

ENVIRONMENTAL IMPACT ASSESSMENT ON BANGABANDHU RAILWAY BRIDGE CONSTRUCTION PROJECT

Executive Summary

The proposed Bangabandhu Railway Bridge is a lifeline connecting the northwestern part with the eastern part of Bangladesh. Bangladesh Railway (BR), Ministry of Railways, Government of Bangladesh (GoB), undertakes the present project. The project envisages the construction of a Railway bridge with provision for a Dual gauge double track, which will run 300 meters up stream and parallel to the exiting Bangabandhu Bridge over the river Jamuna. The proposed project is funded by Japan International Cooperation Agency (JICA) and the project comprises of constructing of the 4.8 Km long bridge across the river Jamuna and construction of about 6.5 Km long approach rail track along with the computer based interlocking signaling system. The western alignment passes through the Bangabandhu Eco-Park. No additional land is required for acquisition. As such, resettlement and rehabilitation issues are not require to address in this project. The entire alignment passes through the land owned by the Bangladesh Bridge Authority (BBA) and that of BR. The proposed bridge will address the load restrictions and speed restrictions on the existing Bangabandhu Bridge. The proposed project will generate multi-dimensional benefit for the local population and will improve the inter-regional trade among the South Asian Countries. A feasibility study for this project prepared by ADB in 2013-2014 and a Supplemental Survey of this project conducted by JICA in 2015

The project is classified as Category A by JICA and as Red Category, (Environment Conservation Rules of 1997) by Department of Environment (DoE). Both JICA and DoE requires an Environmental Impact Assessment for this project. Design Consultant for this project is a joint venture of International and National Consulting Firms. Currently, detail survey and detailed design is in progress. The major construction work will include large-scale construction of large diameter piles, bridge piers followed by construction of steel truss superstructure as well as the restoration of river training works if any. The workforce is estimated around 2,000 people and the 50% of the work force would be from the local population. The terms of reference

issued by DoE, Government of Bangladesh during the feasibility stage was the basis for conducting the environmental surveys and this EIA. As there is no change in the location of the proposed bridge, the purpose of this EIA is to updating the previous EIA study.

Baseline environmental assessment was conducted for the environmental and ecological features of the project area within 5 km radius of Bangabandhu Bridge at upstream and downstream. The socio-economic study was carried out for the local population to assess their livelihood and record the feedback of the local population for the proposed project.

In addition to focus group discussions (FGD), public consultations, individual consultations and the stakeholder consultations were conducted at the various locations in the project area to gather information and opinion of the local population regarding the proposed project. As of now, there is no major issues raised by experts and local people, the project may implement smoothly. During the detailed design stage, the environmental monitoring was conducted in May to July 2017. The environmental monitoring comprised of Air Quality, Water Quality (Surface and Ground Water), Noise and Vibration levels, Soil Quality, River sediment samples, Benthos and Plankton sampling. In the ADB feasibility stage, the parameters like sediments, benthos and plankton sampling, soil sampling and measuring the vibration levels were not considered. Present study was considered all those parameters, which were left out during the feasibility stage and included the fish, birds and dolphin survey. The analytical results showed that the air, noise and water quality baseline conditions of the parameters are very much within the national standards. The following methodology was adopted for measuring various environmental parameters:

Air Quality:

Air Quality monitoring was carried out at 13 locations to assess the background air pollution level within project area including the Bangabandhu Eco-Park. The assessment was carried out to monitor Carbon Monoxide (CO), Oxides of Nitrogen (NO_x), Particle Matter within 2.5 micrometers (PM_{2.5}), within 10 micrometers (PM₁₀), Tri Oxygen / Ozone (O₃), Sulphur Dioxide (SO₂), and meteorological parameters like temperature, humidity, and the wind speed and direction were measured during the monitoring period. The duration of sampling was for 8 hours. The particulate

monitoring was carried out using a high-volume sampler. The particulates were estimated gravimetrically and the gaseous pollutants by Electro-Chemiluminescence technique. The air quality results showed almost unchanged concentrations when compared to the results obtained during the ADB feasibility stage. On the other hand, the noise levels showed tendency to increase when compared with the result of the Feasibility stage.

Surface Water:

Surface Water samples were collected from sixteen (16) locations. For the water samples, a number of physio-chemical parameters were tested on-site. In total Nine (9) Parameters were analyzed and those are; pH, Total Organic Carbon (TOC), Total Phosphorus (T-P), Total Suspended Solid (TSS), Oil & Grease, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and the Bacterial Load. All the samples were analyzed at Bangladesh University of Engineering and Technology (BUET) for testing and the visual observations color and the presence/ absence of detectable odors.

Ground Water:

Ground Water samples were collected from six (6) locations. Laboratory Analysis of ground water samples were carried out in BUET. Nine (9) parameters were analyzed. Those parameters are; Total Dissolved Solids (TDS), Chlorides (Cl), Heavy Metal, Arsenic (As), Iron (Fe), Manganese (Mn), Sulphur (S), Total Coliform (TC) and Faecal Coliform (FC).

The water quality in both surface and ground water found presence of Arsenic. The bacterial loads were also present in the surface water and ground water samples. Proper drinking water to be supplied to the workers who will be working at the project site during construction stage, as the quality ground/surface water is not very satisfactory.

Noise:

Noise measurements were conducted in 13 locations same as the locations for Air Quality Monitoring. The noise was measured one-hour duration during the day time and 15 minutes duration during the night time. The noise monitoring was performed by the Development Solutions Consultant Ltd. (DSCL). Background sound level has

been monitored in time weighted average Leq in dBA both at day and night time at four locations encompassing each of the sample sites. The noise was recorded using a calibrated HTC Sound Level Meter set to A-weighting, slow response and statistical analysis settings. Day and Night Noise has been captured from every location. Vibration was also recorded from two locations using HTC VB-8205 vibration meter.

Soil:

Soil samples were taken from seven (7) locations nearby agricultural lands on either side of the Jamuna River including the Bangabandhu Eco-Park and were sent to Department of Soil, Water and Environment of University of Dhaka for laboratory analysis. Observations were also made about the physical characteristics of the soil at the project area such as color, texture and plasticity. The soil samples were collected for Total nitrogen (T-N), Total phosphorus (T-P), Potassium (K), Sulphur (S), Calcium (Ca), magnesium (Mg), Iron (Fe), Manganese (Mn), Copper (Cu), Zinc (Zn), Boron (B) and Molybdenum (Mo).

Riverbed Sediment:

Total 6 numbers of samples were collected at different locations both from the upstream and downstream of the river Jamuna at proposed railway bridge site. Parameters for analyses are; Total Organic Matter, Phosphate, Nitrate, Ammonia, Sulphates, Al, As, Cd, Ca, Co and Cr. The samples were tested in BUET laboratory.

Benthos and Plankton:

Total 6 samples of both benthos and plankton were also collected from the same locations of sediment sampling. Samplings have been sent to Department of Zoology, Dhaka University for study of Benthos and Plankton.

In addition to the baseline environmental parameters analysis, the surveys were also conducted in the project area. The survey involves the following:

Fishery Survey:

Fishery Survey was conducted to identify the abundant, type and habitat area of different fish species of the river, and fishing gears used around the proposed project area. Fisheries survey was conducted within 5 km radius of Bangabandhu Bridge at upstream and downstream for 7 consecutive days. More than 53 fish species were

identified from the river of Jamuna. Identified fishes were categorized according to Red list of Bangladesh-IUCN,2015. However, the fish population has been greatly reduced due to unsustainable fishing practices.

Wildlife Surveys:

Because of many mammalian and reptilian species are cryptic and unlikely to be encountered using standard field sampling methods. As such, experience suggests that interviews with local people are a very useful method for collecting information on local biodiversity. Strongly follow the Red list of Bangladesh-IUCN, 2015 on mammals, reptiles, amphibians and birds of IUCN-Bangladesh and categorized the wildlife under endangered, critical endangered, vulnerable, data deficient etc. During the field survey period, extensive interviews with local people were conducted to collect information on animal and plant presence, including occurrences, behavior, breeding, distribution and seasonal appearance.

Common mammals in and around study area are Mole Rat (*Bandicota bengalensis*), Bandicoot Rat (*Bandicota indica*), House Shrew (*Suncus murinus*), Field Mouse (*Mus booduga*), House Mouse (*Mus musculus*), House Rat (*Rattus rattus*) and Small Indian Mongoose (*Herpestes autopunctatus*) There is an evidence of the Common Otter (*Lutra lutra*) and Jackal (*Canis aureus*), species at risk of extinction and also categorized as endangered by IUCN. The Bengal Monitor and Yellow Monitor have been observed within the study area. These two species were listed as vulnerable (VU) and endangered (EN) in IUCN Red list category. During the survey in total 16 species of mammals, 11 species of reptiles and 6 species of amphibians were identified and recorded.

Avifauna Survey:

Avifauna survey was conducted for a period of 6 consecutive days by the team members of Zoology Department under Dhaka University lead by Dr. Sabina Yasmin. The surveys on the migratory birds were conducted at the site by collecting information and interacting with the local population. All the information was collected within the 5 km radius during survey of the proposed bridge location. In total 83 species of birds have been identified and recorded and categorized according to Red data book of IUCN Bangladesh.

Bangabandhu Eco-Park Survey:

Bangabandhu Eco-park survey was carried out by different team for making an inventory of plants and wildlife in the eco-park. Two teams were assigned for the survey; one team for plants and the other team for wildlife survey. The works were implemented for 10 consecutive days at the eco-park. Threatened and rare species of wildlife and plants also identified from eco-park.

Gangetic Dolphins Survey:

Gangetic Dolphins Survey was conducted to identify the presence, availability and habitat around the project site. The dolphin survey was conducted up to seven consecutive days during day time only to gather the maximum data during survey. Total 4 team (2 teams for both Upstream and Downstream) consisting 2 members were survey at a time. The survey area was up to 5 km towards both upstream and downstream from the location of existing bridge.

Char land Survey:

Char land survey was conducted based on the existing Char Lands up to 5 km both towards upstream and downstream from the existing bridge. To collect further samples regarding Char livelihood, the survey included 4 Char Lands formed at the upstream: Char Kalipur, Char Katnga, Char Bihari and Char Gabsara, and 2 Char Lands at the downstream: Char Singuliar and Char Jalbali. The survey activities were to collect information regarding environmental impacts likely to cause for the local population who are living at Char Lands. 4 teams worked for char land survey where every team consists of 2 members.

Tree Inventory:

Tree inventory and classification was a part of baseline environmental survey, trees have been inventoried on Bangabandhu Eco-Park for removal of trees in the proposed alignment and the diversity of trees to be identified and recorded. An inventory of trees with local name, girth, dbh, bole height, height, amount of fuel and numbers has been prepared. In total 3683 trees of 27 species were inventoried which will remove during construction period.

Other Projects around the Project site:

The power plant expansion projects, industrial parks and special economic zone proposed at the western bank would increase significant impacts on the water pollution and may affect air quality in and around the project area. When compared to the impacts caused by the proposed developmental activity it may be negligible impacts caused by the proposed bridge construction activity. The baseline chapter discusses about the environmental quality.

Topography:

The Project area is located in the flood plain of the Jamuna River, which is part of an active delta system consisting of flat alluvial plains. The topography in the study area is almost flat with elevation differences between three to nine meters on both sides of the Jamuna River. The larger portion of the alluvial deposits in the study area predominantly consists of fine to medium grained sand with greater density at deeper layers. The basal layers are alluvium gravel layers.

Land Use:

Land use within 100 m either side of the approach track of the proposed railway bridge comprises of commercial structures, planted forest, water bodies, and open lands. The surface water along the proposed alignment is dominated by the Jamuna River. The river exhibits flooding during monsoon.

Agriculture:

Agricultural crops are the major type of vegetation in the study area. All flood plains in the study area are extensively used for agriculture. The majority of these agricultural fields are regularly inundated during the monsoon season. Paddy is the major crop with the major species being "Irri-Boro". Among other crops Peanut (*Arachis hypogaea*), Wheat (*Triticum aestivum*), Black Gram (*Vigna mungo*), Sesame (*Sesamum indicum*), Millet (*Pennisetum glaucum*) and Jute (*Corchorus olitorius*) are also commonly grown. The variety of vegetation on the Char land is comparatively poorer than other mainland ecological resources. Most of the plant varieties on the Char land are grasses. The char land is also well known for vegetable cultivation such as Sweet gourd (*Cucurbita maxima*) and Okra (*Abelmoschus esculentus*). In addition, crops in the Boro (Christmas) season are also cultivated widely on the Char land of the Bangabandhu Railway Bridge area. Vegetation on the Char land is mainly seasonal and agricultural activities are dependent on the length of the dry season. The seasonal wetlands of the river

abound in various types of aquatic flora such as free floating, rooted floating, submerged sedges and meadows, and marginal plants. Huge quantity of the pesticides and herbicides are used for protection of standing crops, at the project area. The chemical fertilizer use is also really huge by the local farmers.

Pesticide:

Most of the farmers apply pesticides in an unbalanced way. The use of pesticides depends on the degree of pest infestation. Application of pesticides has been noticed for 1-3 times to control pest and diseases for the rice crops grown in the areas. The major insects as reported by the farmers were Stem borer, Green leaf hopper, Grass hopper, Rice bug, Brinjal shoot and Fruit borer, Red Pumpkin beetle and Mosaic. Local farmer reported that they were using different types of pesticides such as D-ten 10G, Krishan5G, Krishan10G, Hi power, Heron, Mortar, Foker, Raison-60 EC, Brifer-5G, Siperin-10EC, Regent-3G, Sifanon-57EC and Cumulus etc. to prevent pest infestation in rice, vegetables and others crop cultivation.

Gangetic Dolphin:

Gangetic Dolphin (*Platanista gangetica*) is one of the most important endangered aquatic mammals observed within the project site. The population of this species is considered to be decreasing day-by-day. The Ganges River dolphin is listed in CITES-Appendix I and IUCN as Endangered. The species has been adversely affected by human use of the river system. Entanglement in fishing nets is also causing significant damage to the local population numbers.

Migratory Birds:

No terrestrial or aquatic birds were found endangered within the study area. Although no migratory birds have been observed during site visit, it was evident from the local population as well as from secondary data sources that few migratory bird species nested every year in the study area including: the Grey Headed Lapwing, Black Headed Ibis, Common Tern, Indian River Tern, Long Legged-Buzzard, Short-eared Owl, and Comb Duck. However, the number of migratory birds and their types were decreasing over time due to urban and industrial encroachment.

Environmental Impact:

The activities have the potential impact on the environment, society and economy in both positive and negative ways, and these were identified and assessed through

environmental impacts chapter of this report. The physical, biological, socio-economic and health aspects have been categorized into pre-construction, construction and operational periods. The proposed Project will have noticeable impacts during the construction period, but will be easily prevented or mitigated.

All impacts, mitigation measures and monitoring requirements have been defined in an EMP, included in the EIA and organized into three components, pre-construction, construction and operations. Most of the pre-construction and operating period measures will be implemented by the Client (BR), while the construction period measures will be the contractor's responsibility, enforced by the Engineer and overseen by BR. The construction period section of the EMP has been integrated into the construction contract as a set of environment issues allowing for easy calculation of financial penalties.

Grievance Redress Committees:

Grievance Redress Committees (GRCs) will be organized in two Upazila within the Tangail and Sirajganj administrative areas. The Project will likely trigger both environmental (as defined in the EIA) and social impacts and therefore the GRC will need to be able to address both. Prior to the start of construction, BR will meet with Upazila heads to request each to nominate committee members who could form part of the GRC, and meet when complaints are received. Once the complains reaches the GRC, the GRC has two weeks to render a decision, based on discussion with all parties involved and following the four steps described in Chapter on EMP. Besides grievances for the affected person, construction workers grievances will also be ensured through individual contractual agreements.

Mitigation and monitoring actions:

Mitigation and monitoring actions were defined. The works on construction phase will concentrate around issues arising due to the noise and vibration, char land activities include barge movements, river dredging, material transportation, soil and river channel erosion, topography changes, loss of habitat for aquatic, terrestrial and avian fauna, water pollution and other project induced impacts. The contractor will be required to conduct a regular air, water and noise quality monitoring programme, as specified in the EMP, and submit reports, on a monthly, quarterly, and on annual

basis. The contractor's environmental safeguard personnel will have to attend a mandatory training workshop on EMP implementation, prior to the start of work.

Mitigation and monitoring measures:

Mitigation and monitoring measures were defined that mainly focus on inspection of contractor work areas, their waste disposal sites, rehabilitation/revegetation, proper landscaping, re-establishment of local access, debris clearance from reconstructed culverts, etc. BR will implement an air and noise quality monitoring Programme during three operating years to establish the noise and air quality degradation (if any) at sensitive sites, identified during the EIA and to implement proper noise and air quality attenuation measures.

Environmental and Social Safeguard Unit (ESSU):

The Project will have provision for the creation of an environmental and social safeguard unit (ESSU) within BR to manage the safeguard issues arising from the proposed project. BR will create at least one environmental safeguards staff position and two if its mitigation and monitoring duties are not given to a Consultant. In addition to staff, the ESSU will also need basic equipment to undertaken monitoring as well as staff training. It will be the staff's duty to monitor the contractor's environmental compliance, complete all the operating period EMP requirements and ensure that reporting is technically robust and meets JICA and GoB standards. Therefore, the unit must be trained and ready to take on varied tasks and be able to report to International Donors.

Conclusion

To conclude, the Project could generate a number of environmental impacts, such as those associated with the embankment construction, the river crossings or poor housekeeping by the contractor.

The air quality results showed almost unchanged concentrations when compared to the previous results obtained at ADB feasibility stage. On the other hand, the noise levels showed the tendency to increase compared with the result on the Feasibility stage. The water quality in both surface and ground water found the presence of Arsenic.

The air quality will also be affected due to the use of generators, increase in transportation vehicles and construction of residential accommodation would adversely affect the air quality.

No significant environmental safeguard issues were identified and all likely minor impacts can be mitigated to an acceptable level following the recommendation of this study. Impact from Earthwork, Embankment, Signaling and interlocking system are low and manageable by proper implementation of EMP.

The EIA's EMP provides the specific guidelines, which BR has put in place to prevent or mitigate these effects. BR is committed to implement these measures and has fully endorsed the EIA which is the basis for the EMP. BR will ensure that the work is carried out in an environmentally acceptable manner and the monitoring and reporting are completed in a compliant and timely fashion acceptable to both DoE and JICA.