage (Tk 40 x 45 = T 1,800) per H/H to tide over immediate difficulties. The socio-economic survey indicates that there are about 2,461 number of farm labourers and tenant shopkeepers who will undergo intensive training. NGOs have expressed the willingness to train the intending PAPs as per necessity and choice. Post-training assistance for self-employment through NGOs will also improve their economic status. All other PAPs will be eligible for skill training.

(i) Other than the squatting places in RS sites the squatters and uthulis will be entitled to one time cash grant of Taka 1,800/-. They will have additional benefit package such as training and subsequent loan, preferential allotment of commercial plots in BEF for uthulis and job under contractor.

Total cost of one time cash grant for sharecroppers, farm and non-farm workers, squatters, uthulis and shopkeepers will be Taka 10.50 million.

(j) 731 nos. directly affected PAPs who have already moved away and if they report to JMBA RU afterwards will be entitled to the same benefits as per entitlement. A reasonable time will be allowed by JMBA RU for such reporting.

(k) There are 6,615 nos. households who are entitled to training for skill development and self-employment. These households include PAPs losing homestead only, sharecroppers, farm and non-farm labourers, tenant shopkeepers, squatters and uthulis. Other than these, people of host population areas and other directly affected households will also have opportunity for receiving training. 16,000 nos. persons will be given training on various disciplines by reputed NGOs of the country. Women will have equal opportunity like men in receiving training.

At least two NGOs in each site of the bridge would be engaged by JMBA-RU to impart training to PAPs and host area population. Age and educational background of the PAP and financial condition of the HH will be the criteria for selection of
a PAP in a particular training. Training will be given in occupations like weavit
garment manufacturing/tailoring, rural health works, pisciculture, poultry/livestc
farming, automobile/mechanics, improved agricultural works, professional traini
(deed writing, computer, typewriting, etc). cottage industry etc which would enable the trainees to develop their skill and earn self-employment opportunit

JMBA resettlement unit will keep close watch on the training programme, outcome and will arrange loan through Bangladesh Krishi Bank, Rajshahi Kr
Unnayan Bank, Grameen Bank, BRAC and other reputed NGOs of the country self-employment. Grameen Bank has agreed in principle to extend its operatic
to cover the willing PAPs. It is understood that the PAPs will follow the norm discipline of Grameen Bank and other training and financing institutions.

While some training would cost more than Taka 2,500/- per person, some would cost less. Taka 40 million has been proposed to impart training to some 16,0 persons under the RAP, assuming training cost of Taka 2,500/- per person. Taka 30 million has been proposed for giving loans to trained PAPs which would benefit them in self-employment.

An intensive programme of tree plantation will be undertaken along with flood embankment, road sides, guide bunds and other project areas. Substantial employment will be created in the process of plantation and maintenance of the same for first five years and subsequently usufruct thereof will become available to PAPs. JMBA RU will allow short term renewable lease to uthulis and Bargat families @ one acre per family along the road side and flood embankment surpland. The allottees will be allowed to make a small house and do cropping/pisciculture. A total area of about 300 acres will be put under plantation. Only PAPs will be employed for plantation activities.

Approximately 0.1 million trees will be planted in consultation with the forest department. At an average cost of Taka 300/- per tree for plantation and maintenance, the total cost for afforestation programme has been estimated to be Taka 30 million.

The bridge-end facility study recently done by JMBA consultants indicates a potential of commercial activities at both bridge-ends, specially at east bridge-end. Shopkeepers who will be losing their business may be allowed shops at bridge-end.
areas. The PAPs will get preference in such allotments. JMB- RU will take specific care when such allotments will be made.

The socio-economic survey has identified 90 shopkeepers and other business/industry losing their place of business. Loss of land is covered by compensation under category-1 of the Resettlement Matrix. In addition to that they may be allotted commercial plots to make their shops at the bridge-end or any other suitable area. It is expected that the shopkeepers directly losing their business can restore their lost source of income. Similar allotment of commercial plots can also be done for tenant shopkeepers who used to run their shop/business on land owned. JMB consultant (GHK/MRM International Ltd) has mentioned about the business opportunities that may subsequently come up due to construction of JMB.

The construction contractors will be urged by RU to engage PAPs as unskilled labour or even skilled, if so found. In fact good number of PAPs are already working under JMB contractor under Contract 7, i.e. east flood embankment cum-road. The construction of the JMB would enable the employed PAPs to receive on-the-job training and develop their skill.

A large number of economic activities such as shops, tea stalls, groceries, restaurants, repair shops, workshops, petrol pumps, etc will come up along the approach roads particularly where the road passes along existing villages or intersects existing roads. The RU will identify these sites and make them available to PAPs. The existing programmes of BKBs, BRDB, NCBs for promotion of self employment are considered adequate to support these activities.

The JMB- RU in consultation with NGO’s will select commercial plots with JMB acquired area and allot these plots among the trained PAPs. BRAC survey has identified 504 land losing PAPs having marginal residual land (to continue full time farmer) who will be interested to run parallel business activities in which they are/would be trained. As mentioned earlier JMB- RU will arrange post training loan for self relocation. BRAC, SwanIR Bangladesh, Proshika, three leading NGOs will also be entrusted to create income generating activities for the affected women. The cost of training, post training loan and systematic rehabilitation will be done by JMB- RU through the NGOs.
Though not foreseen, it is however anticipated that some other adverse impact may be caused which may need immediate mitigation. It is proposed to establish a fund under the control of RU to undertake mitigatory activities.

The mitigatory measures will take care of the affected persons during and after the construction work of the bridge. The river channel under the bridge will be narrowed down resulting in rise of the water level at the stream of the river. This situation may have adverse impact on the people at upstream of the bridge. It may be necessary for JMBA-RU to take some special measures to mitigate the recurring problem arising out of the inevitable situations. Also during construction activities some special category of PAPs may emerge of some unforeseen effects which will also be taken care of under this mitigating fund.

The total cost is estimated at Taka 50 million.

14.0 A development project at a cost of Tk 540 m has been approved by the Planning Commission for inclusion in the Annual Development Programme, copy of PCP is Annex-H. The operational period of the project will extend beyond the physical construction of the bridge. The Resettlement Unit (RU) headed by a Director/Project Director with full financial and administrative powers under the overall supervision of the Executive Director of JMBA with 56 full time personnel has been proposed. JMBA-RU will also recruit 116 nos. work charged staff, preferable from among the PAPs (one male and one female from each of the 58 affected villages) to work as village resettlement workers. These VRWs will work as JMBA agents in the village to assist PAPs and maintain the communication links with the local resettlement office and they will provide the necessary local input and participation by the villagers in resettlement decision making process. These VRWs will work in addition to the grievance redressal committee. Two offices under the RU will be set up, one at the east and other at the west bank preferably at Bhuapur and Sirajganj respectively. RU organogram during and after completion is at Annex-I. The main functions of the RU will be to:

(a) **Issue ID cards:** One ID card will be issued to the head of each affected family. ID number will be unique. Particulars of the assets lost and the benefits received will be recorded on ID cards. The amount of compensation received, lease of lands and all other benefits, as and when given, will be recorded. Corresponding entries will be made in PAP registers in RU office simultaneously.
(b) Select land losing PAPs for permanent settlement of khas land reclaimed from Dhaleswari and the Hurasagar rivers.

(c) Arrange land purchase loan from the Bangladesh Krishi Bank and the Rajshahi Krishi Unnayan Bank for vulnerable groups of PAPs. Monitor land purchase and maintain liaison with borrowers and banks.

(d) Organise and liaise with village committees/grievance redressal committees.

(e) Prepare detailed brochure in Bangla describing resettlement plan and entitlement of PAPs and procedures.

(f) Monitor the progress of various components of training and arrange loan for employment.

(g) Assign short term renewable lease of surplus land of JMBA, monitor use there and tag PAPs to different NGO's, if necessary.

(h) Monitor migrating PAPs and provide counsel in matters of movement and purchase of replacement land, house construction, children's education, sanitation, etc.

(i) Keep close watch on squatters during their relocation to designated squatter sites. Extend logistic support to them and also resolve problems of host population.

(j) Keep account of loan amount and accrued interest of land purchase and permanent loan and payments made by the PAPs to Bank.

(k) Arrange plantation along approach roads, flood embankments and around bridge and permanent structures. Forest Department will provide technical and logistic support.

(l) Fund host area schools, religious places and preserve forest to safeguard against environmental imbalance. Intensive afforestation programme will be undertaken to preserve forest of the host area.
(m) Identify commercial sites and new commercial opportunities on JMBA land; select PAPs for location therein.

(n) Monitor unforeseen effects of the project and mitigate them promptly.

(o) Establish RS sites and ensure common facilities.

15.0 The JMBA-RU plans to engage the reputed NGOs of the country to assist in the following resettlement activities:

- To identify particular training needs and impart training to PAPs and host a population. Table 12 may be seen.

- To organize the squatters and uthulis and construct "cluster village" in resettlement sites.

- To take part in the afforestation programme.

- To identify and select commercial plots in the JMB project area.

- To give post training loans to trained PAPs.

- To monitor and evaluate the progress of the RAP by conducting necessary surveys and analysis.

- To provide specific consultancy service to JMBA-RU in implementing the RA

JMBA-RU has started dialogue with the NGOs regarding the above activities. The NGOs would be funded by JMBA-RU mainly. They would also be invited to carry on the already programmed development activities in the project area from their own fund. The NGOs would be given specific tasks for implementation and will be closely monitored and evaluated by JMBA-RU. JMBA-RU intends to enter into agreements with the qualified NGOs after finalization of the RAP.
16.0 A periodic progress report will be prepared and sent to concerned agencies by JMBA-R. This progress report will reflect the category-wise resettlement and migration of PAF. Special remarks if any will be detailed in the progress report. A comprehensive two-stage monitoring format will be designed one at the family level and the other at resettlement village/site level. JMBA-RU also intends to conduct a "Post-Resettlement Survey" with some NGO, preferably BRAC, to determine the actual progress and success of the R. after 4/5 years.

17.0 The JMBA-RU will be given the responsibility with necessary administrative and financial authority to implement the RAP effectively and efficiently. The functions and powers of the Project Director, Resettlement, Head Quarter, Dhaka and Deputy Directors, East and West site offices in relation to the various tasks are given at Annex-J. Officers and staff with social science background would be employed at the field level and also at headquarter at Dhaka. The officers and staff will be given training on resettlement. JMBA-RU plans to organize workshops in Tangail and Sirajganj to train and educate staff, the NGOs and the Village Resettlement Workers.

18.0 Presentation of the bridge project to the IDA Board will be taken as the date when the entire land acquired for the project will be cleared of all habitations and structure. Assuming that mobilization and start of construction will take place soon thereafter, project completion has been assumed to follow the time schedule as described below:

| Contract 1: | 0 + 2 + 40 months from board presentation |
| Contract 2: | 0 + 2 + 36 |
| Contracts 3&4: | 0 + 2 + 34 |
| Closure of Dhaleswari & khas land demarkation and allotment | 0 + 2 + 8 |

The various components of the RAP will be related to the time schedule mentioned above. Sufficient lead time is not available to perform all the necessary activities before the presentation of the bridge project to the IDA Board. It has been planned to complete actions 13(a), (c), (d), (f), (g), (h), (i), (j), before 01 October 1994 and 13(b), (c), (d), (e) during bridge project execution. Actions 13(e), (f), (g), (h), (i), (j), (k), (l), (o), (p) would continue from 01 October 1994 till end of resettlement project and actions 13(m), (n) would be mainly done after completion of the bridge project till end of resettlement project.
Attempt has been made to relate the different resettlement activities and draw a network diagram of RAP. An implementation schedule and network diagram of RAP is shown: Annex-M.

19.0 The detailed cost estimate of RAP is given at Annex-K. A year-wise budgetary provision of RAP has been made which is given at Annex-L.
RESIDUAL LAND & SOCIO-ECONOMIC SURVEY

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