# CHAPTER 6 EXISTING ENVIRONMENTAL CONDITION OF GUARI GRAM IN HAOR AREA

## 6.1 Natural Conditions

### (1) General Description

It falls under physiographic unit 9, i.e. Agro-Ecological Zone of old Bramaputra Flood Plain, Surma-Kushiyara Flood Plain and old Meghna Estuarine Flood Plain. More specifically, Nikli Upazila covers old Meghna Esturiane Flood Plain (120.79 sq. km.) and Sylhet Basin (72.62 sq. km.).

Seasonal flooding is by accumulated rainwater, which is unable to drain off the land when water level is high in the adjoining Sylhet basin and old Bramaputra, Jamuna and Meghna River. During rainy season low land is flooded generally medium to deeply flooded.

The soil is clay and clay loam. It contents low nitrogen and phosphorus and high calcium, copper, iron and manganese. The Ritchi and Austogram soil groups prevail in Study Area. It is subjected to rapid rise in flood level. The soil type of Nikli Upazila covers Acid Basin Clay (193.48sq.km) and Non calcareous Dark Grey Flood Plain (0.98sq.km) only.

### (2) Surface Water Quality

JICA Study Team collected the three water samples for surface water quality analysis. The sampling was done on random basis within the Study Area. The Table data indicates that pH varies from 6.72 to 7.06, Electrical conductivity, EC varied between 248 to 302 µs/cm and total dissolved solids, TDS between 109 to 142 mg/l in the Gurai Gram. The surface water quality is within Bangladesh and WHO guide line values and suitable for irrigation.

**Surface Water Quality in Gurai Gram**

| Water Quality Parameters | Unit | Bangladesh Standard | WHO Standard | Gurai | | |
|---|---|---|---|---|---|---|
| | | | | Location -1 | Location -2 | Location -3 |
| | | | | Open pond Md. Ali Akbar Gurai | Beel Roar Gurai | Open pond Mr. Haradhan Pal Gurai |
| PH | | 6.5-8.5 | | 7.06 | 6.72 | 7.05 |
| EC | µ s/cm | | | 302 | 302 | 248 |
| TDS | mg/l | 1000 | 1000 | 140 | 142 | 109 |
| Chloride (Cl) | mg/l | 600 | 250 | 19.0 | 20.0 | 9.0 |
| Nitrate ($NO_{3)}$ | mg/l | 10 | 50 | 0.0 | 0.0 | 0.9 |

Source: JICA Study Team

### (3) Groundwater Quality

The sampling was done on random basis consisting three samples from hand tube wells with depth varying between 50 m to105 m within the Study Area. The Table data indicates that pH varies between 7.42 to 7.52, EC varies between 474 to 518 µs/cm, Arsenic contents 0.055 mg/l in one sample, Iron contents between 0.25 to 0.52 mg/l, and Phosphate contents between 0.5 to 3.5 mg/l in the Gurai Gram. The data indicate that except Arsenic content in one tube well, the groundwater quality is within Bangladesh and WHO guide line values and suitable for both drinking and irrigation purposes.

**Groundwater Quality in Gurai Gram**

| Water Quality Parameters | Unit | Bangladesh Standard for Drinking Water | WHO Standard for Drinking water | Gurai | | |
|---|---|---|---|---|---|---|
| | | | | Location-1 | Location-2 | Location-3 |
| | | | | Gurai, Depth: 105 m, Hand Tubewell | Golam Rahman Golap, Depth: 75 m, Hand Tubewell | Dr. Mihir Pal, Ranjan Depth: 53 m', Hand Tubewell |
| PH | | 6.5-8.5 | | 7.42 | 7.35 | 7.52 |
| EC | µ s/cm | | | 518 | 474 | 478 |
| Iron (Fe) | mg/l | 0.3-1.0 | 0.3 | 0.52 | 0.49 | 0.25 |
| Arsenic (As) | mg/l | 0.05 | 0.01 | 0 | 0.055 | 0 |
| Chloride (Cl) | mg/l | 600 | 250 | 2.5 | 4.0 | 3.0 |
| Manganese (Mn) | mg/l | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 |
| Sulphate ($SO_4$) | mg/l | 400 | 250 | 0.0 | 0.0 | 0.0 |
| Phosphate ($PO_4$) | mg/l | 6 | | 0.5 | 3.5 | 1.0 |
| Nitrate ($NO_{3)}$ | mg/l | 10 | 50 | 8.9 | 0.9 | 0.0 |

Source: JICA Study Team

## 6.2 Ecological Conditions

**Wetland Flora**

The wetland flora of the Study Area is rich in bio-diversity. The dominant plants in the haor basin are Hijal (Barringtonia acutangula), Koroch (Pongamia pinnata), Barun (Crataeva nurvala), Bon Golap (Rosa involucrata) etc. These plants (except Barun) are now depleted at an alarming rate because of loss of habitats e.g., conversion of land for agricultural purposes, human settlement and cutting of wood for domestic purposes. Wetland floral diversity is highest from June to December of the year or when land submerged in the Study Area. The Barun (Crataeva nurvala) is the dominant tree species in the haor basin. Most of the 25-30 families of the plant diversity are present in the Study Area e.g., Cyperaceae, Gramineae, Amaranthaceae, Malvaceae, Nymphaceae, Polygonaceae, Scrophulariaceae, Rubiaceae, Araceae, Boraginaceae etc., and Compositae (refer to Table 5.1 to 5.3).

**Terrestrial Flora**

Most of the 20-25 principal families of the plants are found in the present Study Area e.g., Gramineae, Leguminosae, Anacardiaceae, Moraceae, Myrtaceae, Cyperaceae, Euphorbiaceae, Annonaceae, Rutaceae, Cucurbitaceae, Ebenaceae, Solanaceae, Lythraceae, Labiatae, Lauraceae, Rubiaceae, Malvaceae, Apocynaceae, Compositae, Combretaceae, etc.

**Endangered Plants**

A complete list of endangered plants for the country is not available but a tentative list of plants which are considered by local experts (NCIP) and various international plant conservation organizations indicates that the study area provides important habitats for a number of endangered species which have become exterminated from the area due to habitat destruction.

Increasing human pressure to convert wetlands for the cultivation of food crops resulted in the loss of wide variety of plant species from the region. *Rosa involucrata*, which is a wild relative of the garden rose, is abundant in the wetlands habitat of the project area. Due to the habitat destruction, this plant species has become rare. Hijal *(Barringtonia acutangula),* Sarpagandha (*Rauolfia serpentina*) and Koroch (*Pongamia pinnata*) are the locally threatened species. There is no existence of national endangered plant species in the project area during the study period.

**Wetland Fauna**

The Study Area supports a variety of wildlife population and fishes. Different types of native fishes are still present in this area in a moderate number. This haor area supports two seasonal wildlife population and their habitat in a year because the area inundate for six months and the rest of the months it is dry-up. Some endangered wildlife and fishes are identified (refer to Table 5.5).

## Terrestrial Fauna

Different types of the wildlife species are the core component of the terrestrial fauna in the Study Area. Wildlife fauna in the haor area is abundant during the rainy season. In dry season, haor area act as nesting ground for the terrestrial wildlife especially for the birds. Both dry and rainy season, the haor areas naturally produce plenty of food for the terrestrial and wetland wildlife. As a result, different type of migratory birds also visited these areas for some months for taking food, shelter, nesting etc. Some endangered wildlife species have identified (refer to Table 5.6 and 5.7).

## 6.3 Socio-Economic Profile

**Economic Activity**

The present bases of economic activities are primarily centered on farmland, small-scale business installations, and service (government and non-government) in both Study Areas. Only in Haor area fishing-ground is the economic base of approximately 15% of the total families. It may be noted that base of fishing ground does not mean they all are engaged directly in fishing. There are people who do fish trading, fish transportation. About 95% of char and 42% of haor household heads believe that economic bases may change in the post development period. One should not assume that all old economic bases would be changed to new ones.

**Percentage Distribution of Possibility of Change of Economic Base of Household**

| Possibility of Change of Economic Base | Gram | | Total N=300 |
|---|---|---|---|
| | Gurai N=150 | Algar Char N=150 | |
| Yes | 42.0 | 95.3 | 68.7 |
| No | 58.0 | 4.7 | 31.3 |
| Total | 100.0 | 100.0 | 100.0 |

**Percentage Distribution of Future Economic Base of Household Heads**

| Future Economic Base | Gram | | Total N206* |
|---|---|---|---|
| | Gurai N=63* | Algar Char N=143* | |
| New job | 25.4 | 4.9 | 11.2 |
| Industry | 7.9 | 0.7 | 2.9 |
| Business | 19.0 | 62.9 | 49.5 |
| Farming | 36.5 | 8.4 | 17.0 |
| Wage labor | 11.1 | 23.1 | 19.4 |
| Total | 100.0 | 100.0 | 100.0 |

*The remaining cases are excluded from the calculation, as they don't anticipate any change

The sampled household heads think most important economic base will be business followed by day labor, faming, and new job opportunities. Respondents of char and haor differ significantly on their opinions on future bases. This could be for two different physical conditions. In char area business and day labor are likely to be the major economic bases while faming and new jobs are likely to be the most important bases of economic activities of haor in the post development period.

Key-informants seem also to believe that there will be significant growth of business in the locality primarily for improved communication system, which they consider most crucial for the growth of agriculture sector. The improved communication system will facilitate marketing of products and getting agriculture inputs quickly at a lower transportation cost. This will in turn generate employment opportunity for the local and immigrants. Therefore, key-informants think that

business and employment in agriculture sector will increase substantially in the post development phase. Key-informant of hoar area don't think that there will be any major change with regard to fishing ground as a base of economic activities except that better communication system may facilitate quick transportation of fishes to distant places, which might fetch better price. The facts reveal that both sampled household heads and key-informants anticipate that business and job opportunities may increase as consequences of development activities. The key-informants anticipate an increase of employment of 20% to 25% for women and 30% for men in both char and haor areas after the completion of proposed development activities.

The flood-proofing program is likely to undertake some measures to achieve the success. The steps that may be taken are land acquisition, change of regulations of land use, and deterioration and depletion of resources. Key-informants anticipate certain consequences of these steps. The land acquisition may create landlessness among the poorer section even if adequate compensation is given to the victims because of non-availability of suitable lands to purchase. Since most of these villagers don't have any special skill these evicted landowners may turn into landless and ultimately wage laborers. Land acquisition may also destroy fishing ground and disturb the free flow of water, which is vital for the growth of fish according to key-informants. Although a limited number of people are likely to suffer for acquisition of lands, a large number of people will be benefited, as these will be used for constructing roads, submersible bridges and roads for the greater interest of the community.

The new land use regulations may have both negative and positive effects. It may restrict many people to pursue their traditional occupations, such as cultivating land of their chosen area, fishing in specific places etc. If the affected people are not properly rehabilitated they will suffer for no fault of their own. Therefore, some people may have to change their occupation in the wake of new regulations. On the contrary it may optimize land use by increasing the possibility of mechanization of agriculture, providing the opportunity for alternative land use, stopping encroachment of public land etc. The key-informants don't think that there will be any major deterioration or depletion of existing economic bases although there may be a need to adjust few things.

Land acquisition will not cause any major change in the economic base since project is likely to acquire only a limited amount of land according to key-informants. If the application of land use regulations remains limited to acquired land there will be little impact upon the existing economic base. If it is applied to all project areas economic base may be changed substantially. However, the key-informants could not anticipate about the nature of changes that would take place in livelihoods of people of the locality.

In addition to key-informant interviews survey also measured the opinions of household heads on following anticipated changes that might take place due to project activities, such as rise of income, causes of change of income rise, income variation, and women's present and future occupations. Nearly all of the household heads believe that income of the people of the locality will increase

after the implementation of the project. The reasons assign to such a rise are increase of job opportunity, improvement of communication, and development of community.

**Percentage Distribution of Opinions of Household Heads on the Reasons for Rise of Income in the Post Implementation Phase**

| Reasons for Income Rise | Gram | | Total N=286* |
|---|---|---|---|
| | Gurai N=136* | Algar Char N=150 | |
| Business | 10.3 | 0.0 | 4.9 |
| Job opportunity | 42.6 | 35.3 | 38.8 |
| Community development | 19.9 | 30.7 | 25.5 |
| Others | 5.9 | 2.7 | 4.2 |
| Improvement communication | 21.3 | 31.3 | 26.6 |
| Total | 100.0 | 100.0 | 100.0 |

*The remaining 14 responds are excluded from the calculation, as they believe that income will remain the same or decrease.

**Percentage Distribution of Opinions of Household Heads on the Possibility of Higher Income Variations in the Post Implementation Phase**

| Create Income Gap | Gram | | Total N=300 |
|---|---|---|---|
| | Gurai N=150 | Algar Char N=150 | |
| No | 0.7 | 0.0 | 0.30 |
| Yes | 90.7 | 100.0 | 95.3 |
| Remain the same | 8.7 | 0.00 | 4.3 |
| Total | 100.0 | 100.0 | 100.0 |

It may be noted here that the income the sampled households expect to rise is not due to total change of previous economic bases rather the above mentioned factors will add to the present ones. Although respondents expect to increase their income are not sure of its equitable distribution. Over 95% of the total sampled households think that the income will create greater gap among different groups of people. However, nearly 9% of household heads of haor area don't anticipate the rise of income.

Under economic activities we have made some inquiry into the changes that may take place in the life of women due to the implementation of the program. According to key-informants almost all women of the project areas who live in the locality are now housewives but they may enter into paid occupations after the implementation of the project if jobs are available for them. They believe such opportunity will be available for them.

**Increased Use of Agrochemicals**

Data with regard to use of agrochemicals have been collected through survey and key-informant interviews. The survey data show a considerable difference among the household heads. About one-third (35%) of sampled household heads of haor opine that the use of agrochemical will

increase in the post project period. Contrary to it about 100% of char respondents asserts increased use of it in future. It could be because char people are more dependent on farming while a considerable numbers of people in haor depend on fishing or fishing related occupations.

**Percentage Distribution of Opinions Household Heads on Use of Agrochemicals**

| Possibility of Rise of Use of Pesticides | Gram | | Total N=300 |
|---|---|---|---|
| | Gurai N=150 | Algar Char N=150 | |
| Yes | 65.3 | 100.0 | 82.7 |
| No | 34.7 | 0.0 | 17.3 |
| Total | 100.0 | 100.0 | 100.0 |

The char and haor key-informants not only differ in their opinions regarding the increased use of it but also on the consequences of its use. They differ on the accumulation of chemical pesticides in soil and water. The majority of key-informant of haor believes that increased use of chemical pesticides due to intensification of agriculture, introduction of high yielding species and new irrigation development will result in accumulation of chemical in soil and water. Contrary to haor key-informants, overwhelming majority of char key-informants hold just the opposite view. Those who assume accumulation of chemicals will be high in soil and water believe that this will ultimately reduce agricultural production and kill or destroy fish production in pond and in open water.

## Increase in Domestic and Other Human wasted

**Percentage Distribution of Opinions of Household Heads on the Possibility of Creating Domestic Wastes**

| Possibility of Producing Domestic Wastes | Gram | | Total N=300 |
|---|---|---|---|
| | Gurai N=150 | Algar Char N=150 | |
| Yes | 85.3 | 87.7 | 92.7 |
| No | 14.7 | 12.3 | 7.3 |
| Total | 100.0 | 100.0 | 100.0 |

The possibility of producing domestic and human wastes is highly asserted by sampled household heads. About 88% and 86% of household heads opine that there are possibilities of producing domestic and human wastes, respectively.

**Percentage Distribution of Opinions of Household Heads on the Possibility of Creating Domestic Wastes**

| Possibility of Producing Human Wastes | Gram | | Total N=300 |
|---|---|---|---|
| | Gurai N=150 | Algar Char N=150 | |
| Yes | 79.3 | 93.3 | 86.3 |
| No | 20.7 | 6.7 | 13.7 |
| Total | 100.0 | 100.0 | 100.0 |

Data are also collected from key-informants to get the explanations of the causes of producing domestic and human wastes. The majority of the key-informants of both haor and char areas opine that both domestic and human wastes are likely to increase in the project areas for high density of population due to the creation of clustered in homesteads for project affected people. Besides, population may also migrate to project areas lured by better economic condition that may occur from the development activities. High density of population in clustered homesteads locations is likely to produce domestic wastes while human wastes may be produced for lack of sanitary latrine in the villages. However, some believe domestic and human wastes will not reach to a point of problem as villages have enough space for disposal of wasted.

# CHAPTER 7 ENVIRONMENTAL IMPACT ASSESSMENT (EIA)

## 7.1 Objective of EIA

This EIA study will be conducted for a detailed investigation on Potential Environmental Impact for the proposed projects/programs as a part of the study, for the purposes of (i) to identify the project's key environmental issues of the Feasibility Study Area, (ii) to evaluate potentially significant impact, (iii) to recommended possible mitigation/abatement measures, and (iv) to formulate a monitoring program for the significant environmental issues. Some important issues to be addressed during the EIA study include a) involuntary settlement, b) increase in domestic and other wastes, c) change in vegetation, d) degradation of ecosystem with bio-diversity, e) negative impact on flora and fauna, f) destruction of wetland, g) soil erosion, h) change in hydrological regimes, and i) sedimentation.

In any project all possible impacts will not produce significant impacts or may be cause of concern. The significant impacts of the environmental issues of the project will be identified by closer examination. The major scope of works to achieve the objective are (i) the existing laws and regulations relevant to the project, (ii) based on the extensive field survey evaluation of Potential Significant Impacts, itemized assessment shall be made considering the items mentioned in the Checklist for Proving EIA.

## 7.2 Methodology

The impacts have been classified for positive impacts as 5, 4, 3, 2, and 1 representing Very high impact, High impact, Moderate impact, Low impact, and Very low impact respectively. Whereas for negative impacts are classified as –5, -4, -3, -2, and –1, representing Severe, Higher, Moderate, Low, and Very low impact respectively (refer to Table 7.1 and 7.2).

**Priority Area for EIA Study**

1) Char Area: The following is finally selected as priority area for model project, Algar Char Gram, in Erendabari Union, Fulchari Upazila, Gaibandha District.

2) Haor Area: The following is finally selected as priority area for model project, Gurai Gram, in Gurai Union, Nikli Upazila, Kishoreganj District.

**Model Projects/Long-Term Development Programs for EIA Study**

### (1) Char Area

- Raising Plinth of Homestead Area (Model project)

- Clustering Houses on High Platform (Long-term development program)

- Provision of Raised Hand Tube-Well (Model project)

- Provision of Community Latrine (Model project)

- Construction/Reconstruction of Submersible Road (Long-term development program)

- Construction/Reconstruction of Submersible Bridge/Culvert (Long-term development program)

**(2) Haor Area**

- Wave Protection Plan (Model project)

- Provision of Raised Hand Tube-Well (Model project)

- Provision of Community Latrine (Model project)

- Construction/Reconstruction of Submersible Road (Long-term development program)

- Construction/Reconstruction of Submersible Bridge/Culvert (Long-term development program)

## 7.3 Results of EIA

Results of the EIA are summarized in Table 7.3, 7.18 (Char) and Table 7.11, 7.18 (Haor). Each result of proposed programs is shown in Table 7.4 to 7.10 on Char and Table 7.12 to 7.17 on Haor. Base on the evaluation of Potential Significant Impacts, main negative itemized assessment shall make mitigation measures.

### 7.3.1 Algar Char Gram in Char

**(1) Demographic Issues**

**Populations Increase**

i) The local shifting cultivators and temporary migrant workers who will settle permanently should be given priority for employment if jobs are created.

ii) Although char is less resourceful compared to haor, the possibility of high immigration is likely in view of the development activities. Immigration from outside should be discouraged.

iii) A family planning program must be strengthened to depress high natural population growth.

**Drastic Change in Population Composition**

i) Immigration to the area should be discouraged although there will be les numbers of immigrants in char area compared to hoar, which is much resource rich.

ii) There should be a skill-training program for the young immigrants and locals, which may help them to find employment outside the project area. This may reduce population pressure upon local resources.

**(2) Health and Sanitary Issues**

**Residual Toxicity of Agrochemicals**

Informal education program should make people aware of actual possibility of accumulation of chemicals in soil and water. The education program should include the suggested actions that are to be taken in case of accumulation.

**Increase in Domestic and Other Human Waste**

The program planners about the possible domestic and human wastes should make a realistic assessment. Based on this, they should identify the perishable and non-perishable wastes. People should be made aware of potential menace of indisposed waste through a health education program. A waste disposal program should be prepared at the initial stage of the program implementation.

**(3) Biological and Ecological Issues**

**Change in Vegetation**

Due to raise of homestead plinth, changes in existing vegetation is anticipated. To minimize the effect before raising the homestead plinth the topsoil may be transferred to another place later on which could be replaced on the top of the homestead land. If it is not possible then soil-covering plants may be planted on the plinth raising area. It should be critically observed that no plant which height is more than five feet would remain as it is.

**Negative Impacts on Important or Indigenous Fauna and Flora**

To minimize the negative impacts on important or indigenous flora and fauna especially for fauna some holes could be made on the homestead area, also a bushy ecosystem may be created for birds.

**Degradation of Ecosystems with Biological Diversity**

Degradation of ecosystems is very critical and most important issue for any project, which depends upon many factors such as changes of flora/fauna, hydrology, soil, agriculture, air and many other components. So care should be taken during implementation of the project so that degradation of ecosystem may be minimized. In this connection an experienced ecologist should be engaged during construction period, which will be responsible for look after the ecological issues. If there is any critical issue he will take immediate action to resolve the problem.

**Destruction of Wetlands and Peat Lands**

Minimum destruction of wetlands and peat lands is anticipated due to implementation of the project. The care should be taken during implementation of the project so that minimum changes of wetlands and peat lands will occur.

**(4) Soil and Land Resources**

**Soil Erosion**

Minimum soil erosion during flood and heavy rainfall is anticipated in char areas, for raising plinth of homestead and clustering houses on high platform. Mainly these include excavation and compaction of earth materials. During construction grading will result in bare, un-vegetated soil that can become susceptible to accelerated erosion from wind, rain or from flooding. Until vegetation becomes established, these areas would be prone to erosion resulting in a significant impact. Also degree of slope and height of the submersible roads and homestead areas should encounter during design, as these will also play active role in erosion.

Therefore, an erosion control plan shall be prepared to minimize the erosion. Standard best management practices shall be included in the plan, such as plantation, construction of slope protective work, and re-vegetation of barren slopes immediately following construction. The types of measures will vary depending upon location and type of armoring proposed.

### 7.3.2 Gurai Gram in Haor

**(1) Demographic Issues**

**Populations Increase**

i) The local shifting cultivators and temporary migrant workers who will settle permanently should be considered first for involvement in possible income generating activities resulting from development program.

ii) The potential immigrants who may be allured to come to project area for employment should be discouraged as they will cost much for resettlement as infrastructural development will be required for them.

iii) A family planning program must be strengthened to depress high natural population growth.

**Drastic Change in Population Composition**

i) Immigration to the area should be discouraged.

ii) There should be a skill training program for the young propels, which may help them to find employment outside the project area. This may reduce pressure upon local resources.

### (2) Economic Activity

The project personnel should identify the possible reasons of economic disparities and plan to reduce them as much as possible. For example, in the post implementation period the victims should get necessary support to have a share in the benefits of the project.

### (3) Health and Sanitary Issues

**Increased Use of Agro-Chemicals**

Informal education should be imparted to agrochemical users about its negative impacts of excessive use. They should also be encouraged to use organic fertilizers. The education program may be tied with agriculture extensive program.

**Residual Toxicity of Agrochemicals**

Informal education program should make people aware of actual possibility of accumulation of chemicals in soil and water. The education program should include the suggested actions that are to be taken in case of accumulation.

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