

第7章 環境社会配慮

7.1 序文

7.1.1 プロジェクトの背景

インドにおいては地上交通としての道路の重要性は良く認識されており、インド全体の旅客の85%及び貨物の60%が道路交通を利用している。しかしながら、インド国内の他の地域と比較すると、北東州の山岳地域では地理的及び技術的な理由から道路交通の発達が遅れている。このため、北東州ではインド国内の他地域と比較すると経済的な格差による不均衡が見られる。

北東7州（アッサム、マニプール、メガラヤ、ミゾラム、ナガランド、トリプラ、アルナチャル・プラデシュ）は、インド本土とは遠く離れてバングラデシュを巻き込むように位置しており、チキンズネックと呼ばれる隘路（最も細い箇所幅22km）で繋がっている。また、バングラデシュやミャンマーとの越境協定が未だ整備中であり、トランジット貨物が通過できず国境で輸出入手続きと共に貨物の積み替えが必要となって、物資の輸送コストが高くなる陸の孤島となっている。インド国内での道路舗装率は63.4%であるが、北東州においては28.5%となっている。そのうちの53%が2車線の国道であるが、これはインドの主要地域と隔離された地域である理由による。また国家の安全保障政策という見地から、隣国に繋がる道路が効果的に開発されてこなかったことにもよる。

北東州の自然環境は比較的厳しく、急峻な山岳地域という地形的制約に加えモンスーンの雨期が長いこと、道路開発が遅れる理由となってきた。北東州の道路網は独立以来、隣国との商工業的な繋がりによって、地域の経済活動をかろうじて維持する一方、国家的な安全を確保する役目を担っている。

これらの課題に対応するため、インド政府は第12次5カ年計画（2012年4月～2017年3月）において、北東地域特別道路整備促進計画（Special Accelerated Road Development Programme for North-East : SARDP-NE）による地域内主要都市間の国道整備を掲げた。同計画は、北東地域の地方中心部や遠隔地域を州都と接続する道路を整備するものである。7,530kmの国道の2車線化あるいは4車線化、並びに2,611kmの州道の2車線化あるいは改良が含まれている。北東州にある88カ所の地方中心部を、少なくとも2車線の道路で、最も近くを通る国道に接続することが目的である。また、2014年5月に発足したモディ新政権も、北東州の開発、特に道路網の整備は重点政策の一つと捉えている。

JICAは、2013年に「南アジア地域におけるクロスボーダー交通インフラ整備・改善に係る情報収集・確認調査」を実施し、インド、バングラデシュ、ブータン、ネパール、ミャンマー、タイの6カ国を対象として地域連結性強化と越境交通インフラ整備に関する提言を行った。その中で、インド北東州と他の地域との既存の交易ルートで克服されるべき課題が多いことが明らかとなり、複数ルートの道路整備が提案された。

かかる状況の下、インド政府は北東州における既存道路8区間（総延長1,242km）の改良、既存橋梁2ヶ所の補修および橋梁1ヶ所の新規建設に関して、日本政府に対し、有償資金協力を要請した。その後、JICAは北東州道路網連結性改善事業フェーズ1（2015年12

月事前通報) (以下、フェーズ 1 調査) を実施し、①要請があった区間を対象とした、現状分析による円借款対象事業としての優先順位付け、②先行 2 区間についてのデータ収集・分析およびインド国実施の F/S のレビュー、③先行 2 区間について、我が国の有償資金協力事業として実施するための審査に必要な調査を行った。

優先順位づけの評価基準として、上位計画との整合性、プロジェクトの熟度、交通需給ギャップ (V/C)、および経済評価 (EIRR) に基づいて優先順位を定めた。その結果、最も優先度が高い区間が国道 54 号線および 51 号線、それに続く区間として国道 40 号線およびドゥブリ橋が選定された。先行 2 区間として、国道 54 号線および 51 号線の調査を実施した。その結果、国道 54 号線については、拡幅事業による既存集落への社会環境インパクトが大きい区間が確認され、4 集落区間についてバイパスルート案の適用と、その対象既存区間については縮小舗装幅 (10 m) で改良工事を行うことが提案され、追加調査が実施された。

本調査は、フェーズ 1 調査、フェーズ 2 調査に続くフェーズ 3 調査としてドゥブリ橋の整備を事業対象とし、データ収集・分析、インド国実施の DPR のレビューを行うと共に環境および社会面の配慮等、我が国の有償資金協力事業として実施するための審査に必要な調査を行った。

なお、有償資金協力事業として実施するための審査は、第 1 フェーズとして国道 54 号線と 51 号線、第 2 フェーズとして国道 54 号線バイパスと国道 40 号線、それに続く第 3 フェーズとしてドゥブリ橋が予定されている。

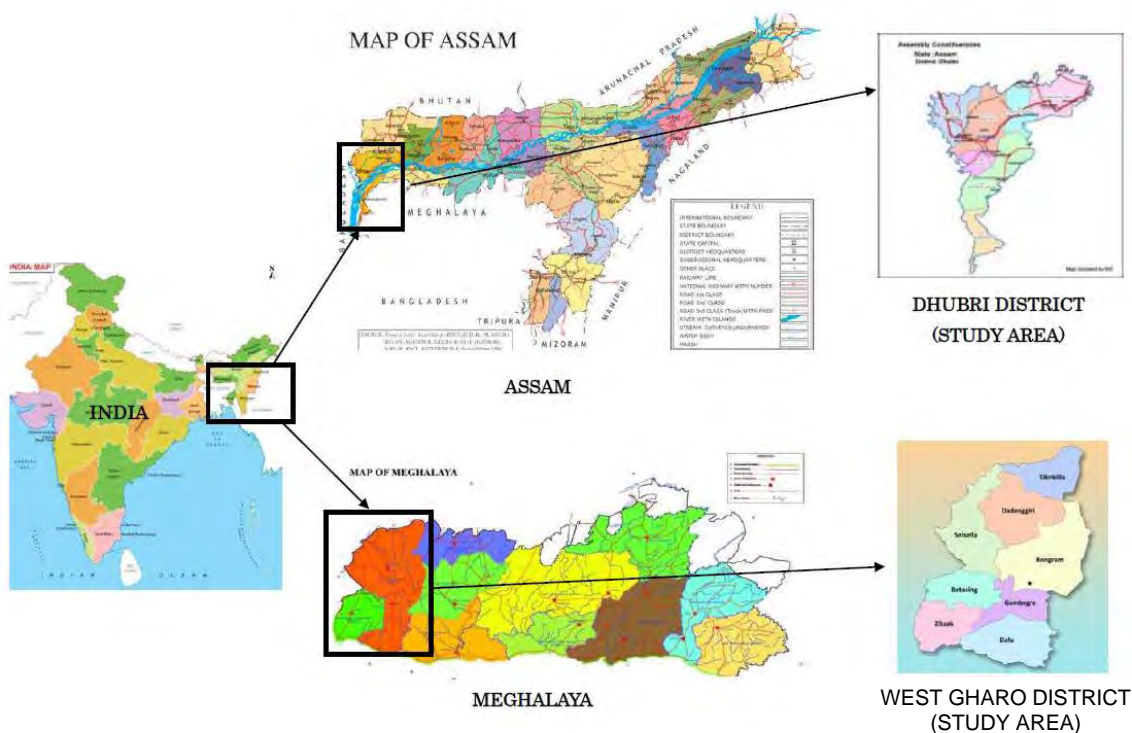
7.1.2 事業の概要

計画中のドゥブリ橋は、ブラマプトラ川を横断し、北岸のアッサム州ドゥブリと南岸のアッサム/メガラヤ州のプルバリを結ぶ全長約 20 km、4 車線の橋となる予定である。建設地は 2 つの州にまたがっており、北岸のドゥブリ県及び南岸の南サルマラ・マンカチャル県はアッサム州、西ガロ・ヒルズ県はメガラヤ州にそれぞれ属する (図 7-1 及び図 7-2 参照)。起点 ($89^{\circ} 55'45.68''E$ & $26^{\circ} 2'10.49''N$) から南東の方角に向かって伸び、ブラマプトラ川とそれに囲まれたいくつの中州の上を横断して南岸の終点 ($90^{\circ} 1'59.11''E$ & $25^{\circ} 53'25.98''N$) と結ばれる。

現地は平坦な低地で、標高は 35 m~42 m である。ブラマプトラ川河口から約 500 km、年間流量 $571 \times 109 \text{ m}^3$ 、流量 $18,099 \text{ m}^3/\text{s}$ 、流速は雨季乾季及び場所で大きく異なるがドゥブリ近辺で 1 m/s 程度、水深は橋梁横断で最も深い箇所が雨季約 10 m 乾季約 4 m、水際は自然傾斜で部分的に水田で雨季時には水没する。ブラマプトラ川の年間送流土砂は 8 億トンである。中州は川の氾濫によって堆積された砂でできており、季節によって浸食され堆積するため位置や大きさは一定ではないが、中州にも現在居住している住民がおり、主に農耕や放牧等に利用されているため、一部住民の移転が予定されている。現在はこの川には橋がなく、小型船 20~30 隻がドゥブリとプルバリや中州の間を運行して人や物資を運んでいるが、対岸まで渡るには所要時間が片道約 2 時間半かかる。

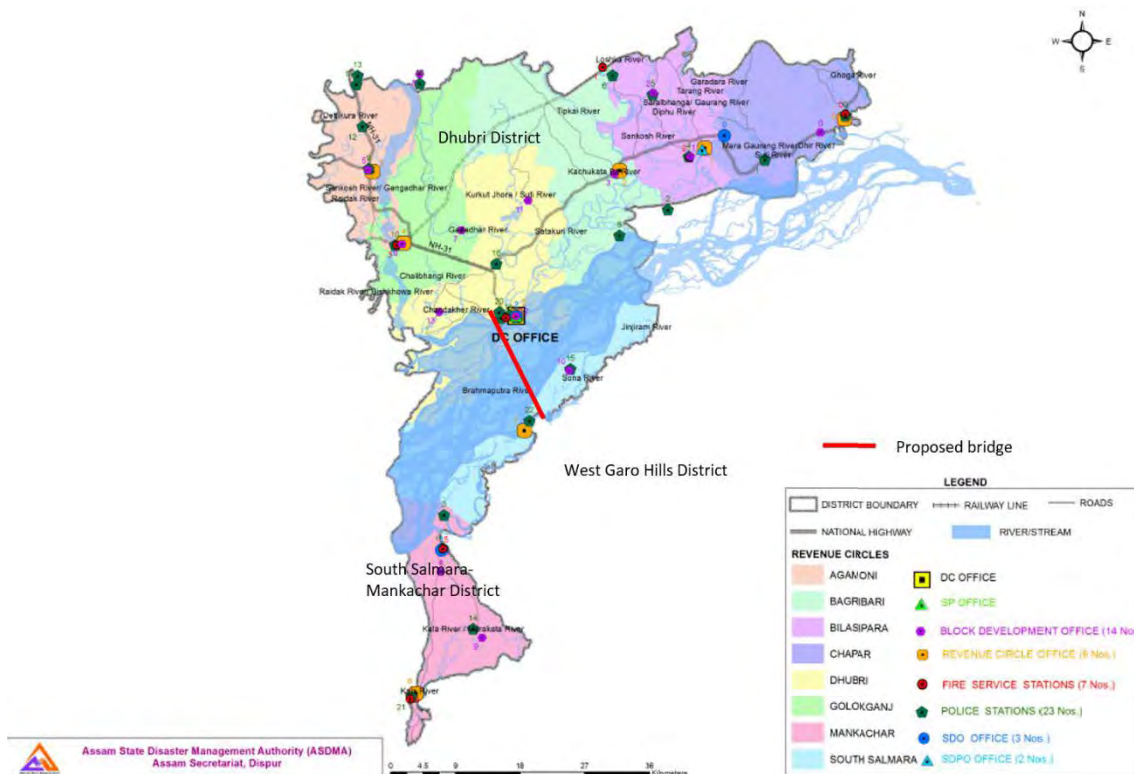
ブラマプトラ川を横断して、ドゥブリとプルバリを結ぶ新設橋梁は、ブラマプトラ川により切断されている道路の連結性を補うものであり最も重要な区間である。これまで完全

にフェリー交通に依存していたインド北東地域の非常に重要な 2 つの中心部について、道路による輸送連結性を確立することになる。この新橋の建設はさらに、メガラヤ州の南西地域とインドの他の地域を最短距離で接続することになり、この地域の輸送網を大きく拡大する。



出典：JICA 調査団

図 7-1：プロジェクト位置図



出典：JICA 調査団

図 7-2：プロジェクト対象地周辺図

7.1.3 本件環境調査の背景と目的

インド政府は環境・森林・気候変動省（MOEFCC）の EIA 通知書（14.09.2006 年 9 月 14 日及び 2013 年 8 月改訂）により、下記の条件に該当するプロジェクトはインド法令上のカテゴリー A に分類され、EIA 調査を実施しなければならないと規定している。

- 1) 新規の国道建設
- 2) 延長 100 km 以上の国道建設で、現道の用地幅を 40 m 以上に拡幅する場合、及び用地幅 60 m を必要とするバイパス等の建設

一方、想定されているドゥブリ-プルバリ橋建設計画においては、本事業実施のために必要とされる用地幅は 60 m 未満であり、バイパスを含む総延長は 20 km であることから、上記の EIA 通知書で規定されている EIA 報告書に基づく環境許認可の取得は求められていない。なお、住民移転を伴うため、用地取得に当たっては各州の適用法に基づき、住民移転計画が作成される。

本件調査業務に係るインド側のコンサルタントは実施設計（Detailed Project Report : DPR）を担当しており、DPR 作成完了に伴って IEE レベルの環境調査を実施している。また、本事業は、JICA 環境社会配慮ガイドライン上、重大な影響を及ぼす道路・橋梁セクターに該当することからカテゴリー A に分類されており、EIA 報告書に基づく環境社会配慮確認が必要とされる。よって、本調査においては、JICA 環境社会配慮ガイドラインに沿って

NHIDCL が EIA 報告書案を作成する支援を行う。また、本事業は大規模非自発的住民移転を伴うことから、2013 年の新用地取得法 (Right to Fair Compensation and Transparency for Land Acquisition Rehabilitation and Resettlement Act : 以下、LARR2013)、国道法及び2015 年のアッサム州用地取得・生活再建移転権利法 (以下、アッサム州 LARR2015) を参照しつつ JICA 環境社会配慮ガイドラインに沿って住民移転計画 (Resettlement Action Plan : RAP) が作成されるよう、NHIDCL を支援する。

7.2 調査地域および影響範囲

7.2.1 地理的影響範囲

調査対象地域は、下図に示すように、ドゥブリ橋 (アプローチ道路を含む総延長約 20 km) 建設予定地から 10 km 以内の範囲とする。



出典：JICA 調査団

図 7-3：調査対象範囲

7.2.2 調査内容

JICA 調査団による 環境社会配慮に係る調査は以下の項目を網羅している。

- (1) インド側の環境社会配慮制度・組織の確認
 - 環境社会配慮（環境影響評価、住民移転等）に関連する法令や基準等（JICA ガイドラインとの整合性）
 - 環境社会配慮に係る各種関係機関の役割
- (2) プロジェクトサイトの環境・社会状況（ベースライン）の確認
- (3) 代替案の比較検討（事業実施しない案を含む）
- (4) 上記状況確認等に基づくスコーピング案の作成
- (5) 環境や社会に対する影響の予測・評価及びモニタリングに必要なデータの収集等
- (6) 影響の予測・評価
- (7) 緩和策（回避・最小化・代償を含む）の検討
- (8) モニタリング計画（実施体制、方法）の作成支援
- (9) ステークホルダー協議の開催支援

また、住民移転計画案の作成支援に係る調査は以下の項目を網羅している。

- (1) 住民移転に係る法的枠組みの分析
- (2) 住民移転の必要性
- (3) 社会経済調査（人口センサス調査、財産・用地調査、家計・生活調査）の実施
- (4) 損失資産の補償、生活再建対策の立案
- (5) 移転先地整備計画の作成（必要に応じて）
- (6) 苦情処理手続きの検討
- (7) 実施体制の検討
- (8) 実施スケジュールの検討
- (9) 費用と財源の検討
- (10) モニタリング体制の検討
- (11) 住民協議の実施支援

7.2.3 調査の方針

(1) 環境及び社会への影響調査

本事業は橋梁建設プロジェクトであるが、建設予定地の自然環境に対する負の影響や比較的大規模な住民移転を含む社会的影響が想定される。大気、水、土壌、廃棄物、生態系及び生物相、非自発的住民移転、貧困層、生計手段、労働安全面を含む、プロジェクトの直接的かつ即時的な影響や派生的・二次的な影響並びに累積的影響について、JICA ガイドラインに沿って環境各項目を網羅的に調査する。

(2) 法的枠組みの調査

本事業の実施地域におけるインド政府、アッサム州およびメガラヤ州政府が定めている環境社会配慮、用地取得・住民移転に関する法令や基準を調査する。その上で、本事業に

適用される法規制を確認し、JICA ガイドラインとの整合性を踏まえて必要な対応策について検討する。

(3) 住民移転の影響範囲

本事業は、ブラマプトラ川を挟みアッサム州とメガラヤ州の 2 州に跨がり、アッサム州に属するブラマプトラ川の中州も影響範囲となる。この中州は、雨季と乾季の水位変動により地形が変化する。雨季（5～10 月）には、河川水位上昇に伴い中州面積は小さくなり、乾季（11～4 月）には徐々に面積が大きくなる特異な地域である。本調査では、DPR コンサルタント（AECOM）が作成した用地取得図（2016 年 6 月作成）をベースとして、用地取得・住民移転の被影響世帯を調査する。住民移転計画については、インドの関連法規をベースに、JICA ガイドライン、世界銀行のセーフガード政策を踏まえて策定する。

7.3 ベースとなる環境および社会の状況

7.3.1 自然環境

(1) 気象状況

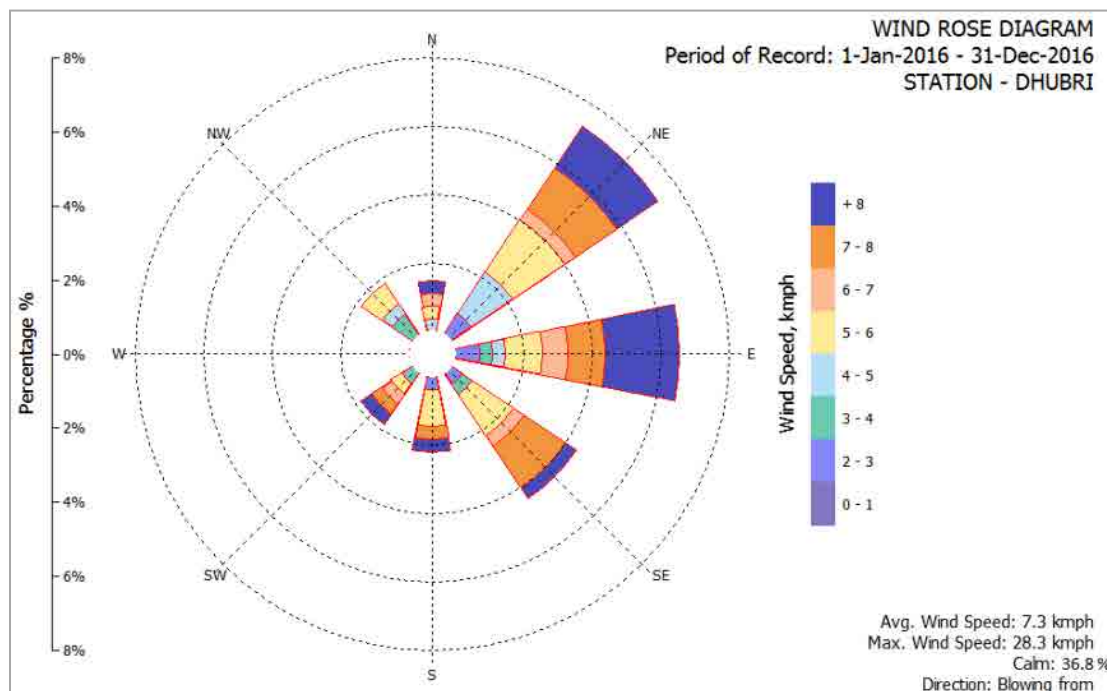
ドゥブリ県周辺は亜熱帯湿潤気候に属し、年間気温は 10.5℃から 30℃の間である（表 7-1）。5 月から 10 月にかけて、南西からモンスーンが吹き気温が高く降水量も多い。年間平均降雨量は 2,363 mm であり、そのうちの 65%はモンスーン期に集中する。

また、西ガロ・ヒルズ県も同様に亜熱帯気候であり、メガラヤ州の中では標高が低いいため気温が高いのが特徴である。年間降雨量は 4203.8 mm でドゥブリ県より多い。風速は年間を通じて穏やか（1～26.5 km/時）であり、1 日のうちでは午前中より午後のほうが強まる傾向がみられる。

表 7-1：ドゥブリ県の年間降雨量と気温（2016 年 1 月～12 月）

月	気温 (°C)			湿度 (%)			気圧 (ヘクトパスカル)			風速 (km/h)	卓越する風向	降水量 (mm)
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg		
1 月	9.3	26.3	17.8	63	86	74.5	1009.7	1013.6	1011.6	4.8	NE	6.7
2 月	10.2	30.2	20.2	52	76	64	1007.1	1013.4	1010.2	5.6	N	6.6
3 月	13.4	35.8	24.6	48	68	58	1003.9	1011.2	1007.5	7.7	E	42.5
4 月	17.2	36.7	26.9	62	74	68	1000.9	1008.6	1004.7	11	NE	133.2
5 月	19.2	35.3	27.2	75	82	78.5	998.3	1005.7	1002	10.1	NE	340.4
6 月	21.7	35.2	28.4	83	89	86	995.2	1002.3	998.7	8.6	E	514.2
7 月	22.8	34.1	28.4	54	87	70.5	994.7	998.2	996.4	6.9	E	432.5
8 月	23.4	34.2	28.8	52	85	68.5	996.2	997.6	996.9	6.6	NE	368.2
9 月	22.3	24.5	23.4	86	83	84.5	999.5	1003.2	1001.3	6.4	NE	263.7
10 月	19.5	32.6	26.0	78	84	81	1004.5	1006.1	1005.3	6.9	NE	140.5
11 月	14.1	29.3	21.7	72	82	77	1007.5	1011.3	1009.4	7.4	NE	18.7
12 月	10.5	25.8	18.1	66	86	76	1008.6	1013.2	1010.9	5.7	NE	3.4

出典：India Meteorological Department



出典：Indian Metrological Department (IMD)のデータに基づき JICA 調査団作成

図 7-4：風向図

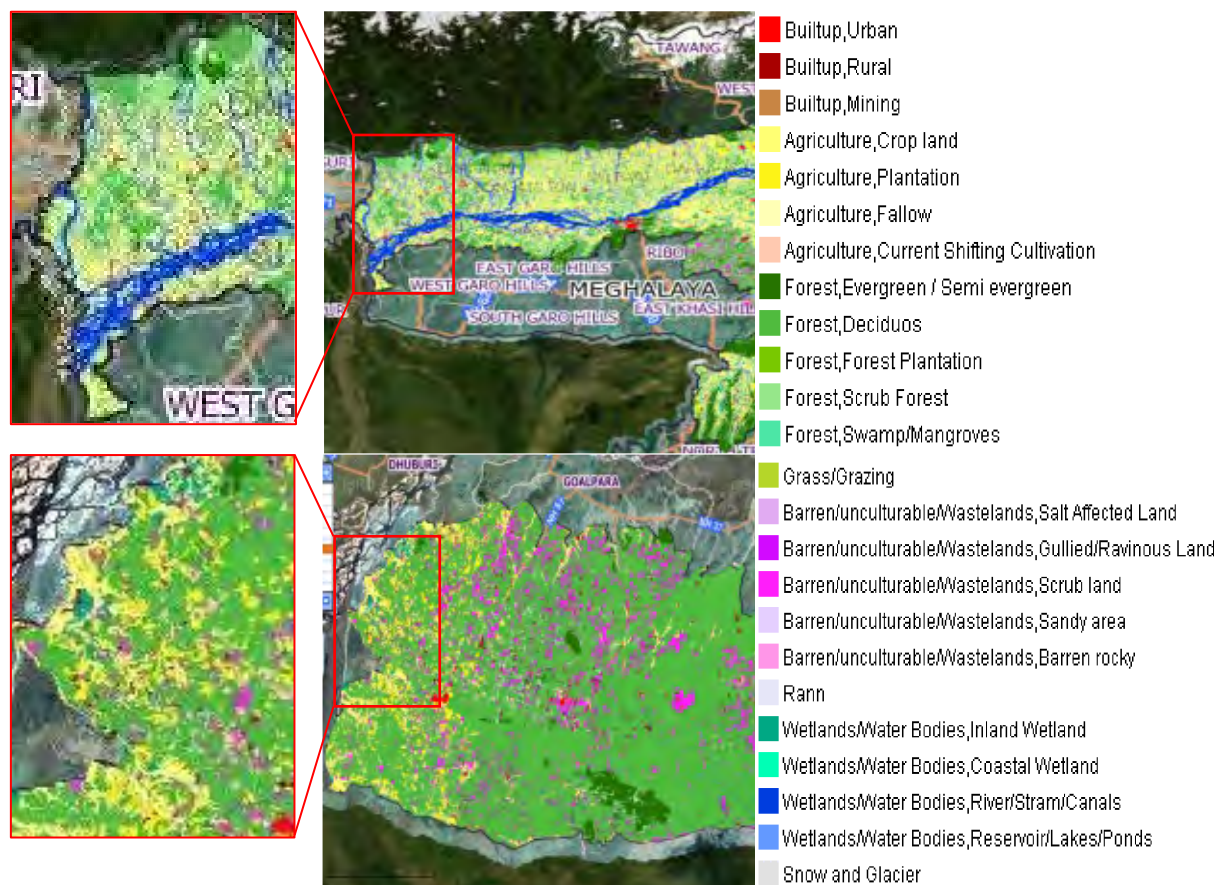
表 7-2：西ガロ・ヒルズ県の月別降水量

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
22.1	14.7	105	269	514	889	910	643	502	298	13.3	24.2	4203.8

出典：Central Ground Water Board of India

(2) 土地利用

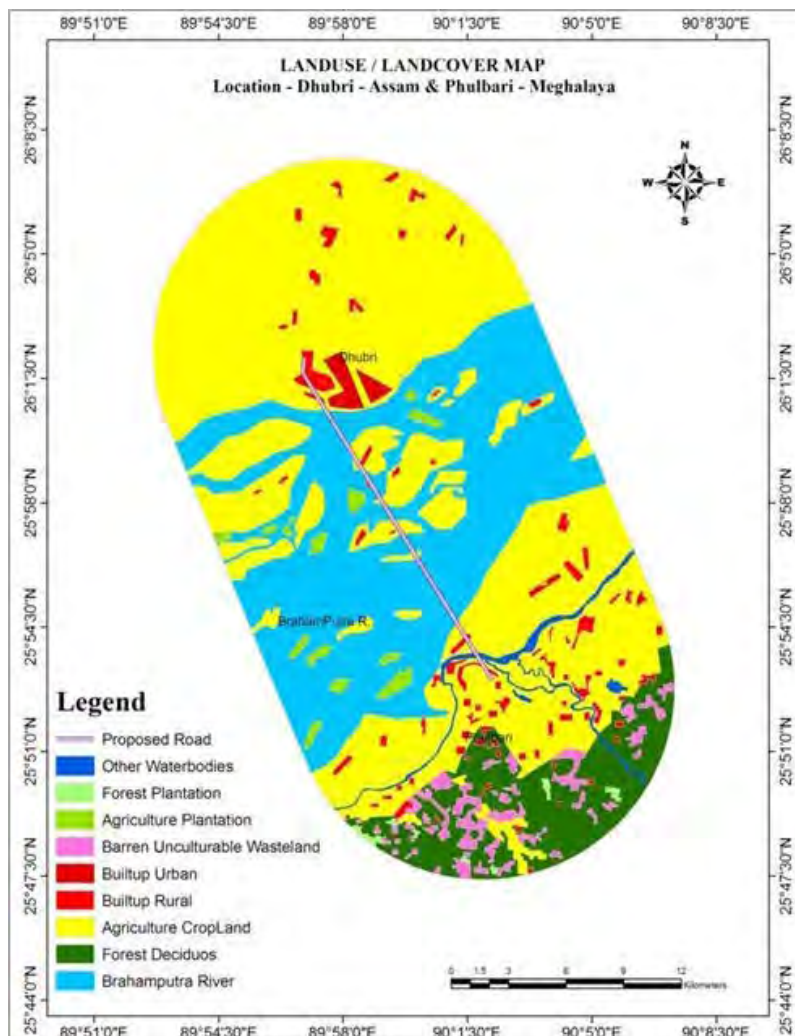
アッサム州及びメガラヤ州における対象地域周辺の土地利用状況を図 7-5 に示す。アッサム州、メガラヤ州ともに、大部分が農地（黄色）、落葉樹（黄緑）となっており、所々に荒廃地（ピンク）が見られる。



出典：Draft Detailed Project Report by AECOM, November 2016

図 7-5：事業対象地域周辺の土地利用

また、図 7-6 及び表 7-3 に事業対象地 10 km 圏内の地域の土地利用状況を示す。当該地域の土地利用状況は、農地（黄色）が 45%、ブラマプトラ川（水色）が 35%となっており、家屋を含む建物密集区域（赤色）は4%に留まる。橋梁の始点となるドゥブリ側は、居住区の脇を通過する計画となっている。



出典：Resourcesat I LISS-III より EIS 作成

図 7-6：事業対象地 10 km 圏内の土地利用

表 7-3：事業対象地 10 km 圏内の土地利用の内訳

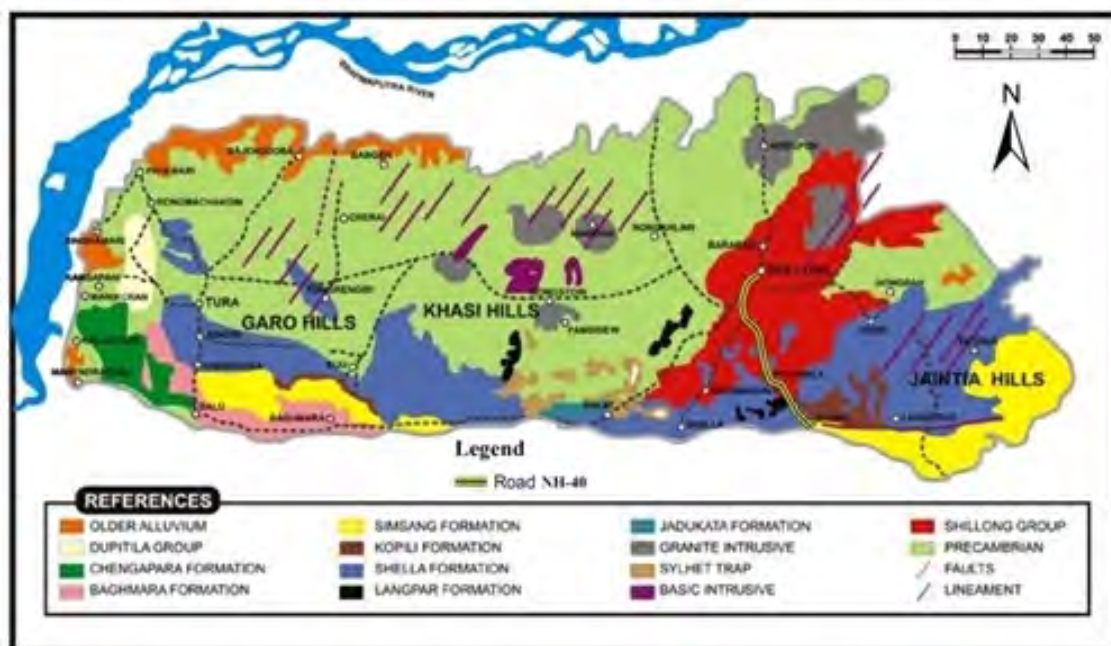
Sl. No.	Landuse Class	% of Class
1	Proposed bridge	0.5%
2	Other Water bodies	1.5%
3	Forest Plantation	2.0%
4	Agriculture Plantation	2.0%
5	Barren Unculturable Wasteland	3.0%
6	Builtup Urban	2.0%
7	Builtup Rural	2.0%
8	Agriculture Crop Land	45.0%
9	Forest Deciduos	7.0%
10	Brahmaputra River	35.0%

出典：Resourcesat I LISS-III より EIS 作成

(3)地理・地質

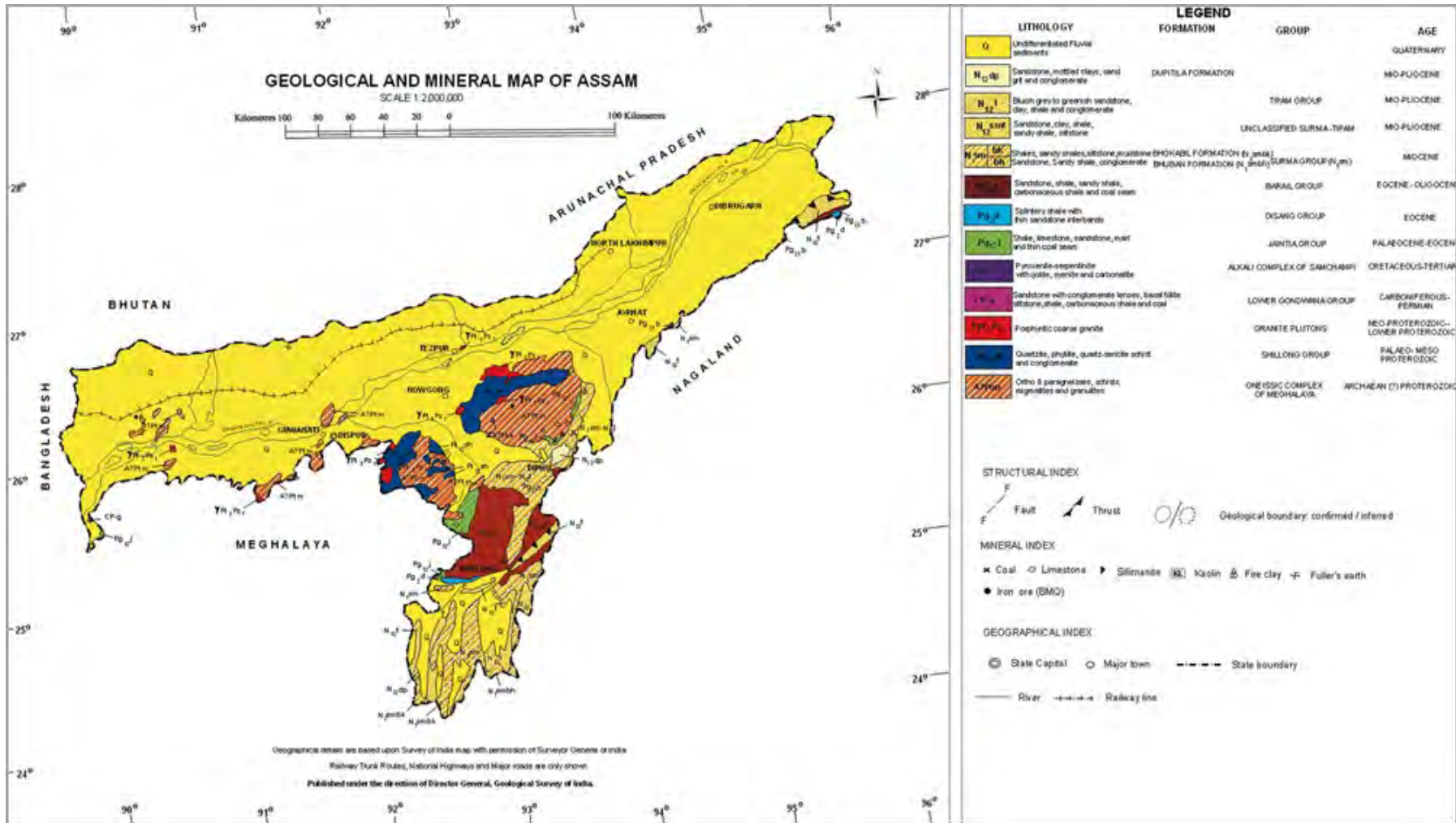
提案されているドゥブリ橋は北岸のドゥブリから南岸の南サルマラ・マンカチャルまでブラマプトラ川を横断している。この周辺の地形は主に平坦な低地であり、河川も多い。西ガロ・ヒルズ県では低い丘も見られる。プロジェクト対象地周辺では、地層は先カンブリア紀の地層及び堆積土砂から成る（図 7-7、7-8）。地質については、ドゥブリ～南サルマラ・マンカチャル地域の地質は均質ではないようである。河の流域にかかるエリアではロームまたは砂質のロームが優占的である。場所によっては粘土質の土も存在する。土壌は酸性であり PH は 5.6～6.5 の値を示す。

GEOLOGICAL MAP OF MEGHALAYA



出典：Department of Mining & Geology, Government of Meghalaya

図 7-7：メガラヤ州の地層分布



出典：JICA 調査団

図 7-8：アッサム州の地層分布

(4) 水文地質的特徴

ドゥブリ県の表層水の分布

ブラマプトラ川の両岸に位置し、北から南に向かっていくつかの支流が流れている。ブラマプトラ川に注ぐ主な支流は、Gadadhar 川、Sankosh 川、Silai 川、Gouranga 川等である。次頁に地図を示す (図 7-9)。

ドゥブリ県の地下水の分布

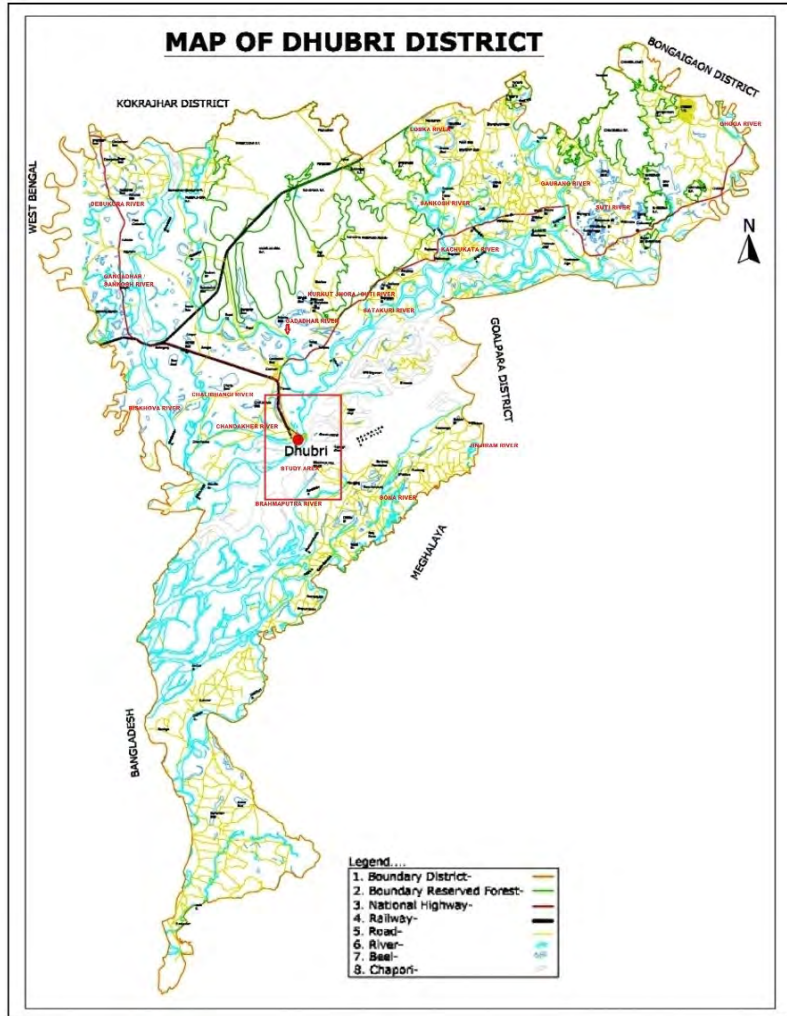
ドゥブリ県には 2 つの地下水系があり、利用可能な地下水量は 2009 年時点で 1635.61 mcm と推定されている。このうち既存の総地下水揚水量は 181.12 mcm であり、11%にあたる。生活及び産業用の将来の供給予定量は 65.35 mcm であり、灌漑用の供給量は 1432.85 mcm である。ドゥブリと南サルマラ・マンカチャルの水文図を次頁に示した (図 7-9)。

南サルマラ・マンカチャル 県—西ガロ・ヒルズ県の表層水の分布

メガラヤ州はその地形のため北部のブラマプトラ系と南部のメグナ/サーマ系の 2 つの流域に分かれている。Tura から西ガロ・ヒルズにかけての流域からは南側のバングラデシュに向かって流れる川と北西のブラマプトラに向かって流れる川がある。これらの川の分布を次々頁に示す (図 7-10)。

南サルマラ・マンカチャル 県—西ガロ・ヒルズ県の地下水の分布

帯水層は砂と砂利の層から成り、地下水までの深さは 0.53 m から 8.3 m である。西ガロ・ヒルズ県の Ichaguri、Borkona、Barengapara、Betasing の周辺で地下帯水層の厚みが最大に達する。県北部では、花崗岩の層が地下 50 m 以下の比較的浅い地点で出現する。南部及び西部では、225 m の深度でも花崗岩の層に到達しない (図 7-10)。



出典：JICA 調査団

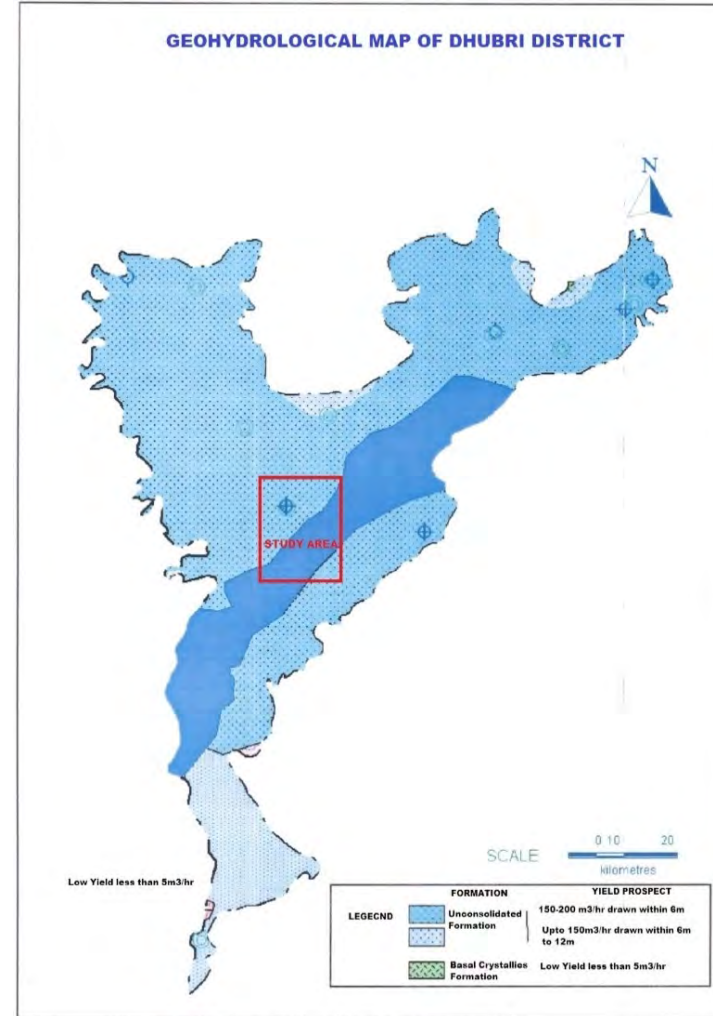
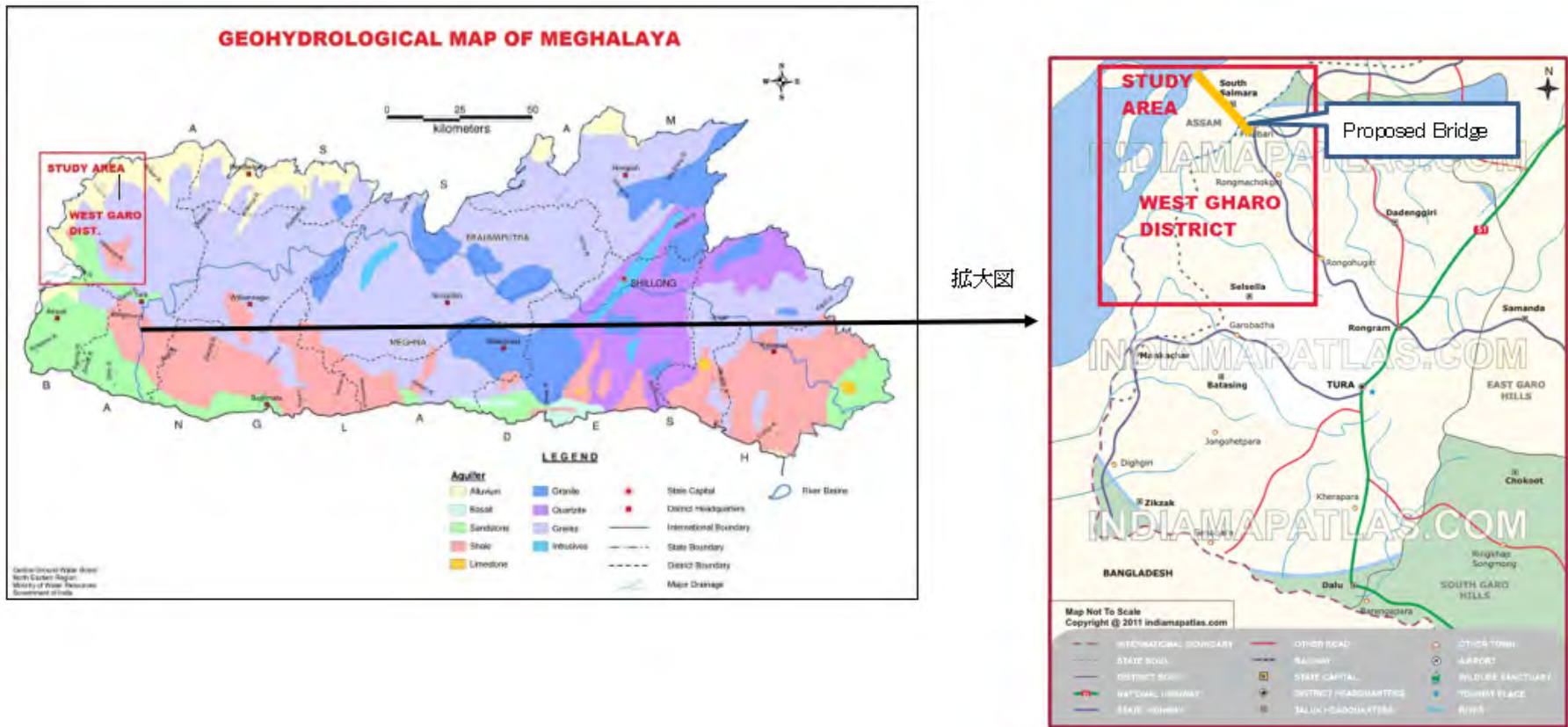


図 7-9：ブラマプトラ川及びアッサム州ドゥブリ県の水文図



出典：JICA 調査団

図 7-10：メガラヤ州西ガロ・ヒルズの水文図

(5) 生態系・希少種等

ドゥブリ県森林局、DPR コンサルタント等へのヒアリングにより、建設予定地周辺に国立公園・自然保護区・保護林等は存在しないことが確認されている。また、対象地域の陸域は主に市街地や農地・放牧地として利用されており、原生な自然環境が残されていないため、希少な生態系や動植物が存在する可能性は極めて低い。しかしながら、ブラマプトラ川は文献によれば希少種であるガンジスカワイルカの生息地となっており、現地調査中にも実際にその存在が数度に亘って目撃された。

ガンジスカワイルカは、クジラ目ハクジラ亜目に属し、淡水域に生息する。国際的には IUCN レッドリストで *Endangered* のカテゴリーに分類され、さらに CITES 付属書 I に記載されている保護生物である。インド国内ではインド野生生物法（1972 年）によって保護種（Schedule I）に指定されている他、インドの象徴として *National Aquatic Animal* に位置づけられている。その生息域はインド、バングラデシュ、ネパール、ブータンの 4 カ国にまたがり、世界中でもガンジス川、ブラマプトラ川、及びその支流（Meghna 川、Karnaphuli 川、Sangu 川等）の限られた地域に生息するのみである。全世界での生息数は 1980 年代には 4000～5000 個体、1990 年代には 2000 個体程度と推定されていたが、2012 年時点で 1200 個体程度と推定されており、減少が著しい。個体数減少の主な原因は、密漁、混獲、過剰漁獲による餌生物の減少、水質汚染、ダム建設等による生息地の分断、土砂流入・採取等による河の地形改変等が挙げられる。

ガンジスカワイルカを含めたブラマプトラ川に生息する水棲生物については特に、今後詳細な調査を行い、プロジェクト実施の影響を慎重に検討する必要がある。

7.3.2 生活環境

(1) 水質

建設予定地周辺は低湿地が多く、また豊富な水量をたたえたブラマプトラ川も流れている。ブラマプトラ川は 2016 年 10 月の現地調査時点では濁度が非常に高かった。インドの他の州でも見られるようにブラマプトラ川には未処理の生活排水が流入しているとともに、川で水浴びをして体を洗ったり洗濯を行ったりしている住民の姿も普通に見られるため、ある程度の人為的な汚染（特に有機物等）は発生していると考えられる。2016 年 3 月に DPR 調査により表層水及び地下水のサンプル採取と分析が行われており、その結果を以下に示す。微生物数が環境基準を超えているが、その他は基準値内に収まっている。

表 7-4 : 水質調査結果

Table 4.7: Showing Test Results of Ground / Surface Water Samples

Sl. No.	Parameter	Unit	CPCB standard for drinking water (desirable limit/ permissible limit)	Chagalchora Bore Well (Ground Water)	Motichora Handpump (Ground Water)	Motichora Brahmaputra (Surface Water)	Savodari Handpump (Ground Water)	Chaitarchar Brahmaputra (Surface Water)
1	Temperature	C	-	22.0	22.6	23.8	23.0	23.0
2	pH value	-	6.5 – 8.5/no relaxation	7.38	7.20	7.56	7.52	7.72
3	Conductivity	µS/cm	-	571.47	593.23	185.09	559.80	182.26
4	Total dissolve solid (TDS)	mg/l	500/2000	371.45	385.60	120.31	363.87	118.26
5	Dissolve Oxygen	mg/l	-	4.3	4.2	6.1	4.8	6.8
6	Turbidity	NTU	5/10	<1.0	<1.0	1.0	<1.0	1.2
7	Salinity	ppt	-	4.8	4	3.8	4	4
8	Alkalinity	mg/l	-	212	221	68	203.90	66
9	Calcium as (CaCO ₃)	mg/l	75/200	162	192.84	50.3	173.60	48.8
10	Magnesium As (CaCO ₃)	mg/l	-	35.6	27.16	16.59	25.40	17.2
11	Total hardness as (CaCO ₃)	mg/l	200/600	197.60	220.0	66.89	199.0	66.0
12	Chloride as (Cl)	mg/l	250/1000	26.80	26.4	0.19	29.70	0.21
13	Iron (as Fe)	mg/l	0.3/1.0	0.238	0.261	0.258	0.252	0.261
14	Manganese (as Mn)	mg/l	0.1/0.3	BDL	BDL	BDL	BDL	BDL
15	Arsenic (as As)	mg/l	0.05/no relaxation	0.02	0.02	<0.01	0.01	<0.01
16	Fluoride (as F)	mg/l	1.0/1.5	0.85	0.98	0.34	0.71	0.38

出典：DPR 調査報告書 (案)

(2) 大気質

DPR 調査により 2016 年 3 月に大気質のサンプル採取及び分析が行われた。その結果は以下のとおりである。いずれの調査地点においても大気質の状態は良好であり、インドの環境基準値以内であった。

表 7-5 : 大気質調査結果

Ambient Air Quality Data March 2016				Location 1 : AQ1 (Village-Chagal Chora)		
S.No	Date	PM2.5, µg/m ³	PM10, µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO, µg/m ³
		Gravimetric	IS:5182:Pt-23	IS:5182:Pt-2	IS:5182:Pt-6	IS:5182:Pt-10
1	01.03.2016	36.5	82.5	9.3	16.8	502
2	05.03.2016	32.3	80.6	8.6	15.9	460
3	09.03.2016	44.9	90.3	10.2	22.2	582
4	13.03.2016	39.8	84.5	9.8	18.9	516
	Min	32.3	80.6	8.6	15.9	460
	Max	44.9	90.3	10.2	22.2	582
	Average	38.4	84.5	9.5	18.5	515.0
	98 Percentile	44.6	90.0	10.2	22.0	578.0
NAAQS, For 24 hourly monitoring (except CO for One hour)		60	100	80	80	4000

Ambient Air Quality Data March 2016				Location 2: AQ2 (Village-Savodari)		
S.No	Date	PM2.5,µg/m3	PM10,µg/m3	SO ₂ µg/m3	NO _x µg/m3	CO, µg/m3
		Gravimetric	IS:5182:Pt-23	IS:5182:Pt-2	IS:5182:Pt-6	IS:5182:Pt-10
1	01.03.2016	22.3	73.3	6.8	12.3	312
2	05.03.2016	24.8	65.7	5.9	12.9	230
3	09.03.2016	23.6	69.8	6.4	14.2	345
4	13.03.2016	26.8	75.9	7.2	13.6	308
	Min	22.3	65.7	5.9	12.3	230
	Max	26.8	75.9	7.2	14.2	345
	Average	24.4	71.2	6.6	13.3	298.8
	98 Percentile	26.7	75.7	7.2	14.2	343.0
NAAQS. For 24 hourly monitoring (except CO for One hour)		60	100	80	80	4000

Ambient Air Quality Data March 2016				Location 3: AQ3(Village-Motichora)		
S.No	Date	PM2.5,µg/m3	PM10,µg/m3	SO ₂ µg/m3	NO ₂ µg/m3	CO, µg/m3
		Gravimetric	IS:5182:Pt-23	IS:5182:Pt-2	IS:5182:Pt-6	IS:5182:Pt-10
1	01.03.2016	37.8	83.7	9.7	17.3	527
2	05.03.2016	30.1	76.1	8.7	15.2	482
3	09.03.2016	41.3	88.6	10.1	20.8	561
4	13.03.2016	33.5	82.6	9.3	16.4	432
	Min	30.1	76.1	8.7	15.2	432
	Max	41.3	88.6	10.1	20.8	561
	Average	35.7	82.8	9.5	17.4	500.5
	98 Percentile	41.1	88.3	10.1	20.6	559.0
NAAQS. For 24 hourly monitoring (except CO for One hour)		60	100	80	80	4000

Ambient Air Quality Data March 2016				Location 4 : AQ4 (Village-Chaitarchar)		
S.No	Date	PM2.5, µg/m3	PM10, µg/m3	SO ₂ µg/m3	NOx µg/m3	CO, µg/m3
		Gravimetric	IS:5182:Pt-23	IS:5182:Pt-2	IS:5182:Pt-6	IS:5182:Pt-10
1	01.03.2016	22.8	56.8	BDL	8.7	220
2	05.03.2016	23.2	60.5	BDL	9.8	283
3	09.03.2016	18.6	54.9	BDL	8.3	212
4	13.03.2016	21.8	58.8	BDL	9.2	249
	Min	18.6	54.9	BDL	8.3	212
	Max	23.2	60.5	BDL	9.8	283
	Average	21.6	57.8	BDL	9.0	241.0
	98 Percentile	23.2	60.4	BDL	9.8	281.0
NAAQS, For 24 hourly monitoring (except CO for One hour)		60	100	80	80	4000

出典：DPR 調査報告書（案）

(3) 騒音・振動

騒音についても、上記 DPR 調査によればインド国内の環境基準以下であり、問題は見られない。振動については、DPR 調査においては未測定である。

表 7-6：騒音調査結果

Location	Eq. Noise levels dB(A), Day.(Leq).	Eq. Noise levels dB(A), Night.(Leq)	National Ambient Air quality standard w.r.t. Noise, 2000 in dB(A) Day. (Leq)	National Ambient Air quality standard w.r.t. Noise, 2000 in dB(A) Night. (Leq)
Chagalchora (Residential)	53.2	38.8	55	45
Motichora (Commercial)	60.2	50.8	65	55
Savodari (Residential)	51.8	40.6	55	45
Chaitarchar (Residential)	48.9	36.7	55	45

出典：DPR 調査報告書（案）

(4) 土壌汚染

DPR 調査により、調査対象地周辺 4 ヶ所で土壌サンプルを採取し分析した結果は以下のとおりである。インド国内では土壌汚染に関する環境基準はない。

表 7-7 : 土壌調査結果

S.No	PARAMETERS	TEST METHOD	UNIT	Chagal chora	Moti chora	Savodari	Chaitarehar
1.	pH(1:5 suspension)	IS:2720(Part-26)	-	7.38	7.21	7.43	7.28
2.	Electrical Conductivity at 25°C (1:5suspension.)	IS:2720(Part-21)	µS/cm	449	458	418	435
3.	Calcium Sulphate	STP/SOIL	mg/kg	BDL	BDL	BDL	BDL
4.	Magnesium(as Mg)	STP/SOIL	mg/kg	145.34	130.7	123.5	139.80
5.	Organic Matter	IS:2720(Part-22)	% by mass	6.28	5.25	4.61	5.65
6.	Potassium(as K)	STP/SOIL	mg/kg	133.15	127.6	123.5	119.83
7.	Water holding Capacity	STP/SOIL	% by mass	34.65	30.6	29.5	31.18
8.	Porosity	STP/SOIL	% by mass	29.40	25.1	23.8	26.46
9.	Sand	STP/SOIL	% by mass	42.40	38.59	43.70	40.16
10.	Clay	STP/SOIL	% by mass	50.32	54.27	46.82	53.32
11.	Silt	STP/SOIL	% by mass	7.28	7.14	9.48	6.52
12.	Sodium Sulphate	STP/SOIL	mg/kg	15.12	14.8	13.24	13.60
13.	Sodium Absorption Ratio	STP/SOIL	-	4.89	4.61	4.03	4.40
14.	Nitrogen	STP/SOIL	% by mass	0.064	0.060	0.051	0.057
15.	Phosphorus	STP/SOIL	mg/kg	23.4	25.4	20.5	21.06
16.	Bulk Density	STP/SOIL	gm /cc	1.32	1.46	1.26	1.18
17.	Texture	STP/SOIL	-	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay
18.	Moisture Retention Capacity	STP/SOIL	% by mass	22.0	20.5	24.6	19.8
19.	Infiltration Rate	STP/SOIL	mm/hr	24.0	26.4	20.3	21.6
20.	Moisture	STP/SOIL	%	16.20	15.64	13.81	14.58
21.	Sulphates	STP/SOIL	mg/1000g	14.24	15.2	13.64	12.81
22.	Sulphur(as S)	STP/SOIL	mg/kg	0.082	0.087	0.077	0.073
23.	Manganese (as Mn)	STP/SOIL	mg/kg	0.052	0.049	0.040	0.046
24.	Iron (as Fe)	STP/SOIL	mg/kg	0.70	0.75	0.67	0.63
25.	Exchangeable Sodium Percentage	STP/SOIL	mg/kg	0.062	0.066	0.051	0.055

出典 : DPR 調査報告書 (案)

7.3.3 社会環境

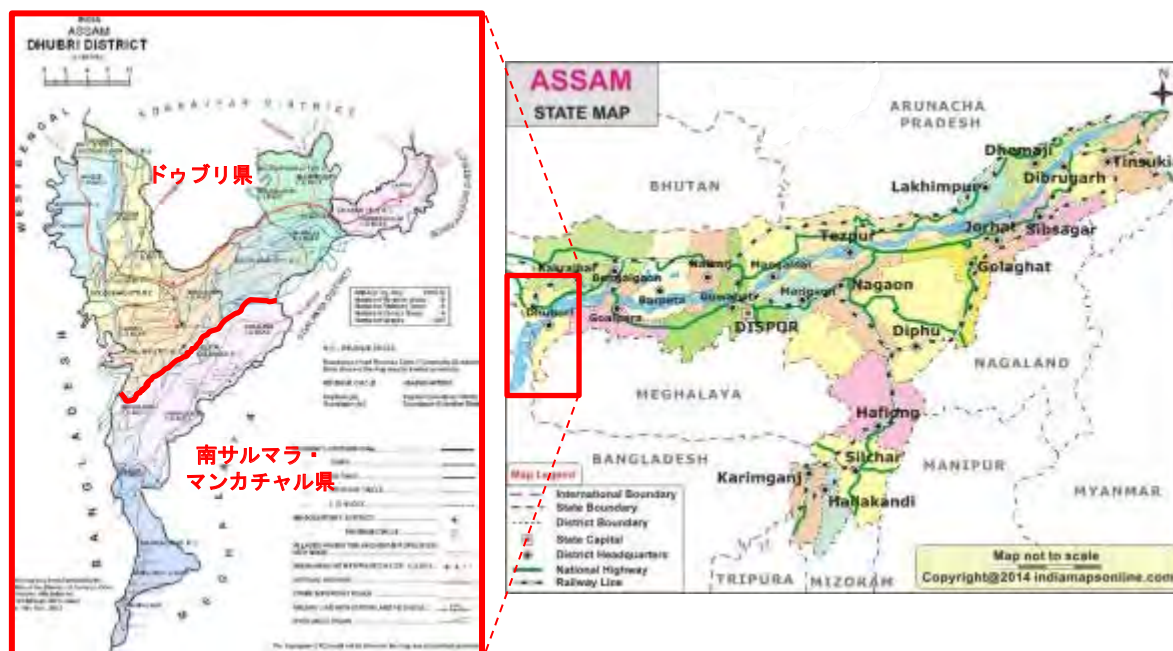
本事業は、アッサム州のドゥブリ県および南サルマラ・マンカチャル県、メガラヤ州の西ガロ・ヒルズ県に位置する。橋梁は、アッサム州ドゥブリ県を起点とし、ブラマプトラ川を西から東に横断して、メガラヤ州西ガロ・ヒルズ県のプルバリを終点とする。ブラマプトラ川には、上流からの土砂等の堆積により、複数の中州 (Char) が形成されており、その中州地域もドゥブリ県および南サルマラ・マンカチャル県に属している。

(1) アッサム州

1) 行政区画

本事業の対象地域となるドゥブリ県および南サルマラ・マンカチャル県は、アッサム州の最西端に位置している。以前は、ドゥブリ県は、ドゥブリ地区、ピラシパラ地区、南サルマラ地区の3地区で構成されていたが、2015年に南サルマラ地区がドゥブリ県から分割される形となり、2016年2月に正式に、南サルマラ・マンカチャル県として行政登録された。この南サルマラ・マンカチャル県は、南サルマラ地区とマンカチャル地区の2区で構成されている。

ドゥブリ県の県都から州都のディスポールまでは、約290 kmの距離がある。また、ブラマプトラ川の反対側に位置する南サルマラ・マンカチャル県の県都ハシンマリから州都までは、メガラヤ州内のルートで約245 kmである。



出典：JICA 調査団

図 7-11：アッサム州地図

2) 人口、面積

ドゥブリ県の面積は 2,176 km²、人口は 1,949,258 人である。人口密度は 896 人/km² であり、アッサム州平均の 398 人/km² と比較すると人口が集中しており、また、2001-2010 年の人口増加率も 24.4% とアッサム州平均の 17.1% を大きく上回る。識字率は 58.3% であり、アッサム州平均 72.2% よりも低い数字となっている。男性の識字率は 63.1%、女性は 53.3% と女性の識字率が低い。

南サルマラ・マンカチャル県の面積は 568 km²、人口は 555,114 人であり、人口密度は 869 人/km² と、ドゥブリ県と同様に人口密度が高い。また、農村部の人口が約 95% を占める。識字率は、39.9% と非常に低い水準である。

アッサム州と対象地域の人口動態を下表に示す。

表 7-8 : アッサム州の人口動態

項目	アッサム州	ドゥブリ県	南サルマラ・マンカチャル県
面積 (km ²)	78,438	2,176	568
人口 (人)	31,205,576	1,949,258	555,114
男女比率 (人) (対男性 1,000)	958	953	—
人口密度 (人/km ²)	398	896	869
人口増加率 (%) (2001-2010)	17.1%	24.4%	—
都市人口 (%)	14.1%	10.5%	4.7%
識字率 (%)	72.2%	58.3%	39.9%

出典 : Census 2011

3) 民族と宗教

アッサム州は、アッサム人、ボド族、アーホーム族が居住しており、州の公用語は、アッサム語とボド語である。また、本事業対象地域では、アッサム語に類似性の高いベンガル語も使用されている。下表に、指定カースト (SC) と指定部族 (ST) の人口および割合を示す。人口割合をみると、ドゥブリ県と南サルマラ・マンカチャル県ともに、SC と ST の割合は、アッサム州平均よりも少ない。また、本調査の結果、本事業の被影響者には、ボド族²⁰を含む指定部族は含まれないことを確認している。

表 7-9 : 指定カーストと指定部族の割合

州/ 県	インド平均	アッサム州	ドゥブリ県	南サルマラ・マンカチャル県
SC 人口 (%)	16.2%	7.2%	3.6%	1.4%
ST 人口 (%)	8.2%	12.5%	0.3%	1.8%

出典 : Census 2011

ドゥブリ県は、ムスリム教徒が多い地域であり、人口の約 80%がムスリム教、ヒンズー教が約 20%を占める。南サルマラ・マンカチャル県も同様に、ムスリム教徒の割合が非常に高い県であり、人口の約 95%がムスリム教、約 5%がヒンズー教である。

4) 経済・産業

アッサム州の 2013-14 年の州内総生産額は 8,854 億ルピー、一人当たり州内純生産額は、50,558 ルピーであり、過去 10 年間の平均成長率は、約 6%である。産業別に見ると、2013-14 年の総生産額比率では、サービス業が約 6 割、農業と工業がそれぞれ約 2 割ずつとなっ

²⁰ 参考情報として、ボド族はインド国憲法別表 6 に登録されている部族であり、チベット・ビルマ語族に起源をもち、自身をボドサ (Bodosa) と称する。ボド族の多くはヒンドゥー教である。ボド族は、政治的独立を求め自治権獲得のための武力闘争を続け、1993 年にアッサム州西部のボドランド自治評議会 (Bodoland Autonomous Council) が発足し、2003 年にはボド領域自治県 (Bodoland Territorial Autonomous District) が発足した。

ている。過去 10 年間の動向を見ると、農業と工業の割合が減少傾向にあり、サービス業の貢献度が高くなっている。各産業の平均成長率は、農業 3.8%、工業 2.8%、サービス業 10.3%であり、サービス業の成長率が顕著である。

表 7-10 : アッサム州における経済動向

	2004-05	2008-09	2013-14	10 年間の平均 年間成長率
州内総生産額 (1 億ルピー)	5,340	6,403	8,854	6.6%
総生産額比率 農業	25.6%	23.4%	21.3%	3.8%
工業	27.5%	25.9%	21.3%	2.8%
サービス業	46.9%	58.1%	57.5%	10.3%

注：実質 GDP ベース (Constant Price 2004-05)
 出典：Planning Commission, Government of India

労働人口の構成で見ると、ドゥブリ県における、労働人口に占める農業関連従事者は 56.2%と過半数を占め、そのうち土地を持たない農業労働者は、25.6%となっている。また、対象地域では、稲作、豆類、野菜類を栽培しており、特に中州地域では、ジュート等の栽培も多い。その他、同地域では、家畜や漁業、ボート業も収入源となっている。

表 7-11 : アッサム州における労働従事者の割合

	アッサム州	ドゥブリ県
労働人口の割合	38.4%	34.4%
耕作者	33.9%	30.7%
農業労働者	15.4%	25.6%
家庭内労働者	4.1%	4.2%
その他労働者	46.6%	39.7%

出典：Directorate of Census Operations Assam, 2011

5) 中州地域

アッサム州を流れるブラマプトラ川は、河川の上流からの土砂が堆積して形成される、中州 (Char) が特徴的である。地理的にはアッサム州の 14 県に広がっており、本事業の対象地の大部分は、この中州地域に該当する。

中州の地形は、幾年にも渡り、浸食と堆積を繰り返して変化してきており、また雨季 (5~10 月) と乾季 (11~4 月) の水位変動によって、1 年のうちでも面積が大きく変化する。中州地域の住民の起源は、イギリス植民地時代に遡り、旧東ベンガル (現バングラデシュ) からの農作移住者であり、このような地形や環境の変化の中で生活している。中州地域の住民は、バングラデシュからの移民であることから、住民の大部分がイスラム教徒である。

中州地域のみを対象とした正式な調査は、1992-93 年と 2003-04 年²¹に実施されているのみである。2003-04 年の調査では、中州地域全域の人口は、2,490,097 人と報告されており、

²¹ Socio-Economic Survey Report, 2003-04, Directorate of Char Areas Development, Govt. of Assam.

そのうち、ドゥブリ県と南サルマラ・マンカチャル県（以前のドゥブリ県）の人口は、約69万人となっている。また、人口増加率および貧困率が高く、識字率が低いという、州内で最も後進地域の特徴を示している。さらに、2003-04年時点では、貧困ライン以下の世帯数が69%、識字率が14.6%となっており、何れも10年前よりも状況が悪化しているという統計結果となっている。

表 7-12：ドゥブリ県・南サルマラ・マンカチャル県の中州地域の人口

年	人口	人口増加率 (10年間)	世帯数	貧困ライン以下の 世帯割合	識字率
1992-93	233,206	—	—	54.2%	19.1%
2003-04	689,909	51.1%	109,748	69.0%	14.6%

出典：Socio-Economic Survey Report, 2003-04, Directorate of Char Areas Development, Govt. of Assam

現地調査では、中州の一部の地域は、土地区画が設定されており私有地も存在することを確認しているが、中州の住民は、必要に応じて居住地を移動する必要があるため、多くが移設可能な家屋に居住している。また、雨季に水没する場所に居住している住民は、雨季には近隣の場所や別の中州に移動し、一部は乾季に元の場所に戻り、一部は移動先に継続して居住している状況である。



移動可能な住居



河川の浸食

中州地域におけるインフラ整備状況は、一部の地域では飲料水用にハンドポンプが導入されているが、河川を水源としている地域もある。また、電力や下水は整備されていない。学校施設は、小・中学校レベルは大部分の村に設置されているが、高等学校以上はドゥブリおよびプルバリ側まで行く必要がある。医療施設は、一部の村落に保健センターがあるものの、医者は駐在ではなく訪問医である等、基本的な生活インフラおよび施設は、極めて限定的である。



ハンドポンプ

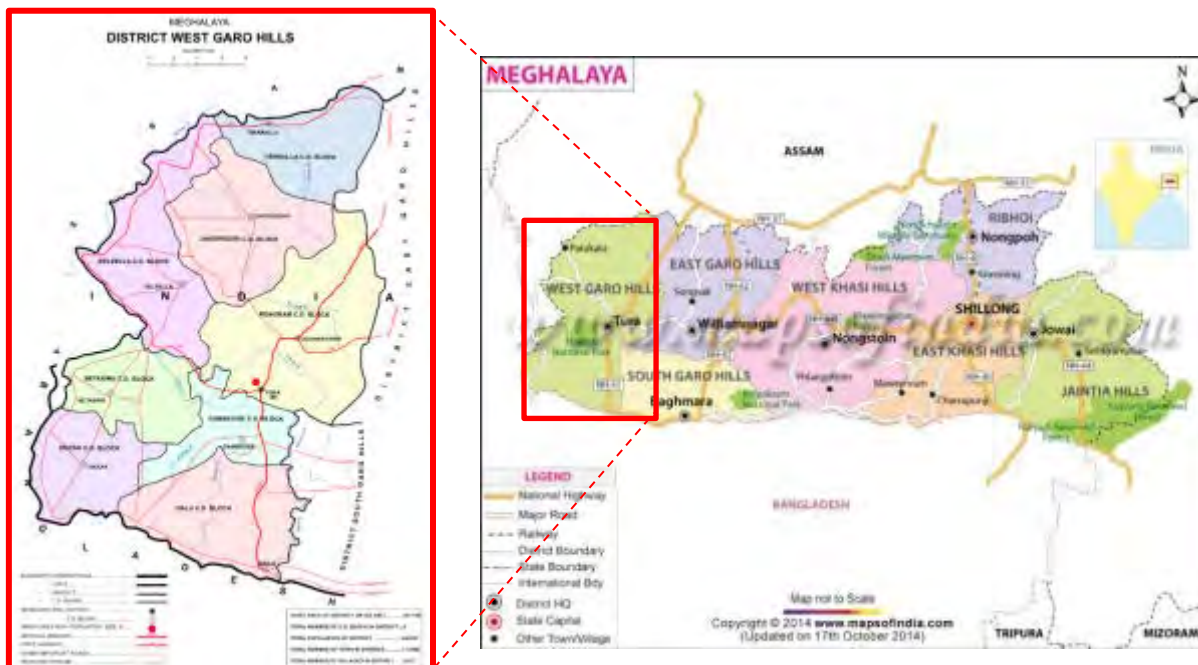


中州内の小学校

(2) メガラヤ州

1) 位置、行政地区

メガラヤ州は、1970年以前はアッサム州の一部であった。1970年4月にメガラヤ州が自治州として創設され、1972年1月に完全な州の地位を得た。メガラヤ州は、北側にアッサム州、南側と西側をバングラデシュ国に接する。また、行政区画は、11つの県に分割されている。本事業の対象地となる西ガロ・ヒルズ県は、メガラヤ州の西部に位置し、県都のトゥラは、州内第2の人口を有する都市である。橋梁の終点となるプルバリ村は、西ガロ・ヒルズ県の最北端に位置しており、トゥラから約80kmの距離にあるが、道路の整備状況が悪く、所要時間は3-4時間である。



出典：JICA 調査団

図 7-12：西ガロ・ヒルズ県の地図

2) 人口動態

西ガロ・ヒルズ県の面積は 1,650 km² (メガラヤ州の 7.4%) であり、人口は約 64 万人とメガラヤ州の約 2 割を占める。2001-2010 年の人口増加率は 26.7%と、メガラヤ州全体平均 (28.0%) よりも多少低い。また、農村部の人口が約 9 割を占める。西ガロ・ヒルズ県の識字率は、67.6%であり、メガラヤ州の 74.4%と比較すると低い水準である。

メガラヤ州および西ガロ・ヒルズ県の人口動態を下表に示す。

表 7-13 : メガラヤ州の人口動態

項目	メガラヤ州	西ガロ・ヒルズ県
面積 (km ²)	22,429	1,650
人口 (人)	2,966,889	642,923
人口増加率 (%) 2001-2010	28.0%	26.7%
人口密度 (人/km ²)	132	173
都市人口 (%)	20.0%	11.6%
識字率 (%)	74.4%	67.6%

出典 : Census 2011

3) 民族と宗教

メガラヤ州の主要民族は、カシ族、ガロ族、ジャインティア族であり、それぞれ異なる丘陵地帯に居住している。メガラヤ州の公用語は、カシ語、ガロ語、英語となっている。本事業の周辺地域の丘陵部にはガロ族が多く分布している。しかし、橋梁の終点となるプルバリ村は、アッサム州との境界であるため、特にブラマプトラ川周辺の平野部では、ムスリム人が居住している。そのため、プルバリ村の使用言語は、ベンガル語が主要言語となっている。

メガラヤ州は、北東州地域に特徴的な、ST が多い州であり、ST 人口は 86.2%を占める。反対に、SC 人口は 0.6%と極めて少数である。西ガロ・ヒルズ県を見ると、ST 人口は 73.7%を占め、そのうち 71.2%がガロ族²²である。ただし、本事業の対象地は、上述したように平野部となるため、被影響者には、ガロ族は含まれない。

表 7-14 : 指定カーストと指定部族の人口割合

	インド平均	メガラヤ州	西ガロ・ヒルズ県
指定カースト (SC)	16.2%	0.6%	1.4%
特定部族 (ST)	8.2%	86.2%	73.7%

出典 : Census 2011

²² 参考情報として、ガロ族はチベット・ビルマ語族に起源をもち、自身をアチック族 (A'chik) またはマンデ族 (Mande) と称する。ガロ族は女系社会であり、土地は女性のみを通じて相続される。伝統的なガロ族の宗教は超自然的な精霊のミテ (mite) に対する信仰に根差し、この精霊は森の中に住んでおり、病気を起こすと信じられている。また、作物の成長を見守る神の存在が信じられている。現在ではガロ族の多くがキリスト教に改宗している。

メガラヤ州の宗教は、イギリスの植民地支配下でキリスト教が布教されたため、州の過半数がキリスト教を信仰している。西ガロ・ヒルズ県においても、人口の 61%がキリスト教、19%がヒンズー教、17%がムスリム教、その他が 4%を占める。

4) 経済・産業

メガラヤ州の 2013-14 年の州内総生産額は 656 億ルピーであり、過去 10 年間の平均成長率は、10.5%となっている。産業別に見ると、2013-14 年の総生産額比率では、サービス業が 54.1%、工業が 31.4%、農業が 14.6%を占める。過去 10 年間の動向は、農業の割合が減少傾向にあり、サービス業および工業の割合が高くなってきている。

表 7-15 : メガラヤ州における経済動向

	2004-05	2008-09	2013-14	10 年間の平均成長率
州内総生産額 (1 億ルピー)	656	900	1,347	10.5%
総生産額比率 農業	23.3%	18.6%	14.6%	2.9%
工業	26.1%	30.1%	31.4%	14.6%
サービス業	50.6%	55.6%	54.1%	11.9%

注：実質 GDP ベース (Constant Price 2004-05)
 出典：Planning Commission, Government of India

労働人口の構成で見ると、西ガロ・ヒルズ県の労働人口の割合は約 4 割であり、メガラヤ州平均値とほぼ同様の割合となっている。労働者の 62.8%が農業関連に従事している。西ガロ・ヒルズ県の農業は稲作中心であり、酪農が農家の二次的職業として営まれている。

表 7-16 : メガラヤ州における労働従事者の割合

	メガラヤ州	西ガロ・ヒルズ県
労働人口の割合	40.0%	39.8%
耕作者	41.7%	47.2%
農業労働者	16.7%	15.5%
家庭内労働者	1.7%	3.0%
その他労働者	39.8%	34.3%

出典：Directorate of Census Operations Meghalya, 2011

特に、本事業対象地は、地理的にもメガラヤ州の最北西に位置し、主要都市からも離れていることから、交通インフラ整備が遅れ、経済活動も乏しく、経済発展が遅れている地域である。

7.4 インド政府の法的な枠組み

7.4.1 本プロジェクトにおける主要な法令

インド政府の環境法に関する枠組みは、1986 年制定の環境保護法が基本となっている。環境・森林・気候変動省 (MOEFCC) はこの法規に係る持続する開発、森林保護、各種法令に係る通知書や改訂、環境汚染防止等すべての運用責任を担っている。環境・森林・気

候変動省（MOEFCC）は新しい法令の発布などを必要に応じて実施し、インド国内の環境保護に努めている。付属する中央汚染管理局（CPCB）および各州にて同様の機能を果たす各州汚染管理局が汚染管理の任に当たっている。また、当プロジェクトの環境関連法令の運用はメガラヤ州環境森林局がその任に当たっている。

(1) 1986年制定の環境保護法

1986年制定の環境保護法はインド国内における自然環境保護関連法をすべて包含する法令である。この法令を運用することで、インド政府は環境保護に関するすべての政策を実施し、国内の自然環境を質的にも量的にもより良く発展させるための各種政策を実施し、環境汚染を防止、管理、低減させるすべての責任を負っている。

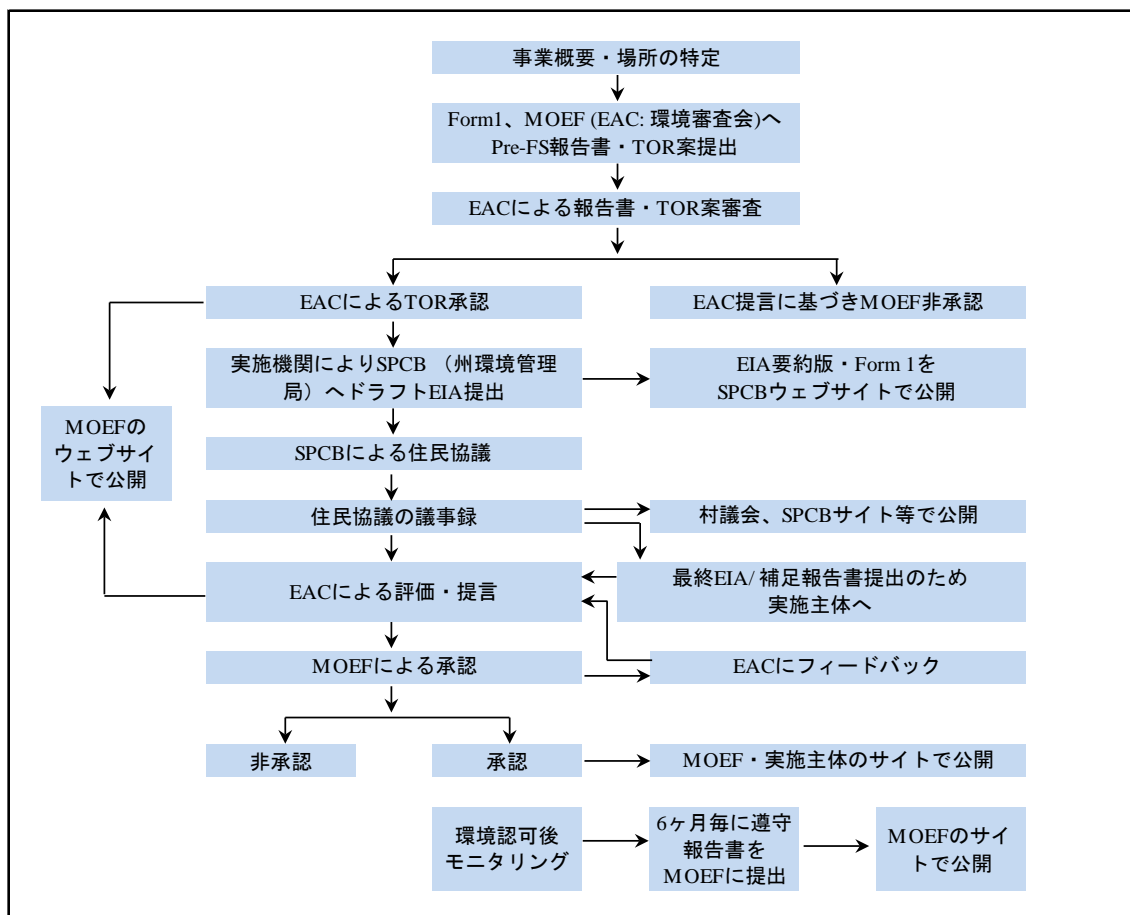
また、1986年に環境保護法と同時に制定された「環境（保護）規定1986」に則って環境政策を実施するために、環境汚染物質（付嘱書I-IV）の排出基準が定められている。

インド政府は各州における環境保護法の運用をそれぞれの州政府に付託しており、環境保護法の第5項を適用して当該法規の運用を各州政府に委任している。このためインド政府の環境保護法は、当プロジェクト実施に伴って、メガラヤ州政府の監督下で適用されることになっている。

(2) 開発プロジェクトに係るEIA実施通知書

1986年制定の環境保護法は2006年、2009年、2102年、2014年に改訂されている。これら一連の改訂により、中央政府または州政府が1ヵ月に1度の専門委員会を招集して、各プロジェクトに関するスコーピング・EIA結果の審査・勧告等の任に当たることが定められている。

インド国内で実施される国家レベルの経済開発プロジェクトや個々の産業セクターにとって重要なプロジェクトについては、森林環境省の通達によるセクター別のEIAガイドラインに基づいてEIAを実施することが定められているほか、環境管理計画や環境モニタリング計画についても実施が義務づけられている。その一方で、EIAが不要なプロジェクトについても各種の通知書や規則によって規定されるケースもある。



出典：JICA 調査団

図 7-13 : EIA に係る環境認可手続き

(3) 1972年制定の野生動物保護法

野生動物保護法は制定以来、1982年、1986年、1991年、1993年、2002年、2006年及び2013年に改定されている。国内の野生動物を保護するために、細部にわたった保護策を打ち出しており、野生動物や野生動物で作られた製品の取引の規制、密猟に対する罰則規定などが、改定の度に定められている。保護区 (protected area) はこの法律に基づいて指定され、インド国内のレッドリストに該当する同法別表 I~IV に規定する保護種の狩猟や捕獲は禁止されている。さらに、この法律に基づき、中央レベルではインド野生生物評議会 (Indian Board for Wildlife)、州レベルでは州野生生物評議会 (State Boards for Wildlife) が法的諮問機関として設置されている。これらの機関は野生生物の保全に関する政策や保護区の設置・解除、その他野生生物保全に係る全般的な事柄について政府に勧告・助言を行っている。

(4) 生物多様性法

生物多様性法は、遺伝資源の保全と利用・利益の配分に関して定めた法であり、この法に基づいて各州ごとに生物多様性評議会 (Biodiversity Board) が設置されている。同評議

会の主な機能は、生物多様性保全に関する課題について州政府に適切な助言をすることである。また生物多様性遺産地域（Biodiversity Heritage Site）の設置も規定されている。

生物多様性保全に関する国家政策としては、2008年に国家生物多様性行動計画が策定され、生物多様性の保全、その持続的利用、生物多様性の利用から生じる利益の平等な配分、保護区ネットワークの拡張、種の保全に着目した保護区の設立等の内容が盛り込まれている。さらに外来種の導入の規制と外来種の撲滅や、経済開発において生物多様性に関する懸念事項に配慮することを求めている。

また、アッサム州では2004年に州の森林政策を策定しており、その中では森林の保全・回復に加えて生物多様性の保全のための施策として保護区ネットワークの強化、湿地の保全、野生生物の生息地の保全、調査研究の促進等が掲げられている。

(5) 1980年制定の森林保護法

1980年に制定された森林保護法は1988年に改訂され、森林地域の他の目的での利用に関する細則が定められている。また、道路際に植えられている樹木の伐採の禁止やプランテーション地域内における樹木の伐採についての規定が、1988年の改訂で厳しくなっている。樹木伐採の対象となる地域の広さおよび森林の密度（単位面積当たりの樹冠面積）によって、中央政府または州政府に、下記の通り樹木伐採許可の申請をしなければならない。

- a. 伐採対象となる森林の面積が20 ha以上または丘陵地域においては10 ha以上の場合には、森林の密度や伐採対象の樹種などを州政府森林局が調査の上、MOEFCCの許可を受けなければならない
- b. 森林の密度が40%を超える場合には、森林地域内で実施される如何なる作業もMOEFCCの許可を受けなければならない
- c. 伐採対象となる森林の面積が5-20 haの場合には、その州が属する地域（数州によって構成される）の森林保護局長の許可が必要である。
- d. 伐採対象となる森林の面積が5 ha以下の場合には、州政府森林局の許可が必要となる。

(6) 1974年制定の水質汚染防止法

1974年制定の水質汚染防止法により、中央レベルの汚染管理局及び州レベルの汚染管理局が制定された。これにより、地下水や河川水の水質の汚染防止政策が実施されるようになり、水質モニタリング、汚染源の特定と罰が規定されている。また、建設工事における地下水や河川水の使用等に関する許可申請なども規定されている。

(7) 1981年制定の大気汚染防止法

中央汚染管理局および各州の汚染管理局は大気質基準を設定して、大気質のモニタリングや汚染者に対する罰則を科すことができる。また、1939年に制定された自動車法では個々の自動車が排出基準を遵守するよう自動車の所有者を指導する権限があると定められている。

(8) 1988年制定の自動車法

自動車法は車両による大気汚染を防止するために、各州の運輸局に個々の車両所有者に対して排出基準を遵守させる権限を与えている。また、登録されている車両に対して排出基準が守られているかどうかをチェックする権限のほか、道路税の徴収や車両の登録をする権限も備わっている。1997年8月には汚染管理証（Pollution under Control Certificate : PUC）を発行する制度が発足し、車両による汚染源をインド全体として CPCB および各州の SPCB が排出基準を遵守するよう、厳しく規制している。メガラヤ州運輸局では、車輛検査係を配して車輛点検を実施し、点検後は車輛税を支払う。車輛税が支払われなければ車輛の登録を停止する。商用目的の車輛では特に厳しく取り締まっている。

(9) 2013年制定の用地取得・生計再建移転権利法

1894年にイギリスが制定した用地取得法はこれまでにかなりの回数の改訂が実施されているが、2013年に制定された「用地取得、生計の再建及び移転に係る透明性ある公正な補償を受け取る権利法（LARR 2013）」が1894年制定の用地取得法に取って代わった。LARR 2013はインド政府が各種のプロジェクトを実施するため必要な用地取得の概念を変え、伝統的には認められていなかった再取得価格の支払いが実施されるようになっている。LARR 2013は州によって運用を拒否しているケースがあるが、メガラヤ州は2014年1月1日以来、LARR 2013を運用している。

7.4.2 JICA/WB/ADB ガイドラインとインドの EIA 法制の比較検討

JICA ガイドラインおよび世界銀行並びにアジア開発銀行の環境調査マニュアルの内容については、インド政府の環境関連法と比較検討し、ガイドライン運用上の差異がないかどうか、差異があればどのように差を埋めるかについて検討した。比較検討すべきインド政府の環境関連法の主なものは以下の通りである。

- 「特定されたインフラストラクチュア・プロジェクトにおける環境ガイドライン（Environmental Guidelines for Selected Infrastructure Projects）」
- 「プロジェクト調査の業務指示書（Project Terms of Reference）」
- 「道路・鉄道・高速道路プロジェクトの環境ガイドライン（Environmental guidelines for Road/Rail/Highway Projects、インド政府 1989）」
- 「環境手続きとガイドラインに係るハンドブック（Handbook of environmental procedures and guidelines、インド政府、1994）」
- 「高速道路プロジェクトにおける EIA マニュアル（Guidelines for Environmental Impact Assessment of Highway Projects (IRC: 104-1988)）」
- 「環境（保護）法（The Environmental (Protection) Act, 1986 and EIA Notification [14/09/2006]）」および以下の EIA Notification を参照した

S.O.695, [4/04/2011] - Amendment to EIA Notification, 2006,
S.O.156, [25/01/2012] - Amendment to EIA Notification, 2006,
S.O.945, [11/06/2007] - Environmental Impact Assessment Notification-2007,
S.O.948, [12/06/2007] - Environmental Impact Assessment Notification-2007,
S.O.1105, [4/07/2007] - Environmental Impact Assessment Notification-2007,
S.O.1134, [12/07/2007] - Environmental Impact Assessment Notification-2007,
S.O.1203, [23/07/2007] - Environmental Impact Assessment Notification-2007,
S.O.1735, [11/10/2007] - Environmental Impact Assessment Notification-2007,
S.O.1736, [11/10/2007] - Environmental Impact Assessment Notification-2007,
S.O.1737, [11/10/2007] - Environmental Impact Assessment Notification-2007,
S.O.2674, [17/11/2008] - Environmental Impact Assessment Notification-2008,
S.O.2244, [22/11/2008] - Environmental Impact Assessment Notification-2008,
S.O.195, [19/01/2009] - Environmental Impact Assessment Notification-2009,
S.O.3067, [01/12/2009] - Environmental Impact Assessment Notification-2009 及び
S.O.1850

上記インド政府の環境関連法について、以下のような視点から JICA/WB/ADB の各ガイドラインと比較検討した。

- 本件調査対象地域における気象、地形学的な特徴、自然排水系、地質、植物、動物、周辺大気の質、水質並びに騒音及び社会経済環境
- 各種報告書のレビュー、法令並びにガイドラインの内容が中央及びメガラヤ州におけるプロジェクト関係機関との協議を通じてどのような差異があるのか
- 情報開示時の協議および住民移転に係る協議開催のプロセスにおける、プロジェクトの最終設計に関連する情報開示と住民からの意見を吸い上げるプロセスに係る差異について
- 大気質、水質、土壌および騒音に関する考え方の差異について
- 重大な影響が惹起される可能性について分析・評価し、影響軽減策の策定について適切なプロセスを経ているかどうか
- 現地における自然環境および社会経済環境のあり方の相違
- 大気、水質、土壌、騒音に係る試験方法やモニタリング方法の決定プロセス
- 二次資料の収集方法について
- 資料の特定、編集、分析および報告書への反映について

EIA 手続きにおける JICA ガイドラインとインド国法制度の比較を表 7-17 に示す。

表 7-17 : EIA 手続きにおける JICA ガイドラインとインド国法制度の比較

No.	項目	JICA ガイドライン	インド国関連法令	対応案
1	EIA の要否	<p><u>EIA レベルでの環境社会配慮調査を要するプロジェクト (カテゴリーA)</u> 環境や社会への重大で望ましくない影響のある可能性を持つようなプロジェクト。影響を及ぼしやすいセクター (道路、鉄道、橋梁等) のプロジェクト、影響を及ぼしやすい特性 (大規模非自発的住民移転等) を持つプロジェクト、影響を受けやすい地域あるいはその近傍に立地するプロジェクト。</p> <p><u>IEE レベルでの環境社会配慮調査を要するプロジェクト (カテゴリーB)</u> 環境や社会への望ましくない影響が、カテゴリーA に比して小さいと考えられる協力事業</p>	<p><u>EIA を要するプロジェクト (カテゴリーA)</u> i) 国道 (National Highway) の新設 ii) 100 km 以上の既存国道の拡張で、現道に追加で幅 40 m 以上の ROW の用地取得もしくは、幅 60 m 以上の Re-alignment もしくはバイパス建設を行う場合。</p> <p><u>State level Environment Impact Assessment Authority が EIA の要否を判断するプロジェクト (カテゴリーB)</u> i) 州道 (State Highway) ii) 海拔 1,000 m 以上の地域、および希少な生態系がある地域で実施される州道の拡幅、延長</p>	<p>本事業は、インド国関連法では EIA の実施は義務付けられていないが、大規模非自発的住民移転を伴うため、JICA ガイドライン上ではカテゴリーA として扱い、EIA を作成する。</p>
2	調査・検討すべき影響の範囲	プロジェクトの直接的、即時的な影響のみならず、派生的・二次的な影響、累積的影響、不可分一体の事業の影響も含む。また、自然環境のみでなく社会配慮の影響も含む。	累積的影響を及ぼす可能性のある要因を特定する。植物相については間接的影響の有無についても検討する。	派生的・二次的な影響、累積的影響、不可分一体の事業の影響も含んで検討する。
3	ステークホルダー・住民協議	スコーピング案、報告書案の段階でそれぞれステークホルダー協議を行う	報告書案が提出された段階で住民協議を行う。	スコーピング案、報告書案の段階でそれぞれステークホルダー協議を行う
4	EIA の情報公開	プロジェクトが実施される国において公開されており、地域住民等のステークホルダーがいつでも閲覧可能であり、また、コピーの取得が認められていることが要求される。	MoEFCC はウェブサイトにてドラフト EIA を公開し、全文を本省で公開する。	国内法上の義務はないが、JICA ガイドラインに沿って EIA 報告書を実施機関が公開する。

No.	項目	JICA ガイドライン	インド国関連法令	対応案
5	環境や社会面に関する許認可	環境アセスメント以外の環境や社会面に関する許認可が必要な場合、その許認可名を記載し、取得を確認する	森林伐採、建設機材据え付け、石切り場の開発、有毒危険物取り扱い、及び個々の建設機械据え置き用地の取得については施工業者が主体となって許認可を取得する。取得状況は施工業者がNHIDCLに報告する義務がある。	現地法に則った許認可の取得の必要性を確認する
6	モニタリング	プロジェクトの実施期間中において、予測が困難であった事態の有無や、事前に計画された緩和策の実施状況及び効果等を把握し、適切な対策をとる。十分なモニタリングが不可欠である場合は、プロジェクト計画にモニタリング計画が含まれていること、及びその計画の実行可能性を確保する。モニタリング結果を、現地ステークホルダーに公表するよう努める。	事業実施主体は環境管理計画およびモニタリング・プログラムを提出する。 事業実施主体は半年に1度、事前に取得した環境許認可の履行状況を報告書として提出し、公開する。	現地制度に則った環境モニタリングを実施する。

出典：JICA 調査団

7.4.3 中央レベルのプロジェクト関連組織

(1) インド国道庁 (NHAI) 及び国道インフラ開発公社 (NHIDCL)

インド道路機構 (NHAI) は 1988 年に制定されたインド道路機構法によって創設された組織である。インド国内の国道網を整備・維持・運営する目的で創設され、1995 年に独立法人となって、現在はインド国内の 70,934 km に登る国道や高速道路を管轄している。

ドゥブリ橋の建設計画は道路運輸省が所有する会社である「道路インフラ開発公社 (National Highway Infrastructure Development Corporation Limited : NHIDCL)」が実施する。道路インフラ開発公社 (NHIDCL) は北東州内および国境を越える道路の開発を促進するために 2015 年 1 月 1 日に創設された。ドゥブリ橋の建設計画の実施に係る基本的な責任は NHIDCL にあるが、上記のように様々な組織が道路建設プロジェクト実施に関わっている。

インド国道庁 (NHAI) とその地域事務所 (Regional Offices : RO) は道路運輸省の下部機関として道路インフラ建設プロジェクトの計画機関として機能しているほか、国境道路局 (Border Roads Organization : BRO) が国境道路開発機構 (Border Roads Development Board : BRDB) の下部機関としてドゥブリ橋の建設計画に関わっている。

ドゥブリ橋の整備は NHIDCL が計画・立案した。NHIDCL の主な機能は、北東州における国境を越える道路を含む北東州全域における道路の計画、立案、測量、設計、建設及び維持運営等の道路全般に関する品質改良に係る整備促進である。このほか、道路網の連繋と貿易に資する機能の向上を目指しており、北東州ならびに西ベンガル州の北部地域における約 500 km の道路整備を手掛けている。

(2) 環境・森林・気候変動省 (MOEFCC)

環境・森林・気候変動省はインド国内の環境保護を目的として 1985 年に創設された、国内の自然環境および森林の保護や維持管理に関する全般的な計画立案、促進、管理をする環境保護の最高機関である。EIA 調査の審査、持続する生物の多様性の発展的な維持管理計画や汚染防止対策の責任機関でもある。2016 年 10 月 2 日に気候変動に関するパリ協定を正式に批准した。

本件においては森林の伐採面積が規定を超える場合には、メガラヤ州森林局の調査内容を踏まえて、森林伐採の許認可することになっている。

(3) 中央汚染管理局 (CPCB)

MOEFCC の下部機関で、主に下記のような汚染防止対策の権威である。

- a. 水質および大気質に関する管理計画の立案と実施
- b. インド政府に対して水質と大気質管理計画を答申
- c. 水質と大気の基準設定
- d. 国内各州の汚染管理局との連繋

CPCB の本件に関する役割は、メガラヤ州汚染管理局 (MSPCB) との連繋を通じて、排出基準等に関する助言をするのみである。

7.4.4 州レベルのプロジェクト関連組織

(1) 公共事業局 (PWD)

メガラヤ州公共事業局 (PWD) は、州内全般のインフラはもとより政府所管の建造物に関する計画、立案、設計、建設工事実施、維持、管理の全てを管轄している。メガラヤ州公共事業局 (PWD) が計画立案から維持管理までを管轄する建造物には、道路、橋梁、都市の中核地域、空港、病院、学校、警察、刑務所、裁判所など多岐にわたっている。

(2) 環境・森林・気候変動省地方事務所 (MOEFCC-RO)

MOEFCC はメガラヤ州を含む北東州に地方事務所を設置している。メガラヤ州の MOEFCC-RO はシロン市内にあり、中央レベルの MOEFCC に提出する必要のない EIA の審査や汚染防止対策、州内の自然保護地域の保護指導キャンペーン実施や維持管理を実施する。

後述するように、メガラヤ州政府環境森林局は当プロジェクトの森林伐採許可申請に伴い、MOEFCC-RO の意見を聴取して、最終的に森林伐採許可申請を MOEFCC に提出する。

(3) 州汚染管理局

アッサム州及びメガラヤ州の各汚染管理局は、主に水質と大気質の監視を実施するほか、州内の環境管理・モニタリングを管轄する。国レベルで定められている大気及び水質汚染の基準の遵守状況を監視し、州政府への大気及び水質汚染や工業廃棄物に関する報告、その他汚染防止に関する法令の遵守を監視する役目を担っている。本件事業における直接的な関与はない。

しかしながら、州汚染管理局は環境汚染並びに公害対策や本件事業に関する EIA 調査報告書を一般に公開し、調査内容に関する公聴会を開催する権限を有する。その結果は州政府並びに環境・森林・気候変動省地方事務所 (MOEFCC-RO) へ報告すると共に、本件事業の EIA 調査報告書の審査内容に応じて、環境への汚染が認められなければ環境許可 (No-objection Certificates : NOC) を発行する権限を有する。

(4) 州森林局

アッサム州及びメガラヤ州の森林局は、州政府が作成する森林活動計画 (Forest Working Plan) に従って州内の森林保護や森林保護区・保存区・生産林地域の維持管理を実施している。また、各種プロジェクトによって必要とされている森林地域における樹木の伐採に関する許認可を 1980 年制定の森林保護法の規定に従って実施する。本プロジェクト対象地の周辺においては、ドゥブリ、プルバリ、コクラジャール等に森林管理官事務所が置かれている。

本件に際しては森林の伐採は発生しない見込みであるため、直接的な関与は予定されていないが、もし森林伐採が発生する場合は、州森林局の許認可を得る必要がある。

7.4.5 その他の環境クリアランス

本件の実施に伴って、以下のような環境許認可を取得しなければならない。

- a. 施工業者はホット・ミックス・プラントやバッチャー・プラントを設置する場合には、大気汚染防止法や水質汚染防止法に則った環境クリアランスをアッサム州及びメガラヤ州政府から取得しなければならない
- b. アッサム州及びメガラヤ州鉱山局から施工用骨材取得のための石切り場開発等の環境クリアランスを取得しなければならない。
- c. 建設期間中に地下水を汲み上げるための井戸を掘削する場合にはアッサム州及びメガラヤ州地下水保護局から許可を取得しなければならない。
- d. 1948 年に制定された工場法、1988 年制定の労働法、1996 年制定の建設労務者採用法に定められた労働衛生と労務者の健康維持管理に関する規定を遵守しなければならない。

- e. 1989年に制定された有害廃棄物処理規則及び1996年制定の化学事故管理規則に定められてるように、建設中に有害物質取り扱う場合には、アッサム州及びメガラヤ州汚染管理局への届出が必要となる。

主な環境許認可を含む各種環境許認可の本件における必要性については下表に示した。

表 7-18 : 適用される環境クリアランス

No.	Activity	Statute	Requirement	Competent Authority	Responsible Agency for Obtaining Clearance	Time Required
Pre-Construction Stage (Responsibility: MORTH)						
1	Road-side tree cutting and clearing forest	Forest Conservation Act 1980 & MOEF Letter Dt. 18.02.1998	Permission for Road-side tree cutting	State and Central Government	MORTH	2-3 months
2	Filling of Roadside water bodies (ponds and borrow pits)	State Fisheries Policy Draft Wetlands (Conservation & Management) Rules, 2008	Permission for filling of water bodies	State Irrigation Department & State Fisheries Department State Wetlands Conservation Committee	MORTH	2-3 months
Construction Stage (Responsibility: Contractor)						
1	Establishing stone crusher, hot mix plant, wet mix plant and Diesel Generator Sets	Water Act of 1974, Air Act of 1981, Noise Rules of 2000 and Environmental Protection Act of 1986 and as Amended	Consent-forest abolishment	States Pollution Control Boards for respective section	The Contractor	4-6 months
2	Operating stone crusher, hot mix plant, wet mix plant and Diesel Generator Sets	Water Act of 1974, Air Act of 1981, Noise Rules of 2000 and Environmental Protection Act of 1986 and as Amended	Consent-for operation	States Pollution Control Boards for respective section	The Contractor	4-6 months
3	Use and storage of explosive for quarry blasting work	India Explosive Act 1984	Explosive licence for use and storage	Chief Controller of Explosives	The Contractor	2-3 months
4	Storage of fuel oil, lubricants, diesel etc. at construction camp	Manufacture storage and Import of Hazardous Chemical Rules 1989	Permission for storage of hazardous chemical	States Pollution Control Boards for respective section and or Local Authority (DC)	The Contractor	4-6 months
5	Quarry Operation	State Minor Mineral Concession Rules, The Mines Act of 1952, Indian Explosive Act of 1984, Air Act of 1981 and Water Act of 1974	Quarry Lease Deed and Quarry License	State Department of Mines and Geology	The Contractor	4-6 months
6	Extraction of ground water	Ground Water Rules of 2002	Permission for extraction of ground water for use in road construction activities	State Ground Water Board	The Contractor	4-6 months
7	Engagement of labor	Labor Act	Labor license	Labor Commissioner	The Contractor	2-3 months

出典：JICA 調査団

土砂・採石及びその他の建設資材の調達については、自然・社会環境面での許認可の取得状況について実施段階で確認する。

7.5 インドにおける環境基準、排出基準および各種基準

前記に述べたような環境法をもとに、インド政府の中央汚染管理局は下記のような項目に対して環境基準、排出基準及び各種基準を設けている。

- 大気環境基準
- 水質基準
- 車両の排気ガス排出基準
- 車両の燃料品質基準
- ディーゼルエンジン及び発電機にかかる騒音・排気基準
- 騒音排出基準

本件は道路建設プロジェクトであるため、建設期間中における建設廃棄物の投棄、土壌汚染、大気と水質の汚染、騒音と振動はモニタリングの対象とし、中央汚染管理局が定めた各種環境基準をクリアするようデータの集積に努める。また、供用期間中の交通増加は騒音や振動の増大につながる可能性があるためにモニタリングの対象とし、中央汚染管理局が定めた各種環境基準をクリアするためのデータを集積するよう努める。下表にインド政府が定めた環境基準を示す。

表 7-19 : 大気質環境基準

Indian Ambient Air Quality Standards					WHO Ambient Air Quality Standards	
S. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		Averaging Period	Guideline value in $\mu\text{g}/\text{m}^3$
			Industrial Residential, Rural and Other Areas	Ecologically Sensitive Area (notified by Central Government)		
(1)	(2)	(3)	(4)	(5)	(1)	(2)
1.	Sulphur Dioxide (SO_2), $\mu\text{g}/\text{m}^3$	Annual* 24 hours**	50 80	20 80	24 hours 10 minutes	125 (Interim target 1) 50 (Interim target 2) 20 (guideline) 500 (guideline)
2.	Nitrogen Dioxide (NO_2), $\mu\text{g}/\text{m}^3$	Annual* 24 hours**	40 80	30 80	1-year 1-hour	40 (guideline) 200 (guideline)
3.	Particular Matter (size less than $10\mu\text{m}$) or PM_{10} $\mu\text{g}/\text{m}^3$	Annual* 24 hours**	60 100	60 100	1-year 24-hour	70 (Interim target 1) 50 (Interim target 2) 30 (Interim target 3) 20 (guideline) 150(Interim target 1) 100 (Interim target 2) 75(Interim target 3) 50 (guideline)
4.	Particular Matter (size less than $2.5\mu\text{m}$) or $\text{PM}_{2.5}$ $\mu\text{g}/\text{m}^3$	Annual* 24 hours**	40 60	40 60	1-year 24-hour	35 (Interim target 1) 25 (Interim target 2) 15 (Interim target 3) 10 (guideline) 75 (Interim target 1) 50 (Interim target 2) 37.5 (Interim target 3) 25 (guideline)
5.	Ozone (O_3) $\mu\text{g}/\text{m}^3$	8 hours** 1 hour**	100 180	100 180	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

出典：中央汚染管理局

大気質の法定基準については、 SO_2 、 PM_{10} 、 $\text{PM}_{2.5}$ の項目で世界保健機構（WHO）の定める基準より緩いものの、その他の項目は一致している。

表 7-20 : WHO による大気環境基準 (参考)

Table 1.1.1: WHO Ambient Air Quality Guidelines ^{7, 8}		
	Averaging Period	Guideline value in $\mu\text{g}/\text{m}^3$
Sulfur dioxide (SO ₂)	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minute	500 (guideline)
Nitrogen dioxide (NO ₂)	1-year	40 (guideline)
	1-hour	200 (guideline)
Particulate Matter PM ₁₀	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter PM _{2.5}	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

出典 : IFC

表 7-21 : 1991 年以降の車両排気ガス排出基準

Norms	Passenger Car	Heavy Diesel Vehicles			
	CO (g/km)	CO (g/km)	HC (g.km.hr)	NOx (g.km.hr)	PM (g.km.hr)
1991 Norms	14.3-27.1	14	3.5	18.0	-
1996 Norms	8.68-12.40	11.2	2.4	14.4	-
1998 Norms	4.34-6.20	-	-	-	-
India stage 2000 norms	2.72	4.5	1.1	8.0	0.4
Bharat stage-II	2.2	4.0	1.1	7.0	0.2
Bharat Stage-III	2.3	2.1	1.6	5.0	0.1
Bharat Stage-IV	1.0	1.5	1.0	3.5	0.0

出典 : 中央汚染管理局

注 : Bharat とはインドにおける排気ガスの名称である。

表 7-22 : 水質基準

Designated best use	Class	Criteria
Drinking water source without conventional treatment but after disinfections	A	Total coliform organisms MPN/100ml shall be 50 or less
		pH between 6.5 and 8.5
		Dissolved oxygen 6 mg/l or more
		Biochemical oxygen demand 2 mg/l or Less
Outdoor bathing (organised)	B	Total coliform organisms MPN/100ml shall be 500 or less
		pH between 6.5 and 8.5 *Dissolved oxygen 5 mg/l or more
		Biochemical oxygen demand 3 mg/l or Less
Drinking water source with conventional treatment followed by disinfection	C	Total coliform organisms MPN/ 100ml shall be 5000 or less
		pH between 6 and 9
		Dissolved oxygen 4 mg/l or more
		Biochemical oxygen demand 3 mg/l or less
Propagation of wild life, fisheries	D	pH between 6.5 and 8.5
		Dissolved oxygen 4 mg/l or more *Free ammonia (as N) 1.2 mg/l or less
Irrigation, industrial cooling, controlled waste disposal	E	pH between 6.0 and 8.5
		Electrical conductivity less than 2250 micro mhos/cm
		Sodium absorption ratio less than 26
		Boron less than 2mg/l

出典：中央汚染管理局

水質基準については、クラス A（再利用可能な処理前の飲料水の水質）と IFC の EHS がインドライン（浄化済生活排水基準）と比較すると、インド国内基準のほうが評価項目が少なく、COD、全窒素、全リン、油分等に関する規定がない。pH、微生物、BOD 等に関しては EHS ガイドラインと同等かそれ以下の基準に設定されている。

表 7-23 : EHS ガイドラインによる水質基準 (参考)

Table 1.3.1 Indicative Values for Treated Sanitary Sewage Discharges ^a		
Pollutants	Units	Guideline Value
pH	pH	6 – 9
BOD	mg/l	30
COD	mg/l	125
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Oil and grease	mg/l	10
Total suspended solids	mg/l	50
Total coliform bacteria	MPN ^b / 100 ml	400 ^a
Notes: ^a Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation. ^b MPN = Most Probable Number		

出典 : IFC

表 7-24 : 燃料の品質基準

Diesel Specification

Contents	1996	2000	2005	2010
Cetane No, Min	45	48	48	51
Sulphur % W/w, Max	0.5	0.25 0.25(metro)	0.05	0.035
Distillation T95	-	370	370	360
Polyaromatic	-	-	-	11

Gasoline Specification

Contents	1996	2000	2005	2010
RVP at 38 Deg.c,kpa	35-70	-	35-60	60
Benzine % by Vol.,Max	5	5.0 3.0(metro)	3.0 (all) 1.0 (metro)	1
Lead G/m3, Max	0.15% (low Pb) 0.013% (unleaded)	0.013	0.013	0.005
Sulphur % by mass, Max	0.10 (low Pb) 0.20 (unleaded)	0.1	0.05	0.015
Aromatics % v/v., Max	-	-	45	42
Oxygen %by Vol., Max	-	-	2	2.7

出典 : 中央汚染管理局

表 7-25 : ディーゼル発電機の騒音排出基準

No.	Description
1	The maximum permissible sound pressure level for new diesel generator (DG) sets with rated capacity upto 1000 KVA, manufactured on or after the 1st January, 2005 shall be 75 dB(A) at 1 metre from the enclosure surface.
2	Noise limits for diesel generator sets not covered by 1, shall be as follows:-
	2.1 Noise from DG set shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the users end.
	2.2 The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction upto actual ambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5 m from the acoustic enclosure/ room, then averaged.
	2.3 The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A).
	2.4 Guidelines for the manufacturers/ users of Diesel Generator sets shall be as under:-
	2.4 (1) The manufacturer shall offer to the user a standard acoustic enclosure of 25 dB (A) insertion loss and also a suitable exhaust muffler with insertion loss of 25 dB(A).
	2.4 (2) The user shall make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise requirements by proper citing and control measures.
	2.4 (3) Installation of DG set must be strictly in compliance with the recommendations of the DG set manufacturer.
	2.4 (4) A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

出典：中央汚染管理局

表 7-26 : 騒音排出基準

S. No.	Type of vehicle	Noise Limits from 1 st January, 2003, dB(A)
1.0	Two wheeler	
1.1	Displacement upto 80 cc	75
1.2	Displacement more than 80 cc but upto 175 cc	77
1.3	Displacement more than 175 cc	80
2.0	Three wheeler	
2.1	Displacement upto 175 cc	77
2.2	Displacement more than 175 cc	80
3.0	Vehicles used for carriage of passengers and capable of having not more than nine seats, including the driver's seat	74
4.0	Vehicles used for carriage of passengers having more than nine seats, including the driver's seat, and a maximum gross Vehicle Weight(GVW) of more than 3.5 tonnes	
4.1	With an engine power less than 150 KW	78
4.2	With an engine power of 150 KW or above	80
5.0	Vehicles used for carriage of passengers having more than nine seats, including the driver's seat: Vehicles used for carriage goods.	
5.1	With maximum GVW not exceeding 2 tonnes	76
5.2	With maximum GVW greater than 3 tonnes but not exceeding 3.5 tonnes	77
6.0	Vehicles used for transport of goods with a maximum GVW exceeding 3.5 tonnes.	
6.1	With an engine power less than 75 KW	77
6.2	With an engine power of 75 KW or above but less than 150 KW	78
6.3	With an engine power of 150 KW or above,	80 ^o

出典：中央汚染管理局

表 7-27 : 騒音基準

Ambient Air Quality Standards in respect of Noise

Area Code	Category of Area / Zone	Limits in dB(A) Leq*	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

- Note:-
1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
 2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
 3. Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority
 4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

出典：環境森林局

騒音基準に関しては、EHS ガイドラインとほぼ同等の基準であり妥当である。

7.6 代替案の検討

7.6.1 代替案の分析

(1) 代替案分析の基準

代替案分析の基本的な考え方を下表に示した。個々の代替案によって影響を受ける環境各項目のうち、本事業に影響を受けない環境各項目はリストから外し、自然環境及び社会環境への影響が正負どちらにおいても重要性を帯びている項目をリストアップして、分析の基準とした。

表 7-28 : 基本的な代替案分析の考え方

No.	代替案	分析の基準
1	事業を実施しない案	公害対策 本事業によって CO2 排出量が増大／減少する
2	道路改善案	水質・土壌汚染が増大／減少する 騒音・振動が増大／減少する
3	水上輸送能力強化案	公衆衛生状況が改善／改悪される 社会経済環境
4	橋梁建設案	住民移転がある／ない 用地取得（商工業地／住宅地／農地）がある／ない 少数民族への影響がある／ない 生活水準が改善／改悪される 交通事故が増大／減少する

No.	代替案	分析の基準
		自然環境 森林や湿地等の重要な生態系への影響がある／ない ガンジスカワイルカや魚類等の Brapamtra 川の生物相への影響がある／ない 道路の状況 現道の状況は改善する必要がある／ない。 本件の事業は地元及びインド経済発展にとって重要な役割を果たす／果たさない その他 本件の事業実施は自然及び社会環境あるいは経済環境にとって改善／改善が期待される 道路建設に係る技術的な問題が有る／無い

出典：JICA 調査団

(2) 代替案の分析

1) 事業を実施しない案

事業を実施しない案は文字通りプロジェクトを実施しないオプションである。分析の結果、事業を実施しない案の環境への影響はかなり小さいと思われる。主な理由としては、自然環境への影響が小さく、「住民移転が無い」ことが代替案全体として影響が小さい理由になっている。一方、現状のままでは社会的及び経済的な改善が期待できないと思われる。

長所

- 住民移転が生じない。
- 沿線の住民は現況の生活習慣や生活レベルを維持することができる。しかしながら、現況の生活レベル維持を負の影響とみる向きもある。
- 生態系・希少生物への影響がない。
- 農地を道路プロジェクト用地として売り渡す必要がない
- 道路建設工事を実施しないことから、工事中の交通渋滞、騒音や埃の拡散や雨期における泥など工事関連の負の影響がない

欠点

- アッサム州西部からメガラヤ州西部への交通の連続性がない。
- 船で輸送できる物資の量が限られている。
- 地域経済の発展が阻害されている。
- 乗船・下船の施設が貧弱で旅行者は大きな危険に晒されている。
- 川の横断に時間がかかり、悪天候時には利用が制限される。

2) 道路改善案

橋が整備されない場合、ドゥブリからプルバリまで陸路で行くには最寄りのゴアルパラ橋まで迂回しなければならず、その距離は約 200 km にもなる。現状でこの道路は舗装されていない区間やメンテナンスがされておらず悪路になっている区間が多い。更に、政治団体によるデモ活動等のため、交通が数時間～数日にわたって遮断されることも頻繁にあり、道端に大型トラックが列をなして待機を余儀なくされている。この道路を改善することにより、ドゥブリからプルバリまでの所要時間はある程度は短縮されると思われるが、その距離の長さを考えると効果には限界がある。さらに、住民移転や環境への影響も甚大である。

長所

- 道路沿いに位置する村落間のアクセスが改善される。
- 周辺地域の経済発展につながる。
- ブラマプトラ川の生態系や生物に対する影響がない。

欠点

- 大規模な住民移転が発生する。
- 森林伐採が発生する。
- 道路脇の住宅地、農地等の土地収用が発生する。
- 道路建設工事中の交通渋滞、騒音や埃の拡散や雨期における泥など工事関連の負の影響がある。
- 高規格道路への改善により、重車両が増加すれば大気汚染・騒音・振動が増加する可能性がある。
- 道路状況の改善によって車両速度が高速化され、交通事故が増加する可能性がある。
- ドゥブリからプルバリまで約 20 km の移動のために約 180 km の余分な移動が生じるために、旅行時間、排気ガス、騒音、振動、交通事故量等が増加する。

3) 水上輸送能力強化案

現状ではドゥブリープルバリ間の渡し船は木造のボートが運行しており、人や農産物、モーターバイク等は輸送できるものの自動車やトラックは輸送できない。また、特にプルバリ側では船着き場や栈橋はなく浅瀬に乗り上げて着岸している。橋を建設しない場合にフェリー乗り場を整備し大型船を導入するという案も可能性としてはあるが、現地は川の兩岸の水深が浅いため、港の建設には大規模な浚渫工事及び護岸工事が必要になると考えられ、希少種の生息地である河川を改変することによる影響が大きいと予想される。更に地形が改変されたことによる水流パターンの変化により、下流において土壌侵食等が発生する可能性や、供用後も船からの汚染物質や油の流出等による水質汚染や生態系への悪影響が懸念される。橋梁建設案に比べて住民移転の規模は最小化できるものの、自然環境への負の影響が相対的に大きい。

長所

- ドゥブリープルバリ間の車両の移動が可能になり、利便性が向上する。
- 住民移転及び土地収用が発生するが、規模は比較的小さい。

欠点

- 川底を浚渫しコンクリート製の岸壁を整備するなど、ブラマプトラ川の生態系に与える負の影響が大きい。
- 大型船の運航やメンテナンスにコストがかかる。
- 川の増水等の自然災害の影響を受けやすい。
- 車の乗船・下船がフェリーのタイムスケジュールに制限され旅行時間がかかる。

4) 橋梁建設案

ドゥブリープルバリ間の橋梁が建設された場合、移動に要する時間は大幅に短縮され、利便性は飛躍的に向上する半面、橋梁建設用地の土地収用に伴う住民移転など、社会的な負の影響が想定される。自然環境の面では、建設工事中に一時的にブラマプトラ川の生態系に悪影響を与える恐れがあるものの、橋梁が無い場合と橋梁建設後の流況の変化について行ったコンピュータ・シミュレーションの結果から、供用後はほとんど影響がないと考えられる。

長所

- 道路の接続性や利便性が大幅に向上される。
- 地域の経済発展効果が期待される。
- 森林の伐採が発生しない。
- ブラマプトラ川の生態系や生物に対する影響が他案に比較して小さい。

欠点

- 農地を含む用地取得及び住民移転が発生する。
- 道路建設工事中の振動、騒音や一時的な水質汚染など工事関連の負の影響がある
- 車の交通量の増加により、騒音や排ガス量、交通事故等が増加する可能性がある。
- 工事中にブラマプトラ川の生態系や生物に対する一時的な負の影響が生じる。

上記分析結果に鑑みて、各案を比較検討した結果をランク付けし、表 7-29 に示した。さらに、ランクに応じてスコアを配分し、合計点の最も高い案を最善として選択した。その際に、地域経済への正の影響をもたらすことが本事業の目的であり最も重視されるため、重みづけを他の項目の 2 倍とした。その結果、「事業を実施しない案」、「道路改善案」、「水上輸送能力強化案」、「橋梁建設案」を相互に比較した場合には、「橋梁建設案」が最善だと示された。

表 7-29 : 代替案の評価

代替案	事業を実施しない案	道路拡幅案	水上輸送能力強化案	橋梁建設案
代替案の概要	事業無し。既存の状況の継続	現状で最も近いゴアルパラ橋までの道路状況を改善する	港を整備し大型フェリーを導入する	橋梁を建設する
住民移転規模	◎ 住民移転がないことは地元社会にとって最大の利点	× 拡張する道路の延長が 200 km にわたり大規模な住民移転が発生する	○ 港を建設する用地確保のため住民移転が発生するが、規模は小さい	△ 住民移転が発生するが、道路改善案より影響は少ない
スコア	4	1	3	2
加重スコア (1倍)	4	1	3	2
自然環境への影響	◎ 自然環境への直接的な影響はない	△ 既存道路の拡幅により、周辺の自然環境への影響が発生する	× 港の建設のために川を浚渫するなど、自然環境及び生物への悪影響が最も大きい	○ ブラマプトラ川の生態系への影響が発生するが、他のオプションと比べて影響が相対的に小さい。
スコア	4	2	1	3
加重スコア (1倍)	4	2	1	3
大気・水質・ 土壌汚染	△ 現状維持のままである。	○ 現在 1 日当たり約 2,500 台の車が約 200 km を迂回している。この区間の道路状況が改善されることにより温室効果ガス排出量が若干削減できる。	× 大型船からの汚染物質や油の流出等による水質汚染や生態系への悪影響が懸念される。	◎ 将来的に交通量が増加した場合においても、橋梁がない場合は迂回するしか選択肢がないため、橋梁を建設した場合は車両 1 台あたりの走行距離が約 200 km から約 20 km に短縮され、大気汚染や温室効果ガスの総排出量を大幅に削減できる。
スコア	2	3	1	4
加重スコア (1倍)	2	3	1	4
地域経済への影響	× 現状維持のまま地域経済へ正の影響はない。	○ 現状よりは交通の利便性が若干改善できる。	△ 現状よりは交通の利便性の改善が期待できるが、洪水等の自然災害には脆弱である。	◎ 交通の利便性が最も改善され、本事業が経済の伸長性に与える影響は代替案中で最大になる。

代替案	事業を実施しない案	道路拡幅案	水上輸送能力強化案	橋梁建設案
スコア	1	3	2	4
加重スコア (2倍)	2	6	4	8
合計スコア	12	12	9	17
順位	2	2	4	1
総合評価	現状では地域経済の発展が阻害されていることを考慮すると、現状維持の事業を実施しない案は推奨されない	大規模な住民移転や自然環境への影響が発生する割に、高い改善効果は期待できない。	住民移転の影響は小さいものの、自然環境への負の影響が大きい。	住民移転や自然環境への影響があるが、交通の利便性向上により、地域社会経済の発展に大きく寄与する。

凡例：◎：4つの代替案の中で最も優れている。スコア4として換算。

○：4つの代替案の中で2番目に優れている。スコア3として換算。

△：4つの代替案の中で3番目に優れている。スコア2として換算。

×：4つの代替案の中で最も悪い。スコア1として換算。

出典：JICA 調査団

(3) 橋梁の線形による代替案の分析

この橋梁建設の目的は、ドゥブリ側の道路の先端である地点 B とプルバリ側の道路の先端である地点 E とを接続することにある。橋梁を建設する場合の線形について環境社会への影響が最小化されるため、3つのオプションを比較検討した。3つのオプションは、下記のとおり設定した。

それぞれの線形は下表の6つの地点のうちの下記の組合せを結ぶ線である。

- オプション1：

ドゥブリの住宅密集地および中州の居住地を最大限避ける案（地点 A—地点 D）は、橋梁の延長とアプローチ道路の延長は長くなるが、住宅地等への影響を最小限にできる。

- オプション2：

ドゥブリとプルバリとを最短距離で結ぶ案（地点 B—地点 E）は、橋梁の延長とアプローチ道路の延長を短くできるが、ドゥブリ側の道路の接続始点が住宅密集地に位置していることと、中州の居住地の中心部を横断することになる。

- オプション3：

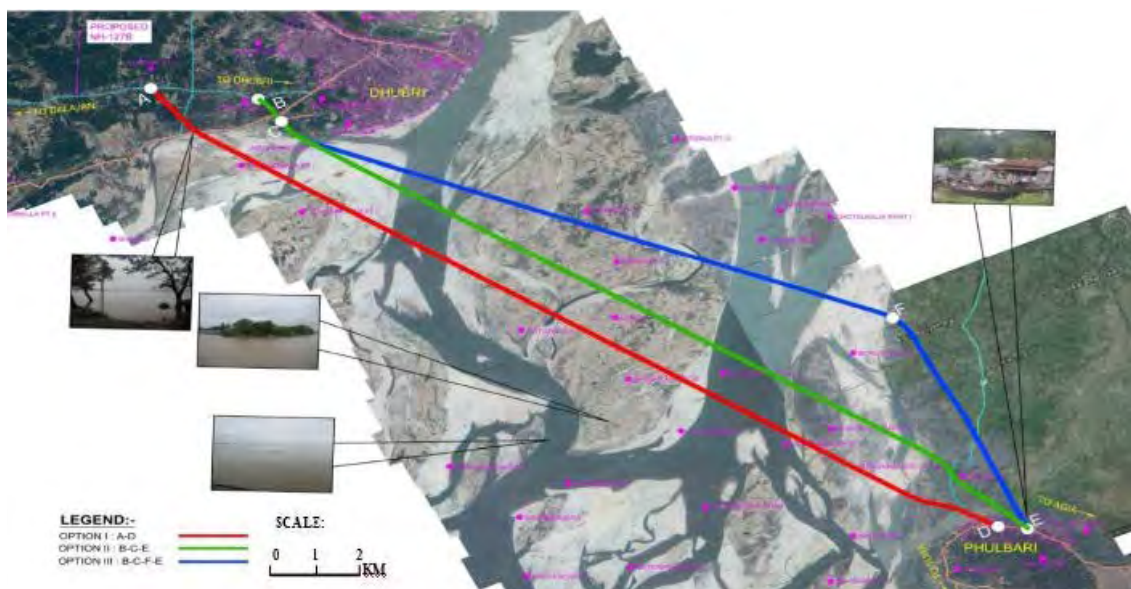
河川を直角かつ最短に結ぶ案（地点 B—地点 C—地点 F—地点 E）は、河川の航路区間の延長を短くでき、さらに中州の居住地の中心部を避けることができるが、ドゥブリ側の道路の接続地点が住宅密集地に位置し、また道路線形にカーブが多くなる。

表 7-30：橋梁の線形による代替案の始点・通過点・終点の位置

地点	位置
地点 A	国道 127B 号線 Adabari 交差点付近
地点 B	Adabari 交差点の 1.3km 東の地点、Choto Bashjani 付近
地点 C	Bidyapara 付近、College Road と Bund road の交差点

地点	位置
地点 D	Agia-Tura NEC Road,上、Phulbari 船着場より Agia 方面へ 400m の地点
地点 E	Agia-Tura NEC Road,上、Phulbari 船着場より Agia 方面へ 1 Km の地点
地点 F	ブラマプトラ川南岸、 Borokalia Surjyamara 付近

出典：JICA 調査団



赤線：オプション1 緑線：オプション2 青線：オプション3

出典：JICA 調査団

図 7-14：橋梁建設案（オプション1～3）

比較する項目は下記を用いた。

表 7-31：比較の指標、評価方法及び調査方法

	指標	評価方法	調査方法
社会的影響	移転が必要な家屋の概数	数値が大きいほど影響が大きい	衛星画像による確認及び現地での目視
	土地収用が必要な面積	同上	同上
	中州の居住地域を通過する距離	同上	同上
環境的影響	ブラマプトラ川を横断する距離	同上	衛星画像による確認
	土地収用が必要な農地面積	同上	同上
	走行距離の全長	同上	DPR コンサルタントによる設計案の確認
技術的検討	橋の全長	数値が小さいほど望ましい	DPR コンサルタントによる設計案の確認
	アプローチ部の距離	同上	同上
	カーブの数	同上	同上
	カーブの総延長	同上	同上
建設コスト	概算総費用	同上	同上

出典：JICA 調査団

社会的影響については、本案件の用地取得による影響を評価するため、移転が必要な家屋の概数で住民移転の規模を想定し、数値が大きいほど負の影響が大きいと評価した。また、土地収用の面積が大きいほど、土地ベースで生計を立てている対象住民への影響が大きいと想定されることから、面積に応じて影響が大きくなると評価した。さらに、貧困層が含まれると想定される中州住民に対する影響にも配慮するため、中州の住居地域を通過する距離も指標に加え、距離が長いほど、影響が大きいと評価した。地域経済への影響という正の影響については、いずれの案でも移動の効率性が改善されオプション間での差がないため、評価対象項目とはしなかった。

環境的影響については、本案件では特にブラマプトラ川の生態系及び生息する水棲生物への影響が懸念されることから、工事区間のうちブラマプトラ川にかかる距離を指標とし、この距離が長くなるほど生態系への影響が大きい、すなわち望ましくないと評価した。また、自然的環境に関する影響の程度としては、現地周辺に原生的な自然環境が存在しないことから、収容される予定の農地面積によって影響の程度を比較した。農地は希少種の生息地ではないが、食料生産や土壌・大気の循環等の生態系サービスの周辺地域への提供源と考えられる。さらに、完成した橋を車両が通過する距離が長いほど周辺地域への騒音・振動・大気汚染等の影響が大きくなると想定されるため、走行距離の全長をこれらの影響の指標とした。

橋の全長については、橋構造は盛土構造に比較してより高度な技術が要求され建設費も本事業のように深い基礎工が必要な場合には数倍にも高額になるので、橋の延長が短い方が有利であると評価した。アプローチ部の距離については、アプローチ部が橋梁と既存道路とを接続する新設部分の道路であり、新設道路が短い方が有利であると評価した。カーブの数については、カーブの数が少ないほど車の運転走行性が向上するので、少ないほど安全性が高いと評価した。また、カーブの総延長については、カーブの延長が長いほど構造が複雑で高度な建設技術が要求されるので、短い方が有利であると評価した。

オプション1～3それぞれについて、結果は以下のとおりとなった。さらに、以下の計算式でスコアを出し、定量的に比較した。数値が小さいほど環境社会への影響が相対的に小さく、望ましいことを表す。

オプション X のスコア = 10 点 × オプション X の値 / 3 つのオプション中の最大値

さらに、社会的影響、環境的影響、技術的検討、建設コストのそれぞれについて、最も望ましい (=スコアが小さい) 案を○、2 番目を△、3 番目を×と評価した。

表 7-32 : 代替案の比較と評価

	指標	オプション1		オプション2		オプション3	
		値	スコア	値	スコア	値	スコア
社会的影響	移転が必要な家屋の概数(軒)	122	6.52	170	9.09	187	10
	土地収用が必要な面積 (ha)	55.2	7.69	63	8.77	71.76	10
	中州の居住地域を通過する距離 (km)	6.3	9.40	6.7	10	5.1	7.61
	合計スコア		23.61		27.86		27.61
	評価	○		△		△	
環境的影響	土地収用が必要な農地面積 (ha)	0.012	3.42	0.018	5.14	0.035	10
	ブラマプトラ川を横断する距離 (km)	2.85	10	2.67	9.36	2.20	7.72
	走行区間の全長 (大気汚染・騒音・振動の指標、km)	19.282	10	17.847	9.26	18.797	9.75
	合計スコア		23.42		27.76		37.47
	評価	○		△		×	
技術的検討	橋の全長 (km)	18.360	10	17.01	9.26	17.995	9.80
	アプローチ部の距離 (km)	0.471	10	0.465	9.87	0.430	9.13
	カーブの数	3	6	5	10	5	10
	カーブの総延長 (m)	983.2	3.24	2054.15	6.77	3035.09	10
	合計スコア		29.24		35.9		38.93
評価	○		△		×		
建設コスト	概算総費用 (千万ルピー)	2,858	9.47	3,018	10	2,889	9.57
	評価	○		△		○	
総合ランク		1		2		3	

出典：JICA 調査団

社会的影響について比較した結果、住民移転概数および土地収用面積の2項目において、オプション1の影響が最小となった。貧困層への影響を確認する中州地域の通過距離は、オプション3が最小となった。

線形毎の説明は以下のとおりである。

オプション1は、中州地域を含む住民移転概数および土地収用面積が最も小さい。中州の居住地域への影響を評価すると、オプション3に比べ大きい。

オプション2は、全体の住民移転概数および土地収用面積ともに、2番目であるが、中州地域への影響が最大となる。

オプション 3 は、中州地域への影響は最も小さいが、ブラマプトラ対岸の居住地を通過して国道と接続するアライメントになるため、全体の住民移転概数および土地収用面積が最も大きくなる。

当該地域では、世帯構成員が約 4 人であり、また、世帯当たりの土地所有面積が小さく、一区画を複数世帯で所有している場合も多いため、住民移転概数および土地収用面積が大きい程、被影響世帯数の規模が拡大し、影響の程度が大きくなる。オプション 1 とオプション 2、3 では、被影響世帯数に約 200-250 人以上の差があることになる。これらを踏まえ、オプション 1 が最も影響が少ないと評価した。

環境的影響について比較した結果、農地への影響については、オプション 1 が最も小さかった。それ以外のブラマプトラ川を横断する距離、走行区間の全長の 2 項目については、オプション間での差が小さく、総合的にはオプション 1 が最も高いスコアを獲得した。

技術的検討については、オプション 1 が橋の全長とアプローチ部の距離で長くなり不利であるが、カーブの数が少なくかつカーブの総延長が短いために有利であり、総合的にはオプション 1 が最も高いスコアを獲得した。

上記のように、分析の結果、オプション 1 が「社会的影響」「環境的影響」「技術的検討」「建設コスト」の 4 分野全てで○を獲得し、この 3 オプションの比較においてはオプション 1 が最も優れていることが示された。

7.7 スコーピング

7.7.1 基本的な影響の検討

本事業の用地取得幅 (ROW) は、60m に設定されている。本事業の実施によって自然環境に与える影響としては、水生生物への影響が懸念され、また用地取得並びに住民移転による社会的影響も重要な検討項目となる。

7.7.2 スコーピング・マトリクス

前述の代替案の評価により選定されたオプション 1 のスコーピング案を下表に示す。JICA 環境社会配慮ガイドライン (2010) に基づき、影響の度合いは以下の基準に基づき評価した。

- A+/- : 多大な正/負の影響が想定される。
- B+/- : ある程度の正/負の影響が想定される。
- C+/- : 情報不足などにより影響の正/負の程度は不明。
- D : 影響は想定されない。

表中の記号で「P : 計画期間」、「C : 建設期間」、「O : 供用期間」を示す。

表 7-33 : スコーピング案

No.	項目	結果			評価理由
		P	C	O	
生活環境(公害)					
1	大気汚染	D	B-	B-	P: 計画段階による影響は無い。
					C: 工事車両・重機からの排ガス・粉塵飛散による大気汚染が発生する。乾季には工事地域での塵埃の発生が著しいが一時的なものである。
					O: 新たな橋梁を渡る車両に伴う排気ガスによる限定的な影響が考えられる。
2	水質汚染	D	B-	D	P: 計画段階による影響は無い。
					C: 橋梁工事では河川の水質(濁度、pH など)に一時的な影響が生ずることが考えられる。また、労働者キャンプの排水・下水処理排水による一時的な影響が想定される。有害物質による恒久的な水質汚染は生じない。
					O: 影響は想定されない。
3	廃棄物/有害物質	D	B-	D	P: 計画段階による影響は無い。
					C: 建設工事および労働者キャンプの廃棄物が発生するが、一般的な廃棄物で重大な影響は想定されない。
					O: 影響は想定されない。
4	土壌汚染	D	B-	D	P/O: 本事業による影響は無い。
					C: 建設機材の潤滑油や燃料漏れによる限定的な影響は想定されるが、有害物質による汚染は想定されない。
5	騒音/振動	D	B-	B-	P: 計画段階による影響は無い。
					C: 建設機械の稼働による騒音と振動が生ずる。
					O: 交通量の増大で、振動と騒音レベルが事業前より高くなる。
6	地盤沈下	D	D	D	P/C/O: 本事業による影響は無い。
7	悪臭	D	D	D	P/C/O: 本事業による影響は無い。
8	底質	D	C	C	P: 本事業による影響は無い。
					C/O: 橋脚の建設により底質に影響を与える可能性がある。
自然環境					
9	保護区	D	D	D	P/C/O: 保護区は10km圏内には存在せず影響は想定されない
10	生態系	D	A-	B-	P: 計画段階による影響は生じない。
					C: 工事中の水質の悪化等により、対象地域内に生息する希少生物(ガンジスカワイルカ等)に影響を与える可能性がある。
					O: 交通量の増加により、対象地域の動植物に影響を与える。
11	水文/水象	D	B-	B-	P: 計画段階による影響は無い。
					C: 盛土・切土・護岸・橋げたの設置等による限定的な影響が想定される。
					O: 接続道路・橋脚による微細な変化が想定される。
12	地形・地質	D	B-	D	P: 事業による影響は無い。
					C: 接続道路に限定した地形の改変(盛土と切土)が発生する。雨季の洪水時に工事区間の土壌浸食が生じる可能性がある。
					O: 供用後の影響は無い。
社会環境					
13	非自発的住民移転	A-	D	D	P: 本事業により、100世帯を超える非自発的住民移転、700世帯を超える被影響世帯が発生すると見込まれる。 C/O: 住民移転は工事開始前に終了するため、この段階での影響は発生しない。

No.	項目	結果			評価理由
		P	C	O	
14	地域経済と生活・生計	A-	B-/+	B-/+	P: 住民移転および所有地・耕作地の大半が用地取得対象となる場合に、生計手段への負の影響が見込まれる。
					C: 工事中は、漁業従事者への負の影響の可能性はある。一方で、工事中に様々な技能レベルの雇用機会が地域住民に与えると想定される。更に、工事中の作業者の増加により、道路沿いなどで、飲食系の行商の増加が想定される。
					O: 耕作地の損失による生計への負の影響が考えられる。また、ボートオペレーターの経済活動への負の影響が見込まれる。一方で、交通網の改善により、市場や公共施設等へのアクセスが向上し、地域経済への正の影響が見込まれる。また、それに伴う雇用機会の増加も想定される。中州地域は、直接的なアクセス向上には繋がらないが、地域の物流アクセス改善により、市場や物資へのアクセスの向上が期待できる。
15	土地利用	B-	B-	D	P: 用地取得により、既存の土地利用が変化する可能性がある。
					C: 工事用ヤード等に必要土地利用により変化する可能性があるが、一時的なものであり、影響は限定的と考えられる。
					O: 工事後、工事用ヤードは、建設業者により元の状態に復元される。
16	地域資源利用	D	B-	D	P: 特段の影響は想定されない。
					C: 建設資材として地域資源の利用が想定されているため、影響がある可能性がある。
					O: 工事後は、地域資源の利用は想定されていないため、影響はない。
17	水利用、水利権及び共同体の権利	D	B-	D	P: 特段の影響は想定されない。
					C: 河川を生活用水として利用している住民に影響がある可能性がある。
					O: 特段の影響は想定されない。
18	社会インフラや社会サービス	B-	D	B+/-	P: 橋梁始点に位置する学校の校庭に影響が出る可能性がある。
					C: 特段の影響は想定されない。
					O: 学校移転場所によっては、通学の距離が長くなる等の影響が生じる可能性がある。長期的には、交通網の改善は、社会インフラやサービスへのアクセス向上をもたらす。
19	社会組織や地域の意思決定組織	D	D	D	P/C/O: 用地取得・住民移転は、既存の意思決定組織構造に基づいて行われるため、特段の影響は想定されない。
20	被害と便益の偏在	B-	B-		P: 用地取得、住民移転の対象住民と非対象者で、事業による影響および裨益の度合いが異なる。ただし、対象住民には適切な補償パッケージを提供する住民移転計画を策定、実施することで緩和することが可能である。
					C: 用地取得、住民移転の対象住民を優先的に建設工事に雇用する等の配慮が必要である。
					O: 橋梁の接続地点となる陸側と、直接接続しない中州との間で、便益の差が生まれる可能性がある。長期的には、交通アクセス改善が、地域全体の経済活動の活性化に貢献することが想定される。
21	地域内の利害対立	B-	B-	B-	P/C/O: 被害と便益の偏在に伴う、利害対立が発生する可能性がある。
22	文化的・歴史的遺産	D	D		P/C/O: 対象地域沿いには、重要な文化的、歴史的遺産はない。

No.	項目	結果			評価理由
		P	C	O	
23	景観	D	D	D	P/C/O: 橋梁建設により、工事中および供用中に景観が変化する。ただし、事業対象地は特別な観光地や景観保全地区には該当せず、本事業による負の影響はない。
24	貧困層	A-		B-/+	P: 特に中州地域には、貧困層および非識字者が多いため、脆弱性を考慮した生計回復支援を策定、実施する必要がある。
					C: 建設工事への雇用機会から利益を受けることができる。
					O: 貧困層は、工事への従事以降は、生計手段が確保できない可能性がある。長期的には、事業が生み出す地域の経済発展により、貧困層にも正の影響があると考えられる。本事業による貧困層への正と負の影響については、本調査で確認する。
25	少数民族／先住民	C	C	C	P/C/O: ヒアリング結果では、対象地域に少数民族や指定部族(ST)は存在しないとのことだが、現地調査時にセンサス調査を実施した上で、再度、存在の有無を確認し、影響の有無を評価する。
26	ジェンダー				P: 用地取得および住民移転の過程において、女性の参加が確保されるような配慮が必要である。
					C: 建設工事への雇用において均等な機会が提供されるような配慮が必要である。
					O: 特段の影響はないと考えられる。
27	子どもの権利	B-	C	D	P: 学校の移転が想定されるため、既存の生徒に対する配慮が必要である。
					C: 工事期間中の影響については、調査後に影響の有無を評価する。
					O: 特段の影響は想定されない。
28	公衆衛生 (感染症)	D	B-	D	P: 計画段階による影響は無い。
					C: 労働者の移入により、感染症が蔓延するリスクがある。
					O: 特段の影響は想定されない。
29	労働安全衛生	D	B-	B-	P: 計画段階による影響は無い。
					C: 工事現場の衛生、労働者の健康や安全は、環境管理計画の実施を通じて適切に管理される必要がある。
					O: メンテナンスや補修作業の担当作業員の衛生や安全にも十分に配慮する。
その他					
30	事故	D	B-	B-	P: 計画段階による影響は無い。
					C: 重機や工事用車両による交通事故リスクが増大する。
					O: 交通量の増加および通行速度の上昇により事故リスクは増大する。
31	気候変動・越境影響	D	D	D	P: 計画段階による影響は無い。
					C: 工事用機材や車両、交通量の増加等により、GHG排出が発生するが、影響は殆どないと考えられる。
					O: 新橋梁により大幅なトラック輸送距離の短縮で、GHG 排出削減効果が期待される一方、交通量の増加も想定される。ただし気候変動や越境影響を与える程の影響は殆どないと考えられる。

出典：JICA 調査団

7.7.3 環境社会配慮調査の TOR

環境社会配慮調査の TOR を下表に示す。

表 7-34 : 環境社会配慮調査の TOR

調査項目	調査場所	調査項目	調査方法 (予測・評価)
大気質	工事区間に最も近い居住地区境界周辺：3～4ヶ所(10 km 毎標準)	<ul style="list-style-type: none"> PM2.5 (微粒子状物質)、PM10 (粒子状物質)、NOx (窒素酸化物)、SO2 (二酸化硫黄) 	<ul style="list-style-type: none"> 実施機関が策定した EIA レビュー 現地調査方法はインドの大気質調査規定に準ずる 現地調査項目は1ヶ所当たり 24 時間連続 (平日 1 日) 建設工事中及び供用後の影響は施工計画、需要予測より定性的に評価
水質	工事区間周辺で通年採水可能な点：3～4ヶ所	<ul style="list-style-type: none"> 濁度 (NTU)、pH、BOD5、COD 	<ul style="list-style-type: none"> 実施機関が策定した EIA レビュー 現地調査方法はインドの水質調査規程に準ずる 建設工事中の影響は施工計画、近隣の類似事業の現状より定性的に評価
廃棄物／有害物質		<ul style="list-style-type: none"> 想定される廃棄物量・種類 	<ul style="list-style-type: none"> 実施機関が策定した EIA レビュー 建設工事中の影響は施工計画、近隣の類似事業の現状より定性的に評価
土壌汚染	工事区間周辺：3～4ヶ所	<ul style="list-style-type: none"> pH、マンガン、鉄分等 	<ul style="list-style-type: none"> 実施機関が策定した EIA レビュー 土壌サンプルの化学分析 建設工事中の影響は施工計画、近隣の類似事業の現状より定性的に評価
騒音・振動	工事区間周辺：3～4ヶ所	<ul style="list-style-type: none"> 騒音レベル 	<ul style="list-style-type: none"> 実施機関が策定した EIA レビュー 調査方法はインド騒音測定規程に準ずる 建設工事中の影響は施工計画より定性的に評価
生態系	プロジェクト影響範囲及び ROW 内	<ul style="list-style-type: none"> 森林及び影響を受ける希少種の有無 	<ul style="list-style-type: none"> 実施機関が策定した EIA レビュー ヒアリング調査、フィールド調査 希少種の存在が確認された場合は、建設工事中及び供用後の影響を施工計画、需要予測より定性的に評価
水文／水象	工事区間全域	<ul style="list-style-type: none"> 取り付け道路周辺の水文 河川内橋脚周辺の水象 	<ul style="list-style-type: none"> 実施機関が策定した EIA レビュー 既存資料、過去の洪水記録、地形図等の 2 次資料整理 現地踏査による現状確認 建設工事中及び供用後の影響は施工計画、基本設計構造、近隣の類似事業の現状より定性的に評価
地形・地質	工事区間全域	<ul style="list-style-type: none"> 取り付け道路周辺の地形、地質 	<ul style="list-style-type: none"> 実施機関が策定した EIA レビュー 既存資料、過去の降雨記録、地形図等の 2 次資料整理 現地踏査による現状確認 建設工事中の影響は施工計画、近隣の類似事業の現状より定性的に評価
非自発的住民移転	ROW 内のみ	<ul style="list-style-type: none"> 移転対象建物・土地の詳細 被影響世帯に対する補償等 	<ul style="list-style-type: none"> センサス調査 用地取得に伴う非自発的住民移転の対象世帯・対象者を定量的に把握する 用地・財産調査により被影響世帯に対する補償額を算出する
地域経済と生活・生計	ROW 周辺	<ul style="list-style-type: none"> 地域経済状況 社会構造 家計・生計手段 	<ul style="list-style-type: none"> 社会経済調査・センサス調査・グループディスカッション 既存資料収集整理 既存資料から本事業の対象地域経済への影響を予測する 家計・生計調査により被影響世帯の社会経済状況を定量的に把握し、影響の有無及び規模を確認する(調査対象者は、ボートオペレーター等の本事業による影響が想定されるものも含む)

調査項目	調査場所	調査項目	調査方法 (予測・評価)
土地利用・地域資源利用	ROW 内のみ	<ul style="list-style-type: none"> 土地利用状況 事業に伴う影響範囲 	<ul style="list-style-type: none"> 社会経済調査 1次データ及び周辺の類似案件のRAP報告書などに基づき、影響の有無及び規模を確認する
水利用、水利権及び共同体の権利	ROW 周辺	<ul style="list-style-type: none"> 水利用の実態 	<ul style="list-style-type: none"> 社会経済調査・センサス調査 現地調査結果に基づき、影響の有無及び程度を確認する
社会インフラや社会サービス	ROW 周辺	<ul style="list-style-type: none"> 対象施設 ROWからの距離、位置 アクセス状況 	<ul style="list-style-type: none"> 社会経済調査 公共施設の分布(医療・教育施設等)について情報を入手し影響の有無及び規模を確認する
被害と便益の偏在	ROW 周辺	<ul style="list-style-type: none"> 移転対象住民の生計手段 影響を受ける土地利用状況 	<ul style="list-style-type: none"> センサス調査・グループディスカッション 土地収用・移転住民と近隣住民の生計手段と土地利用状況を把握し、便益の偏在が発生するかどうかを予測し、その影響の大きさを確認する
地域内の利害対立	ROW 周辺	<ul style="list-style-type: none"> 移転対象住民の生計手段 影響を受ける土地利用状況 	<ul style="list-style-type: none"> センサス調査・ステークホルダー協議 現地調査結果に基づき、影響の有無及び程度を確認する
貧困層	ROW 内 PAH	<ul style="list-style-type: none"> 生計手段、就労状況 識字率 	<ul style="list-style-type: none"> 社会経済調査・センサス調査 現地調査結果および既存資料に基づき、影響を予測し、影響の規模を確認する
少数民族／先住民族	ROW 内 PAH	<ul style="list-style-type: none"> 民族、言語 生計手段等 	<ul style="list-style-type: none"> 社会経済調査・センサス調査 現地調査結果および既存資料に基づき、影響の有無及び規模を確認する。
ジェンダー	ROW 内 PAH ROW 周辺	<ul style="list-style-type: none"> 社会構造 生計手段、就労状況 識字率 	<ul style="list-style-type: none"> センサス調査・グループディスカッション 周辺の類似案件のRAP報告書、対象地域専門家ヒアリング 現地調査結果および既存資料に基づき、影響の有無及び規模を確認する
子どもの権利	移転対象となる学校周辺	<ul style="list-style-type: none"> 生徒数 周辺の教育施設の分布 	<ul style="list-style-type: none"> 社会経済調査 周辺の類似案件のRAP報告書、対象地域専門家ヒアリング 現地調査結果に基づき、影響の有無及び規模を確認する
公衆衛生	ROW 周辺	<ul style="list-style-type: none"> 既存資料調査 	<ul style="list-style-type: none"> 感染症等の傾向を調査し、類似事例の情報を収集する 影響の有無及びその規模を確認する
労働安全衛生	-	<ul style="list-style-type: none"> 労働安全衛生リスク、対策 	<ul style="list-style-type: none"> 施工管理計画、類似事例の情報を収集する 影響の有無及びその規模を確認する
事故	-	<ul style="list-style-type: none"> 事故リスク、対策 	<ul style="list-style-type: none"> 施工管理計画、交通需要予測の整理 既存資料や類似事例により交通分野に関連する事故の発生状況／交通事故の傾向を調査し、定性的な評価を通じて影響の有無及び規模を確認する

出典：JICA 調査団

7.8 環境社会配慮調査結果

7.8.1 生活環境に対する主な影響

(1) 現況調査結果

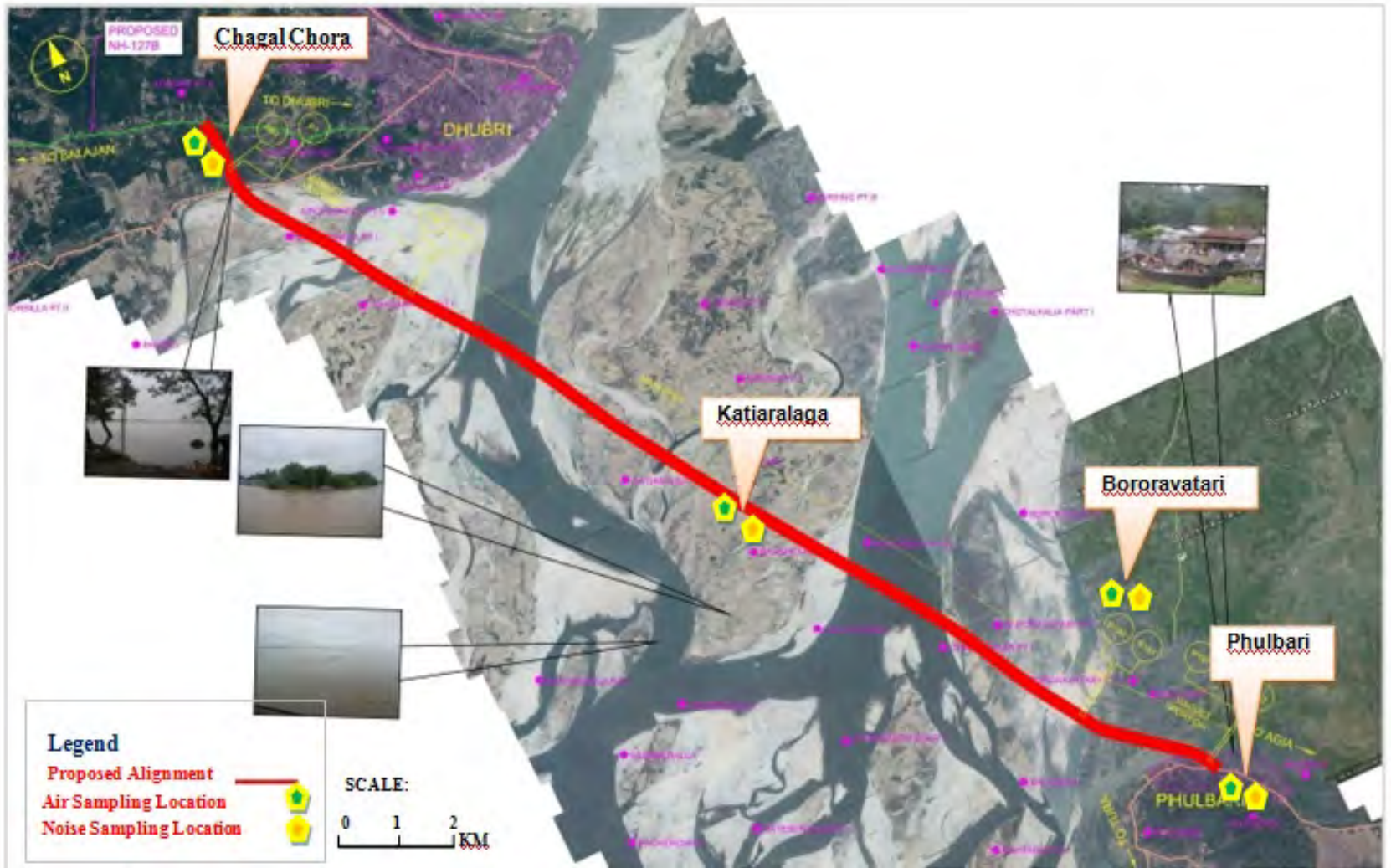
ア) 大気質

2016年10月に建設予定地周辺の4か所で大気サンプルを採取し、汚染物質の量を測定した。その結果は下表のとおりである。WHOの基準と比較すると、PM_{2.5}とPM₁₀の測定値でChagal Choraとプルバリの2地点でWHOのガイドライン値を超えているが、Interim Target 2の基準を満たしている。それ以外の測定値については、いずれも基準値以下である。COについてはWHOの基準値が存在しない。図7-16～20に示すとおり、4か所のサンプリング地点での大気質はいずれもインドの大気環境基準値以下であった。

表 7-35 : 建設予定地周辺における大気質測定結果

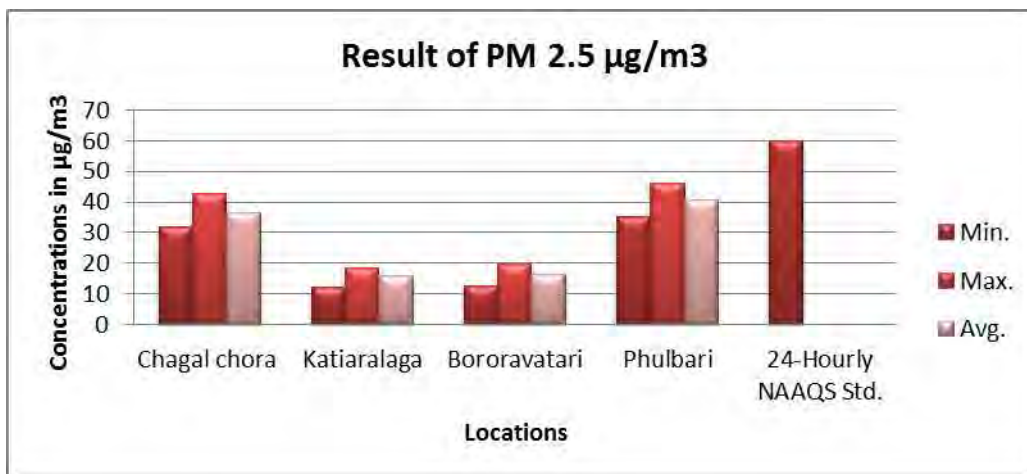
Chagal chora (緯度 26° 02'0.32"N、経度 89° 56'15.67"E)					
	PM _{2.5} , µg/m ³	PM ₁₀ , µg/m ³	SO ₂ , µg/m ³	NO _x , µg/m ³	CO, µg/m ³
最小値	31.7	78.6	8.2	15.2	450
最大値	42.6	86.3	10.2	22.4	750
平均値	36.6	81.8	9.0	18.6	567.1
Katiaralaga (緯度 25° 57' 49.90" N、経度 89° 58'38.26" E)					
	PM _{2.5} , µg/m ³	PM ₁₀ , µg/m ³	SO ₂ , µg/m ³	NO _x , µg/m ³	CO, µg/m ³
最小値	12.2	45.2	BDL	8.2	220
最大値	18.3	56.4	BDL	10.4	290
平均値	16.0	50.8	BDL	9.2	251.3
Bororavatari (緯度 25° 55' 03.91"、経度 90° 00' 53.50" E)					
	PM _{2.5} , µg/m ³	PM ₁₀ , µg/m ³	SO ₂ , µg/m ³	NO _x , µg/m ³	CO, µg/m ³
最小値	12.8	47.2	BDL	8.8	230
最大値	19.6	59.4	BDL	11.6	310
平均値	16.2	54.2	BDL	9.9	270.0
Phulbari (緯度 25° 53' 21.04" N、経度 90° 02' 13.40" E)					
	PM _{2.5} , µg/m ³	PM ₁₀ , µg/m ³	SO ₂ , µg/m ³	NO _x , µg/m ³	CO, µg/m ³
最小値	35.2	79.6	8.9	16.2	460
最大値	46.2	88.7	11.5	23.7	780
平均値	40.7	83.2	10.1	19.6	576.3

出典：JICA 調査団



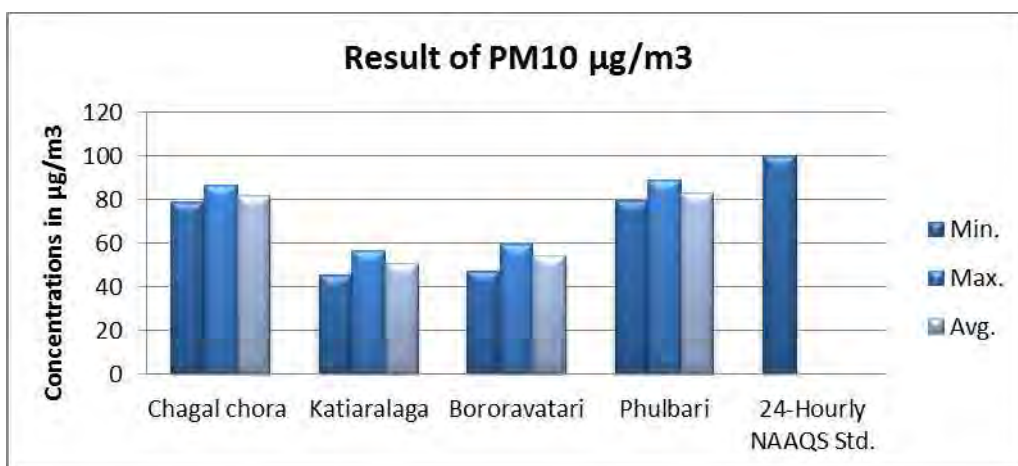
出典：JICA 調査団

図 7-15：大気質サンプル採取地点及び騒音測定地点



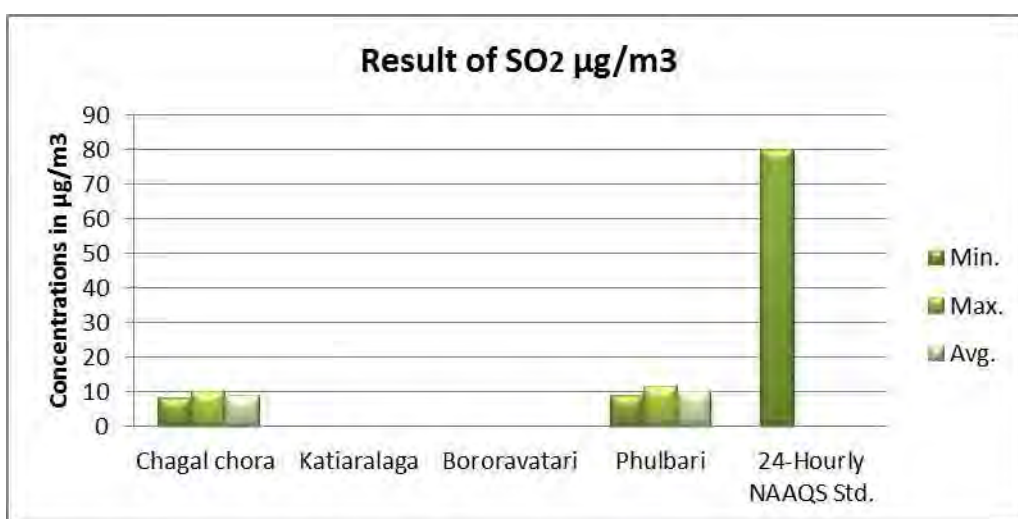
出典：JICA 調査団

図 7-16：測定地点 4 か所における大気中の PM2.5 濃度



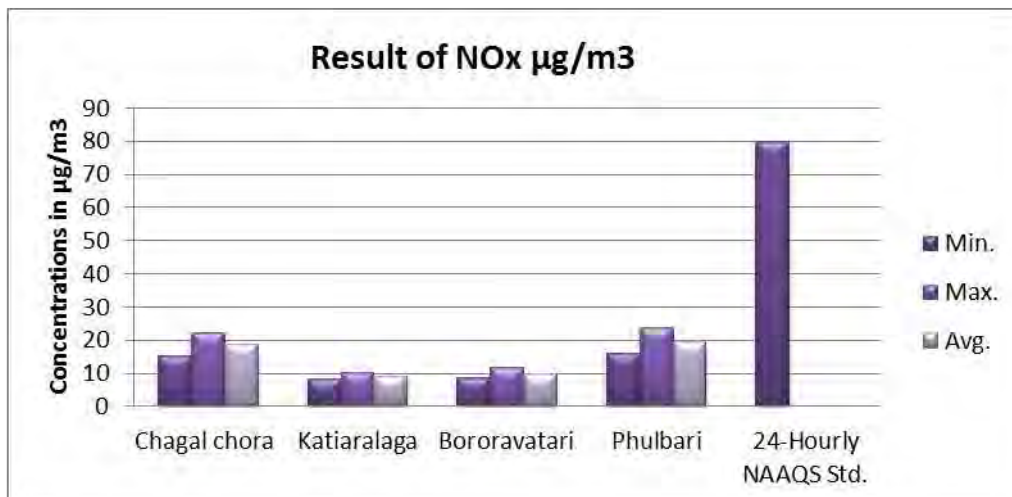
出典：JICA 調査団

図 7-17：測定地点 4 か所における大気中の PM10 濃度



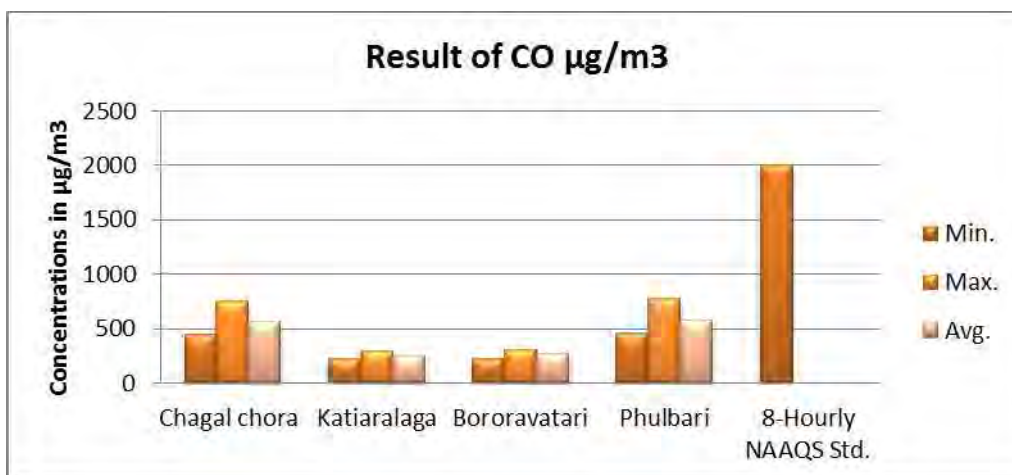
出典：JICA 調査団

図 7-18：測定地点 4 か所における大気中の SO2 濃度



出典：JICA 調査団

図 7-19：測定地点 4 か所における大気中の NO_x 濃度



出典：JICA 調査団

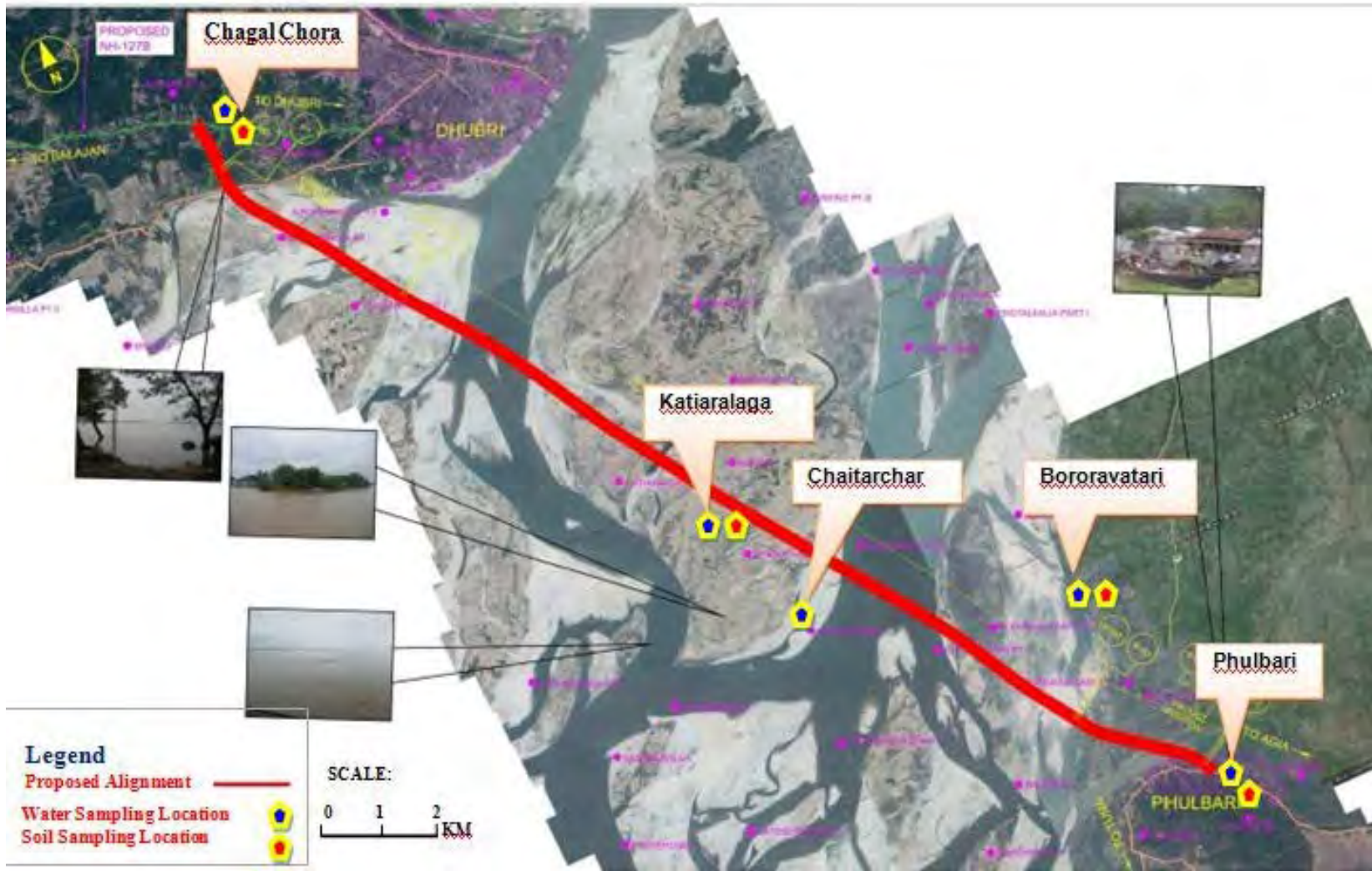
図 7-20：測定地点 4 か所における大気中の CO 濃度

イ) 水質・土壌

2016年10月に建設予定地周辺の5か所で水質及び土壌のサンプルを採取し、分析を行った。結果は下表のとおりである。

水質についてはプルバリのサンプリング地点1か所で、pHが基準値より低く、わずかに酸性を示した。また、Chaitarchar と Bororavatari のサンプリング地点で細菌が検出され、生活排水による汚染が生じていると思われた。それ以外はいずれもインドの環境基準及び EHS ガイドラインによる水質基準を満たしていた。

土壌についても酸性を示し、pHは5.4~6.5の範囲であった。土壌の質は良好であり、特に問題となる汚染は確認されなかった。インドには土壌汚染の基準値が存在しないため、日本の環境基準値との比較を行った結果、いずれも基準値以下であった。



出典：JICA 調査団

図 7-21：水質・土壌調査サンプリング地点

表 7-36 : 水質サンプル分析結果

	項目	単位	基準値 (IS:10500-2012)		Chagal chora (緯度 26° 02'0.58"N、 経度 89° 56'15.22"E) (井戸水)	Chaitarchar (緯度 25° 55'49.65"、 経度 89° 59'30.77"E) (プラマプトラ川)	Katiaralaga (緯度 25° 57' 48.71" N、 経度 89°58' 34.52" E) (手動ポンプ)	Bororavatari (緯度 25° 55' 00.77" N 経度 90° 01' 45.56" E) (Jinger 川)	Phulbari (緯度 25° 53' 21.04" N 経度 90° 02' 13.40" E) (井戸水)
			Desirable Limit	Permissible Limit					
1	pH	-	6.5-8.5	No Relaxation	6.56	7.54	7.29	6.63	6.02
2	Colour	Hazen	5	25	<5	<5	<5	<5	<5
3.	Turbidity	NTU	5	10	BDL	5.5	BDL	6.5	BDL
3	Dissolved Oxygen	% By Mass	5	10	7.2	6.5	6.5	7.0	6.0
4	BOD (at 27°C 3-Days)	mg/l	-	-	<2.0	3.8	<2.0	4.2	<2.0
5	COD	mg/l	-	-	BDL	10.6	BDL	16.0	BDL
6	TKN	mg/l	-	-	3.1	3.2	2.5	3.5	2.0
7	Total Hardness (as CaCO ₃)	mg/l	200	600	204.30	60.4	186.60	45.6	120
8	Calcium (as CaCO ₃)	mg/l	75	200	168	44.40	153	34.6	94
9	Magnesium (as CaCO ₃)	mg/l	30	100	38.3	16.0	33.6	11	26
10	Ammonia (NH ₃)	mg/l			BDL	BDL	BDL	BDL	BDL
11	Electrical Conductivity	Micromhos/cm	-	-	649.87	184.17	660.99	177.91	598.06
12	Chloride (as Cl)	mg/l	250	1000	23.99	0.5	27.3	4.49	50.99
13	Sulphate (as SO ₄)	mg/l	200	400	46.52	8.4	38.4	19.6	41.0
14	Phosphates	mg/l	-	-	BDL	BDL	BDL	BDL	BDL
15	Nitrate (as NO ₃)	mg/l	45	No Relaxation	10.68	3.8	8.32	2.6	9.6
16	Fluoride (as F)	mg/l	1	1.5	0.45	0.32	0.31	0.28	0.23
17	Arsenic (As)	mg/l	-	-	<0.01	<0.01	<0.01	<0.01	<0.01

	項目	単位	基準値 (IS:10500-2012)		Chagal chora (緯度 26° 02'0.58"N、 経度 89° 56'15.22"E) (井戸水)	Chaitarchar (緯度 25° 55'49.65"、 経度 89° 59'30.77"E) (ブラマプトラ川)	Katiaralaga (緯度 25° 57' 48.71" N、 経度 89°58' 34.52" E) (手動ポンプ)	Bororavatari (緯度 25° 55' 00.77" N 経度 90° 01' 45.56" E) (Jinger 川)	Phulbari (緯度 25° 53' 21.04" N 経度 90° 02' 13.40" E) (井戸水)
			Desirable Limit	Permissible Limit					
18	Lead (as Pb)	mg/l	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
19	Mercury (as Hg)	mg/l	-	-	<0.001	<0.0001	<0.001	<0.001	<0.001
20	Phenols	mg/l	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
21	Cyanides	mg/l	-	-	BDL	BDL	BDL	BDL	BDL
22	TDS	mg/l	500	2000	422.41	119.71	429.64	115.64	388.74
23	Iron (as Fe)	mg/l	0.3	1.0	0.165	0.24	0.18	0.54	0.14
24	Alkalinity as (CaCO ₃)	mg/l	200	600	221	68	216	51	168
25	Sodium (as Na)	mg/l	-	-	32.6	12	56.7	16.30	62.5
26	Potassium (as K)	mg/l	-	-	1.8	1.33	3.5	2.2	3.8
27	Total Organic Carbon (TOC)	mg/l	-	-	3.2	0.092	2.7	1.9	2.6
28	Zinc	mg/l	5	15	<0.05	0.044	<0.05	<0.05	0.208
29	Cadmium	mg/l	0.003	No Relaxation	<0.001	<0.01	<0.001	<0.001	<0.001
30	Chromium	mg/l	0.05	No Relaxation	<0.05	<0.01	<0.05	<0.05	<0.05
31	Manganese (as Mn)	mg/l	0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1
32	Nitrite (as No ₂)	mg/l	<0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
Bacteriological Parameters									
1.	Faecal Coliform	MPN/100 ml	Shall Not be Detectable		Absent	168	Absent	210	Absent
2.	Total Coliform	MPN/100 ml	Shall Not be Detectable		Absent	655	Absent	740	Absent

出典：JICA 調査団

表 7-37 : 土壌サンプル分析結果

S.No.	PARAMETERS	TEST METHOD	UNIT	Chagal chora (緯度 26° 01'59.13"N 経度 89° 56'16.42"E)	Katiaralaga (緯度 25° 57' 48.75" N 経度 89° 58'34.64" E)	Bororavatari (緯度 25° 55' 07.21" N 経度 90° 00' 56.29" E)	Phulbari (緯度 25° 53' 20.24" N 経度 90° 02' 14.60" E)	日本の土壌 汚染対策法に よる 基準値 (参考)
1.	pH (1:5 suspension)	IS:2720 (Part-26)	-	6.2	5.9	5.4	6.5	—
2.	Electrical Conductivity at 25° C (1:2suspension.)	IS:2720 (Part-21)	μS/cm	449	490	378	461	—
3.	Calcium Sulphates	STP/SOIL	mg/kg	BDL	BDL	BDL	BDL	—
4.	Magnesium (as Mg)	STP/SOIL	mg/kg	132.85	123.4	145.6	115.0	—
5.	Organic Matter	IS:2720 (Part-22)	% by mass	6.36	5.12	5.76	6.67	—
6.	Potassium (as K)	STP/SOIL	mg/kg	128.5	114.3	122.7	137.9	—
7.	Water Holding Capacity	STP/SOIL	% by mass	31.1	22.8	29.36	26.71	—
8.	Porosity	STP/SOIL	% by mass	23.3	17.3	22.82	32.7	—
9.	Sand	STP/SOIL	% by mass	38.0	37.8	39.3	36.4	—
10.	Clay	STP/SOIL	% by mass	54.6	55.2	52.7	54.4	—
11.	Silt	STP/SOIL	% by mass	7.4	7.0	8.0	9.2	—
12.	Sodium Sulphates	STP/SOIL	mg/kg	13.9	12.20	15.76	12.5	—
13.	Sodium Absorption Ratio	STP/SOIL	-	4.12	4.49	4.51	5.23	—
14.	Nitrogen	STP/SOIL	% by mass	0.062	0.057	0.051	0.076	—
15.	Phosphorus	STP/SOIL	mg/kg	22.7	18.4	16.20	21.93	—
16.	Bulk Density	STP/SOIL	gm/cc	1.30	1.37	1.52	1.45	—

S.No.	PARAMETERTS	TEST METHOD	UNIT	Chagal chora (緯度 26° 01'59.13"N 経度 89° 56'16.42"E)	Katiaralaga (緯度 25° 57' 48.75" N 経度 89° 58'34.64" E)	Bororavatari (緯度 25° 55' 07.21" N 経度 90° 00' 56.29" E)	Phulbari (緯度 25° 53' 20.24" N 経度 90° 02' 14.60" E)	日本の土壌 汚染対策法に よる 基準値 (参考)
17.	Texture	STP/SOIL	-	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay	—
18.	Moisture Retention capacity	STP/SOIL	%by mass	20.6	18.9	22.3	19.6	—
19.	Infiltration Rate	STP/SOIL	mm/hr	23.4	21.0	19.66	24.2	—
20.	Moisture	STP/SOIL	%	16.82	14.3	13.28	15.6	—
21.	Sulphates	STP/SOIL	mg/1000g	13.4	15.7	17.9	14.62	—
22.	Available Sulphur (as S)	STP/SOIL	mg/kg	0.081	0.072	0.060	0.078	—
23.	Available Manganese (as Mn)	STP/SOIL	mg/kg	0.048	0.040	0.051	0.059	—
24.	Available Iron (as Fe)	STP/SOIL	mg/kg	0.63	0.71	0.68	0.076	—
25.	Exchangeable Sodium Percentage	STP/SOIL	mg/kg	0.076	0.052	0.067	0.059	—
26.	Mercury (as Hg)	STP/SOIL	mg/kg	ND	ND	ND	ND	15
27.	Lead (as Pb)	STP/SOIL	mg/kg	ND	ND	ND	ND	150
28.	Cadmium (as Cd)	STP/SOIL	mg/kg	ND	ND	ND	ND	150
29.	Zinc (as Zn)	STP/SOIL	mg/kg	0.02	0.3	0.2	0.2	—
30.	Total Chromium	STP/SOIL	mg/kg	ND	ND	ND	ND	250

出典：JICA 調査団

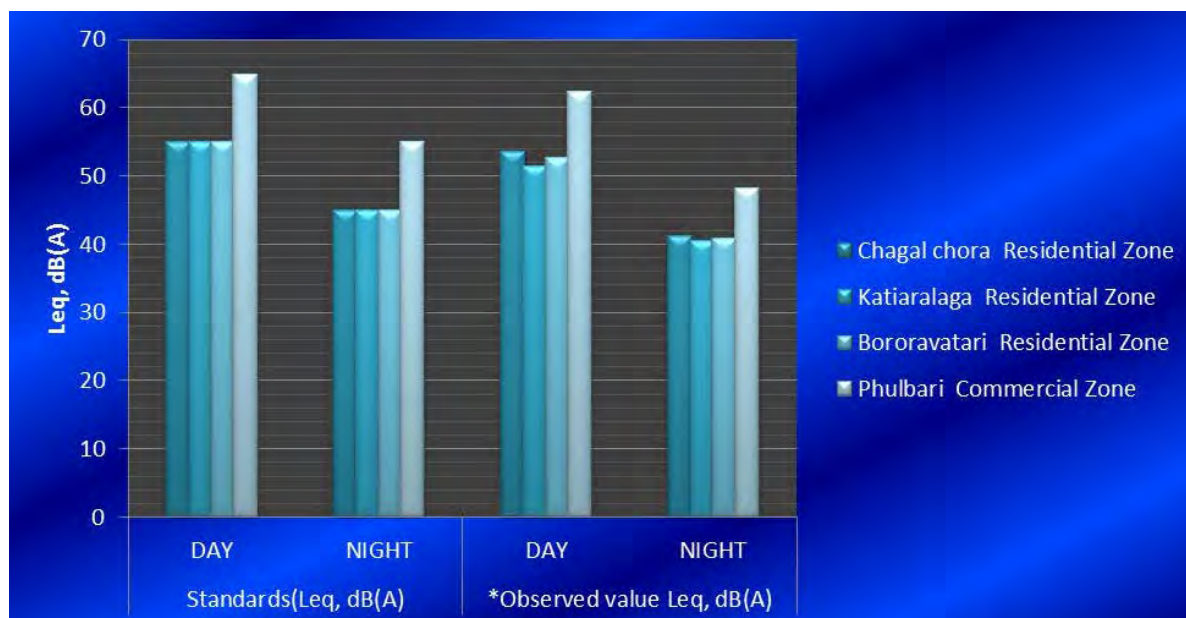
ウ) 騒音・振動

騒音・振動についても、2016年10月に現地調査を実施した。騒音は建設予定地周辺の4か所で測定を行った。振動については、現状では現地周辺に特に振動原となるものが存在しないため、測定を行っていない。結果を下表に示す。測定値はいずれもインドの環境基準及びEHSガイドラインの基準を満たしている。

表 7-38 : 調査対象地における騒音レベル

Sl. No	測定日	測定場所	区域	環境基準値 Leq, dB(A)		測定値 Leq, dB(A)	
				昼間	夜間	昼間	夜間
1	04.10.2016	Chagal chora (Latitude 26° 02'0.58"N & Longitude 89° 56'15.22"E)	住宅地	55	45	53.6	41.2
2	04.10.2016	Katiaralaga (Latitude 25° 57' 48.75" N & Longitude 89° 58'34.64" E)	住宅地	55	45	51.4	40.5
3	05.10.2016	Bororavatari (Latitude 25° 55' 05.21 N & Longitude 90° 00' 54.81" E)	住宅地	55	45	52.7	40.8
4	05.10.2016	Phulbari (Latitude 25° 53' 20.91" N & Longitude 90° 02' 15.30" E)	商業地	65	55	62.4	48.2

出典：JICA 調査団



出典：JICA 調査団

図 7-22 : 調査対象地周辺における騒音レベル

(2) 影響予測・評価

ア) 大気質

影響

建設用資材の運搬車両の通行や重機の使用等により、工事区間周辺やその風下において粉塵の増加などの短期的な大気質の悪化が予想される。現地調査の結果より、現在の大気質の測定値は中央汚染管理局の定める大気質環境基準値以下であるが、この影響により大気中の粒子状物質の値が一時的に上昇する可能性がある。供用後は上流のゴアルパラ橋まで迂回していた車両交通が最短距離でドゥブリ～プルバリ間を移動できるため温室効果ガスや大気汚染物質の排出量の削減という正の効果が期待できる一方、橋梁に交通が集中することにより橋梁周辺地域では大気汚染物質が増加する可能性があるが、交通需要予測に基づき大気汚染物質量のシミュレーションを行ったところ、汚染物質の増加はいずれも微量であり、大気質に対する悪影響は想定されなかった。

緩和策

ホット・ミックス・プラント等の大気汚染物質が発生する作業を行う場所は、住宅地等から少なくとも 500 m 以上風下に設置し、大気汚染防止法に従って粒子除去装置等を取り付ける。また、建設機械や車両等の整備を行い、排ガスが法令基準値以下であることを確認する。また、工事作業場所周辺での大気質のモニタリングを行う。さらに、砂塵等の飛散を防ぐために、作業場周辺への水撒きや生垣の設置を行う。建設資材を運搬する際には荷台をシートで覆い、落下や飛散を防ぐ。

供用後は、大気中の PM10、一酸化炭素、硫黄酸化物、窒素酸化物等のモニタリングを定期的に行い、必要な場合には速度制限や渋滞のコントロール、周辺住民への情報提供、関係機関への連絡・協議などの対策を行う。

イ) 水質

影響

橋梁建設の影響により、土砂流入等の一時的な水質への影響が想定される。工事中に環境に有害な物質を使用することはないため、周辺住民への健康被害や水生生物への悪影響は想定されない。労働者キャンプからの生活排水や、工事に使用する重機等からの油漏れによる限定的な汚染は発生する可能性がある。

工事に使用される水の供給については、ブラマプトラ川を含む表層水を使用する予定である。労働者キャンプにおける飲料水については、地元自治体の許可を得た上で上水道を利用する。

供用時における影響はほとんど想定されない。橋梁を通過する車両による事故が発生した場合にはガソリン等による汚染が想定されるが、このような影響は稀に発生したとしても局所的かつ限定的であり、環境に重大な悪影響はないと想定される。

緩和策

水質への悪影響を避けるため、特にモンスーン期においては川の付近や水辺での工事は避けられるべきである。また、廃棄物等は中央汚染管理局の規定に従って適切に処理し、水中に投棄されないよう十分注意する。重機等に使用するガソリン・油などによる水質汚染防止のため、建設に使用する重機や車両等のメンテナンスを適切に行い、オイル漏れ等がないよう事前にチェックする。給油は予め決められた場所でのみ行い、周囲に汚染防止のためオイルトラップを設ける。さらに、車両や重機の駐機場では、排水溝に油ろ過装置を設置する。この装置は1時間あたり 200 L の排水を処理することが可能で、水の表面に浮いた油をすくい取って排水から分離するものである。

また、労働者キャンプでは浄化槽を設置し、汚水を浄化してから環境中に排水する。この浄化槽は必要なメンテナンスを定期的に行う。建設に必要な水の調達は施工業者の責任となるが、周辺住民への水供給を阻害しないような方法で行い、できる限りの節水に努める。

供用後は、万一の事故等により油の流出が発生した場合に備え、予め緊急対応の役割分担や手順を定めたマニュアルを作成しておくことが望ましい。

ウ) 廃棄物

建設中に発生する廃棄物の種類としては、アスファルト片、コンクリート片、土砂、スクラップ鉄、および労働者キャンプからの有機物が想定される。廃棄物の量等は詳細設計及び工事計画の段階で明らかにし、環境管理計画に反映させる必要がある。発生したすべての廃棄物は、国及び州の法律に従って適切に処理する。

エ) 土壌

影響

建設時は有害物質による汚染は想定されないが、労働者キャンプからの廃棄物や重機からのオイル類の流出等による汚染が場合によっては発生する可能性がある。供用時における影響はほとんど想定されない。あるとすれば水質と同様に事故等の際の燃料の流出等の可能性がある。

緩和策

建設に使用する車両や重機のメンテナンス、資材管理を徹底し、ガソリン等の流出を防止する。給油所には土壌汚染対策として上記の油ろ過装置を設置するとともに、環境に影響を与えるような農地・住宅地等から離れた場所に設置する。また、全ての廃棄物等は廃棄物処理法 (Hazardous Waste Management and Handling Rules) に従って処理し、環境中への悪影響がないよう十分留意する。

オ) 騒音・振動

影響

建設工事中は、使用される重機や資材を運搬する車両からの騒音・振動が一時的に発生する。発生する騒音のレベルは、およそ 80 - 95 dB(A) (下表) である。工事が行われる日中のみ騒音が発生し、夜間は影響はない。

表 7-39 : 重機等により発生する騒音レベル

重機の種類	騒音レベル dB(A)
Bulldozer	80
Front end loader	72-84
Jack hammer	81-98
Crane with ball	75-87
Crane	75-77
Bulldozer	80
Backhoe	72-93
Front end loader	72-84
Cement & Dump trucks	83-94
Jack hammer	81-98
Scraper	80-93
Welding generator	71-82
Grader	80-93
Roller	73-75
Concrete mixer	74-88
Concrete pump	81-84
Concrete vibrator	76
Paver	86-88
Truck	83-94
Tamper	74-77
Air compressor	74-87
Pneumatic tools	81-98

出典 : U.S. Environmental Protection Agency, noise from Construction Equipment and Operations. Building, Equipment and Home Appliance.NJID. 300.1. December 31, 1971

現状では建設予定地周辺の騒音レベルは基準値以下であるが、建設工事中に発生する騒音により周辺環境及び特に建設作業に従事する作業員への悪影響を及ぼす可能性がある。インドでは建設作業員に対する騒音基準として米国労働安全衛生管理局と同等の基準を採用しているが、最長 8 時間の作業シフトにおける騒音の上限は 90 dB(A)とされている。また、突発的な騒音に関してはアメリカ合衆国産業衛生専門家会議の推奨する上限は 140 dB(A)である。これらの上限値を超えないよう対策を講じる必要がある。

供用後は道路状態の改善により、渋滞の解消や騒音の減少効果が期待される。しかしながら、将来的に物流の需要が増加した場合には、トラックなどの交通量の増加に伴って騒音が増加する可能性もある。

緩和策

騒音の影響を低減するために以下の対策が必要である。

- 建設機械等から発生する騒音については、CPCB の基準を順守する。建設重機や車両等を定期的にモニタリングし、消音装置やマフラーのメンテナンスを行う。
- 90 dB(A)以上の大きな騒音が発生する場所では、作業員に耳栓・ヘルメットの使用を義務付ける。
- 住宅地の近くでは夜 10 時から朝 6 時までには作業を中断する。
- 作業プラントを設置する場所は学校や病院などの影響を受けやすい施設から 500 m 以上離れた場所とするか、または遮音壁などを設置して騒音を軽減する。
- 騒音や振動を発生する作業は一度に複数の作業を行わず、タイミングをずらす。
- 建設中の工事車両、資材搬入車両等の運行ルートにおいて、住宅街および学校や病院などの影響を受けやすい施設の近隣を可能な限り避ける。
- 建設機械は住宅地から離れた場所に設置する。
- 無駄な騒音が発生しないよう、効率的な作業計画を立てる。
- 供用後は騒音が増加しないよう、路面のメンテナンスを定期的に行う。
- 住宅地の近くではドライバーが警笛を無駄に使用しないよう標識を設置する。
- 必要に応じ路肩に防音壁やグリーンベルトを設ける。

カ) 底質

影響

計画中のボーリング調査により底質に軽微な影響が想定されるが、一時的なものである。橋梁下部工の工事中に河床を掘削するが、基礎工の工事完了後に埋め戻して原形復旧するので一時的な影響である。

供用後は特段の影響はない。

緩和策

底質の移動に伴い、工事実施者は汚濁防止カーテンを設置する必要がある。洪水警報が出ている際には工事を中断する。

7.8.2 自然環境に対する主な影響

(1) 現況調査結果

ア) 生態系

調査対象地の生態系・生物多様性について、2016年10月に調査を行った。調査方法は、対象地域内の現地踏査による植物・動物相の確認、GPS を使用した土地利用状況の確認、森林局等の報告書による文献調査、及び政府機関・漁業者・ボートオペレーター・ローカル環境 NGO・現地の生態系に詳しい学識者等を対象とした聞き取り調査、Guwahati 大学動物学部長への聞き取り調査により、現地の生物多様性についての情報を収集した。

対象地域の主な生態系はブラマプトラ川の河川生態系である。既述のとおり土砂が堆積してできた中州には小さな村があり居住地となっている。村の住民は自然資源を利用した簡素な漁業及び農業を行っている。対象地域内に自然林は認められず、場所によりチークやユーカリ等が植樹されている。西ガロ・ヒルズ県のプルバリ近郊には落葉樹林が認められるが、橋の建設予定地からは15 km以上離れている。

対象地域内では農業作物種として栽培されている37種の植物種が確認された。また、住民によってヤギ、牛、水牛、豚、アヒル、鶏等の飼育がおこなわれている。また、住民による漁業もおこなわれているが、水産物の養殖（魚やエビ等）は行われていない。

表 7-40 : 調査対象地内で見られる栽培植物種リスト

学名	科	形態	俗名
<i>Allium cepa</i>	Amaryllidaceae	Vegetable	Piyaj
<i>Allium sativum</i>	Amaryllidaceae	Spice	Lahsun
<i>Amaranthus</i> sp.	Amaranthaceae	Vegetable	Lalsag
<i>Anacardium occidentale</i>	Anacardiaceae	Plantation Crop	Kaju
<i>Ananas comosus</i>	Bromeliaceae	Fruit	Pineapple
<i>Areca catechu</i>	Arecaceae	Plantation Crop	Tambul
<i>Artocarpus hetrophyllus</i>	Moraceae	Vegetable	Kathal
<i>Brassica</i> spp.	Brassicaceae	Oilseed	Sarson
<i>Capsicum annuum</i>	Solanaceae	Vegetable	Mirch
<i>Carica papaya</i>	Caricaceae	Fruit	Papita
<i>Cier aeriatinum</i>	Fabaceae	Pulse	Chana
<i>Citrus media</i>	Rutaceae	Fruit	Nimbu
<i>Cocos nucifera</i>	Arecaceae	Fruit	Narikol
<i>Colocasia antiquorum</i>	Aracea	Vegetable	Kachchu
<i>Corchorus capsularis</i>	Malvaceae	Fibre	Jute
<i>Coriandrum sativum</i>	Apiaceae	Condiment & Spice	Dhania
<i>Cucumis sativa</i>	Cucurbitaceae	Fruit	Kheera
<i>Cucurbita pepo</i>	Cucurbitaceae	Vegetable	Kaddu
<i>Daucus carota</i>	Apiaceae	Vegetable	Gajar
<i>Hevia brasiliensis</i>	Euphorbiaceae	Plantation Crop	Ruber
<i>Lens esculenta</i>	Fabaceae	Pulse	Masur
<i>Luffa</i> spp.	Cucurbitaceae	Vegetable	Lauki
<i>Lycopersicon esculentum</i>	Solanaceae	Vegetable	Tamatar
<i>Momordica charantia</i>	Cucurbitaceae	Vegetable	Karela
<i>Musa indica</i>	Musaceae	Fruit	Kela
<i>Oryza sativa</i>	Poaceae	Cereal	Dhan
<i>Phaseolus mungo</i>	Fabaceae	Pulse	Urd
<i>Psidium guajava</i>	Myrtaceae	Fruit	Amrud
<i>Raphanus sativa</i>	Brassicaceae	Vegetable	Muli
<i>Sesamum indicum</i>	Pedaliaceae	Oilseed	Til
<i>Solanum melongena</i>	Solanaceae	Vegetable	Began

学名	科	形態	俗名
<i>Solanum tuberosum</i>	Solanaceae	Vegetable	Aalu
<i>Spinach oleracea</i>	Amaranthaceae	Vegetable	Palak
<i>Trigonella foenium graecum</i>	Fabaceae	Vegetable	Methi
<i>Triticum aestivum</i>	Poaceae	Cereal	Gehu
<i>Zea mays</i>	Poaceae	Cereal	Makka
<i>Zingiber officinalis</i>	Zingiberaceae	Rhizome	Adrakh

出典：JICA 調査団

調査対象地で確認された野生植物は 75 種で、希少種は含まれていなかった。うち 27 種は侵略的外来種であった。中州ではサトウキビ属の 1 種で在来種の *Saccharum spontaneum* が優先種であった。

表 7-41：調査対象地内で見られる野生植物種リスト

学名	科	形態	生息状況	IUCN に よる分類
(A) ANGIOSPERMS				
<i>Acacia pennata</i>	Mimosaceae	Herb	Common	LC
<i>Ageratum conyzoides</i>	Asteraceae	Herb	Very Common	NA
<i>Albizia procera</i>	Mimosaceae	Tree	Rare	NA
<i>Anthocephalus chinensis</i>	Rubiaceae	Tree	Common	NA
<i>Artocarpus integrifolia</i>	Moraceae	Small Tree	Common	NA
<i>Arundinella nepalensis</i>	Poaceae	Herb	Common	NA
<i>Arundo donax</i>	Poaceae	Herb	Common	LC
<i>Asparagus racemosus</i>	Liliaceae	Trailing Herb	Rare	NA
<i>Bauhinia acuminata</i>	Caesalpiniaceae	Small Tree	Common	LC
<i>Bombax ceiba</i>	Bambacaceae	Tree	Very Common	NA
<i>Cardamine impatiens</i>	Brassicaceae	Herb	Common	NA
<i>Cassia fistula</i>	Caesalpiniaceae	Small Tree	Common	NA
<i>Cassia tora</i>	Caesalpiniaceae	Shrub	Common	NA
<i>Chrysopogon fulvus</i>	Poaceae	Herb	Common	NA
<i>Cissampelos pariera</i>	Manispermaceae	Herb	Rare	NANIC
<i>Commelina bengalensis</i>	Commelinaceae	Herb	Very Common	NANIC
<i>Cyperus rotundus</i>	Cyperaceae	Herb	Abundant	NANIC
<i>Dendrocalamus hamiltonii</i>	Poaceae	Herb	Common	NA
<i>Dioscorea bulbifera</i>	Dioscoreaceae	Climber	Common	NA
<i>Erythrina variegata</i>	Papilionaceae	Small Tree	Rare	NA
<i>Eucalyptus tereticornis</i>	Myrtaceae	Tree	Rare	NA
<i>Euphorbia emodi</i>	Euphorbiaceae	Herb	Common	LC
<i>E. hirta</i>	Euphorbiaceae	Herb	Common	NA
<i>Ficus hispida</i>	Moraceae	Tree	Common	NA
<i>Galium sp.</i>	Rubiaceae	Herb	Common	NA
<i>Gmelina arborea</i>	Verbenaceae	Tree	Common	NA

学名	科	形態	生息状況	IUCN による分類
<i>Imperata cylindrica</i>	Poaceae	Herb	Common	LC
<i>Ipomoea aquatica</i>	Convolvulaceae	Herb	Common	NA
<i>I. cairica</i>	Convolvulaceae	Creeper	Very common	NA
<i>Justicia adhatoda</i>	Acanthaceae	Shrub	Common	NA
<i>Lagerstroemia parviflora</i>	Lytharaceae	Tree	Rare	NA
<i>Lathyrus aphaca</i>	Fabaceae	Herb	Common	NA
<i>Lemna minor</i>	Lemnaceae	Herb	Common	LC
<i>Lepidium virginicum</i>	Brassicaceae	Herb	Common	NA
<i>Litsea glutinosa</i>	Lauraceae	Tree	Rare	NA
<i>Mallotus philippensis</i>	Euphorbiaceae	Small Tree	Common	NA
<i>Mimosa pudica</i>	Mimosaceae	Herb	Rare	NA
<i>Phragmites karka</i>	Poaceae	Herb	Common	LC
<i>Phyllanthus emblica</i>	Euphorbiaceae	Tree	Common	NA
<i>Poa annua</i>	Poaceae	Herb	Common	LC
<i>Potamogeton pectinatus</i>	Potamogetonaceae	Herb	Common	LC
<i>Pycnium spp.</i>	Cyperaceae	Herb	Abundant	NA
<i>Ranunculus arvensis</i>	Ranunculaceae	Herb	Common	NA
<i>Saccharum spontaneum</i>	Poaceae	Herb	Abundant	LC
<i>Sapium baccatum</i>	Euphorbiaceae	Tree	Common	NA
<i>Scripus spp.</i>	Cyperaceae	Herb	Common	NA
<i>Shorea robusta</i>	Dipterocarpaceae	tree	Rare	NA
<i>Smilax zylanica</i>	Smilacaceae	Climber	Rare	LR
<i>Solanum erianthum</i>	Solanaceae	Herb	Common	NANIC
<i>Sonchus spp.</i>	Asteraceae	Herb	Common	NA
<i>Stellaria media</i>	Caryophyllaceae	Herb	Common	NA
<i>Syzygium cumini</i>	Myrtaceae	Tree	Common	NA
<i>Tectona grandis</i>	Verbenaceae	Tree	Common	NA
<i>Thysanolaena maxima</i>	Poaceae	Herb	Common	NA
<i>Tinospora cordifolia</i>	Manispermaceae	Climber	Rare	NA
<i>Toona ciliata</i>	Meliaceae	Tree	Common	NA
<i>Trewia nudiflora</i>	Euphorbiaceae	Tree	Rare	LR
<i>Vitex peduncularis</i>	Verbenaceae	Tree	Rare	NA
<i>Zizyphus mauritiana</i>	Rhamnaceae	Tall Shrub	Abundant	NANIC
(B) FERNS AND FERN ALLIES				
<i>Adiantum caudatum</i>	Adiantaceae	Herb	Common	NA
<i>Equisetum diffusum</i>	Equisetaceae	Herb	Common	NA
<i>Marselia minuta</i>	Marseliaceae	Herb	Common	NANIC
<i>Pteris biaurita</i>	Pterideae	Herb	Rare	NA
<i>Seleginella helferi</i>	Selaginellaceae	Herb	Common	NANIC

凡例：VU = Vulnerable, NA = Not assessed but present in the catalogue of Life, NANIC = Not assessed and not present in the catalogue of Life, LC = Least concern, LR = Low risk

出典：JICA 調査団

表 7-42 : 調査対象地内で見られる外来植物種リスト

学名	科	形態	原産地
<i>Aerva javanica</i>	Amaranthaceae	Herb	Tropical America
<i>Ageratum conyzoides</i>	Asteraceae	Herb	Brazil
<i>Amaranthus spinosus</i>	Amaranthaceae	Herb	Tropical America
<i>Anagallis arvensis</i>	Primulaceae	Herb	Europe
<i>Argemone mexicana</i>	Papaveraceae	Herb	Tropical South America
<i>Calotropis procera</i>	Asclapiadaceae	Shrub	Tropical America
<i>Cannabis sativa</i>	Cannabaceae	Herb	Tropical America
<i>Chenopodium album</i>	Chenopodiaceae	Herb	Tropical America
<i>Cleome viscosa</i>	Capparaceae	Herb	Tropical America
<i>Cuscuta reflexa</i>	Cuscutaceae	Climber	Mediterranean region
<i>Datura metal</i>	Solanaceae	Shrub	Tropical America
<i>Eichhornia crassipes</i>	Pontederiaceae	Herb	Tropical America
<i>Euphobia hirta</i>	Euphorbiaceae	Herb	Tropical America
<i>E. thymifolia</i>	Euphorbiaceae	Hurb	Tropical America
<i>Galinsoga paviflora</i>	Asteraceae	Herb	Tropical America
<i>Lantana camara</i>	Verbenaceae	Shrub	Tropical America
<i>Oxalis corniculata</i>	Oxalidaceae	Herb	Europe
<i>Parthenium hysterophorus</i>	Asteraceae	Herb	Tropical America
<i>Physalis minima</i>	Solanaceae	Herb	Tropical America
<i>Portulaca oleracea</i>	Portulacaceae	Herb	Tropical South America
<i>Prosopis juliflora</i>	Mimosaceae	Small Tree	Mexico
<i>Side acuta</i>	Malvaceae	Herb	Tropical America
<i>Solanum nigrum</i>	Solanaceae	Herb	Tropical America
<i>Tridex procumbens</i>	Asteraceae	Herb	Tropical America
<i>Typha angustifolia</i>	Typhaceae	Herb	Tropical America
<i>Xanthium strumarium</i>	Asteraceae	Herb	Tropical America

出典 : JICA 調査団

また、動物に関しては、表 7-43 に存在が確認された種とそのインド野生生物保護法による指定状況及び IUCN レッドリストにおける分類を示した。全 177 種が確認されたが、そのうち上記のインド野生生物保護法と IUCN のいずれかまたは両方において希少種に指定されている種は哺乳類 5 種、鳥類 8 種、爬虫類 9 種、両生類 1 種であった。なお、確認された種の中には、季節移動をする種も含まれていた。例えば、ガンジスカワイルカは、川の水位の季節変動に適応して雨期と乾季で生息場所を移動することが知られているが、調査対象地周辺では年間を通じて生息する。その他の季節的な移動をする種は全て鳥類であり、爬虫類・両生類・魚類・無脊椎動物については季節変動はなかった。

表 7-43 : 調査対象地周辺における動物種リスト

Scientific Name	Local /English Name	Status* WLA	IUCN** Status
Mammals			
<i>Canis aureus</i>	Jackal		LC
<i>Cynomys badius</i>	Bay Bamboo rat		NANIC
<i>Lepus nigricollis</i>	Hare	Sch.III	LC
<i>Macaca mulatta</i>	Monkey		LC
<i>Mus musculus</i>	House mouse		LC
<i>Platanista gangetica ssp. gangetica</i>	Dolphin	Sch. I	EN
<i>Pteropus giganteus</i>	Flying fox	Sch. I	LC
<i>Trachypithecus pileatus</i>	Capped Langur	Sch. I	VU
<i>Sus scrofa</i>	Wild Boar		LC
<i>Vulpes bengalensis</i>	Fox	Sch. III	LC
Birds			
<i>Actitis hypoleucos</i>	Common Sandpiper		LC
<i>Alcedo atthis</i>	Common Kingfisher		LC
<i>Anas crecca</i>	Common Teal		LC
<i>Anas acuta</i>	Northern Pintail		LC
<i>A. strepera</i>	Gadwall		LC
<i>A. platyrhynchos</i>	Mallard		LC
<i>Alcedo atthis</i>	Common Kingfisher		LC
<i>Anastomus oscitans</i>	Asian Openbill		LC
<i>Ardea alba</i>	Great Egret		LC
<i>A. cinerea</i>	Grey Heron		LC
<i>A. intermedia</i>	Intermediate Egret		LC
<i>Ardea cinerea</i>	Grey Heron		LC
<i>Ardeola grayii</i>	Indian Pond Heron		LC
<i>Aythya baeri</i>	Baer's Pochard		CR
<i>A. ferina</i>	Common Pochard		LC
<i>A. fuligula</i>	Tufted Duck		LC
<i>A. nyroca</i>	Ferruginous Duck		NT
<i>A. platyrhynchos</i>	Mallard		LC
<i>Bubulcus ibis</i>	Bagula, Cattle Egret		LC
<i>Calidris minuta</i>	Little Stint		LC
<i>Ceryle rudis</i>	Pied Kingfisher		LC
<i>Charadrius dubius</i>	Little Ringed Plover		LC
<i>Chlidonias hybrida</i>	Whiskered Tern		LC
<i>Chroicocephalus ridibundus</i>	Black-headed Gull		LC
<i>Circus melanoleucos</i>	Pied Harrier		LC
<i>Corvus splendens</i>	House Crow		LC

Scientific Name	Local /English Name	Status* WLA	IUCN** Status
<i>Cuculus micropeterus</i>	Indian Cuckoo		NANIC
<i>Dendrocygna javanica</i>	Lesser Whistling Duck		LC
<i>Dendrocopus mahrattensis</i>	Woodpecker		NANIC
<i>Egretta garzetta</i>	Little Egret		LC
<i>Falco tinnunculus</i>	Common Kestrel		LC
<i>Fulica atra</i>	Common Coot		LC
Gallinago gallinago	Common Snipe		LC
<i>Gracula religiosa</i>	Hill Myna	Sch. II	LC
Gyps indicus	Vulture	Sch. I	CR
<i>Halcyon smyrnensis</i>	White-throated Kingfisher		LC
<i>Hirundo rustica</i>	Barn Swallow		LC
<i>Hydrophasianus chirurgus</i>	Pheasant-tailed Jacana		LC
<i>Leptoptilos javanicus</i>	Lesser Adjutant		VU
<i>L. dubius</i>	Greater Adjutant		VU
Mareca strepera	Gadwall		LC
M.penelope	Eurasian Wigeon		LC
<i>Metopidius indicus</i>	Bronze-winged Jacana		LC
<i>Microcarbo niger</i>	Little Cormorant		LC
Motacilla flava	Western Yellow Wagtail		LC
M. alba	White Wagtail		LC
M. citreola	Citrine Wagtail		LC
M. cinerea	Grey Wagtail		LC
Otus spilocephalus	Mountain Scops Owl	Sch. I	LC
<i>Rostratula benghalensis</i>	Greater Painted-snipe		LC
<i>Passer domesticus</i>	House Sparrow		LC
<i>Perdica asiatica</i>	Jungle Bush Quail		LC
Ploceus philippinus	Baya		LC
Pluvialis fulva	Pacific Golden Plover		LC
<i>Podiceps nigricollis</i>	Blacknecked grebe		LC
<i>Porphyrio porphyrio</i>	Purple Swamphen		LC
<i>Psittacula krameri manillensis</i>	Parrot	Sch. I	NA
Spatula clypeata	Red-crested Pochard		LC
S. querquedula	Garganey		LC
<i>Sturnus contra</i>	Grey-headed Myna	Sch.I	NA
<i>Tachybaptus ruficollis</i>	Little Grebe		LC
Tringa stagnatilis	Marsh Sandpiper		LC
T. glareola	Wood Sandpiper		LC
T. nebularia	Common Green Shank		LC
T. ochropus	Green Sandpiper		LC
Vanellus vanellus	Northern Lapwing		LC
V. cinereus	Grey-headed Lapwing		LC

Scientific Name	Local /English Name	Status* WLA	IUCN** Status
<i>V. indicus</i>	Red-wattled Lapwing		LC
Reptiles			
<i>Aspideretes gangeticus</i>	Gangetic softshell turtle	Sch. I	VU
<i>Aspideretes hurum</i>	Indian peacock softshell turtle	Sch. I	VU
<i>Bungarus fasciatus</i>	Common Indian Krait	Sch. II	LC
<i>Chitra indica</i>	Narrow-headed softshell turtle		EN
<i>Crotalus sp.</i>	Viper		LC
<i>Cyclemys sp.</i>	Asian leaf turtle		NT
<i>Hemidactylus flaviviridis</i>	House Gecko		NA
<i>Lissemys punctata</i>	Indial flap-shelled turtle		LC
<i>Melanochelys tricarinata</i>	Tricarinate turtle	Sch. I	VU
<i>Morenia petersi</i>	Indian eyed turtle		VU
<i>Naja naja</i>	Cobra	Sch. II	DD
<i>Pangshura smithii</i>	Brown roofed turtle		NT
<i>Pangshura sylhetensis</i>	Assam roofed turtle		EN
<i>P. tentoria</i>	Indian tent turtle		LC
<i>Varanus bengalensis</i>	Common Indian Monitor	Sch. I	LC
Amphibians			
<i>Bufo melanostictus</i>	Common Asian Toad		LC
<i>Hoplobatrachus tigerinus</i>	Indian Bull Frog	Sch. I	LC
<i>Polypedates sp.</i>	Frog		LC
<i>Spaerotheca breviceps</i>	Burrowing Frog		NANIC
Fish			
<i>Ailia coila</i>	Gangetic ailia		NT
<i>Amphipnous cuchia</i>	Cuchia		NA
<i>Anabas testudineus</i>	Climbing perch		DD
<i>Aorichthys seenghala</i>	Giant river-catfish		NA
<i>A. aor</i>	Long-whiskered catfish		LC
<i>Apistogramma borelli</i>	Bareli		NA
<i>Aspidoparia moror</i>	Boreala		NANIC
<i>Badis badis</i>	Blue perch		LC
<i>Bagarius bagarius</i>	Devil catfish		NT
<i>Barillus bendalasis</i>	Barilius		NANIC
<i>B.barna</i>	Barilius		NANIC
<i>Batasio sp.</i>	Tengra		NA
<i>Catla catla</i>	Catla		NA
<i>C.striatus</i>	Sal		NANIC
<i>Chaca chaca</i>	Angler catfish		LC
<i>Chanda nama</i>	Elongate glassy perchlet		LC
<i>C.ranga</i>	Indian Glassy Fish		LC
<i>C.baculis</i>	Chanda		NA

Scientific Name	Local /English Name	Status* WLA	IUCN** Status
<i>Channa marulius</i>	Sal		LC
<i>C. orientalis</i>	Chengeli		NA
<i>C.punctatus</i>	Spotted snakehead		NA
<i>C.striatus</i>	Striped snakehead		NA
<i>Cirrhinus mrigala</i>	Mrigal		LC
<i>C. reba</i>	Mrigal		LC
<i>Clarias butrachus</i>	Magur		NANIC
<i>C.gariepinus</i>	African sharptooth catfish		LC
<i>Clupisoma garua</i>			LC
<i>Colisa chuna</i>	Honey Gourami		NA
<i>C.fasciata</i>	Banded gourami		NA
<i>C.lalia</i>	Dwarf gourami		NA
<i>Ctenopharyngodon idella</i>	Grass carp		NA
<i>Cyprinus carpio*</i>	Common carp/Chinese carp		VU
<i>C. nudus</i>	Common carp/Chinese carp		NA
<i>Eutropiichthys vacha</i>			LC
<i>E. murius</i>	Kangong		LC
<i>Gudusia chapra</i>	Indian river shad		LC
<i>Heteropneustes fossilis</i>	Asian stinging catfish		LC
<i>Hypophthalmichthys molotrix</i>	Silver carp		NA
<i>Labeo rohita</i>	Rohu/Rau		NANIC
<i>L. calbasu</i>	Orangefin labeo		LC
<i>L. gonius</i>	Kuria labeo		LC
<i>L. dero</i>	Kalabans		LC
<i>L. boga</i>	Bogabata		LC
<i>L. pangusia</i>	Bholung		NT
<i>Macrogathus pancalus</i>	Indian spiny eel		LC
<i>M aculeatus</i>	Lesser spiny eel		NA
<i>Mastacembelus armatus</i>	Common Spiny Eal		LC
<i>Monopterus cuchia</i>	Cuchia		LC
<i>Mystus bleekeri</i>	Day's mystus		LC
<i>M. cavasius</i>	Dwarf Tengra		LC
<i>M. gulio</i>	Long Whiskers Catfish		LC
<i>M. tengara</i>	Tingorah		LC
<i>M. vittatus</i>	Striped dwarf catfish		LC
<i>Nanuas nandus</i>			NANIC
<i>Neolissocheilus hexagonolepis</i>	Mahseer		NA
<i>Noemachilus beavani</i>	Botia		NANIC
<i>N. botia</i>	Striped Louch		NANIC
<i>Notopteru notopterus</i>	Bronze featherback		NANIC
<i>N chitala</i>			NANIC

Scientific Name	Local /English Name	Status* WLA	IUCN** Status
<i>Ompok bimaculatus</i>	butter catfish		NT
<i>O. pabo</i>	Pabo catfish		NT
<i>O. pabda</i>	Pabdah catfish		NT
<i>Pangasius pangasius</i>	Pangas catfish		LC
<i>Punctius chola</i>	Puthi/Punti		NANIC
<i>P. javanicus</i>			NANIC
<i>P. sarana</i>	Fire fin barb		NANIC
<i>P. ticto</i>			NANIC
<i>Rita rita</i>	Rita		LC
<i>Tenualosa ilisha (Hilsa ilisha)</i>	Ilis/Ilisha		LC
<i>Wallago attu</i>	Wallago		NT
Invertebrates			
<i>Macrobrachium choprai</i>	Prawn		NA
<i>M. rosenbergii</i>	Prawn		NA
<i>Macrognathus aral</i>	Toru		LC
<i>Chilades Laius</i>	Lime blue		NA
<i>Graphium sarpedon sarpedon</i>	Common Bluebottle		NA
<i>Mycalensis perseus blasius</i>	Common Bushbown		NANIC
<i>Anopheles stepnensi</i>	Anepheles Mosquito		NANIC
<i>Culex quinquefasciatus</i>	Culex Mosquito		NANIC
<i>Hippasa lycosina</i>	Grassland spider		NA
<i>Pholcus phalangiodes</i>	House Spider		NANIC

注) *本地域においては外来種であり、生息数も多い。太字：回遊・移動する種

凡例: VU = Vulnerable, NA = Not assessed but present in the catalogue of Life, NANIC = Not assessed and not present in the catalogue of Life, LC = Least concern, LR = Low risk, NT = Near Threatened, EN = Endangered, CR = Critically Endangered, DD = Data Deficient

出典：JICA 調査団

ガンジスカワイルカについては、アッサム州内のブラマプトラ水系において過去 17 年間にわたり調査・研究及び保全活動を行ってきた Wildlife Institute of India のプロジェクト研究員 Abdul Wakid 博士にヒアリングを行った。博士によれば、2012 年に実施した調査の結果、ブラマプトラ川に生息するイルカの個体数は以下のとおり推定されている。

- ブラマプトラ川全域（支流を含む）：635 頭
- ブラマプトラ川本流：583 頭
- ゴアルパラ橋からバングラ国境まで：92～96 頭

Wakid 博士の研究チームはアッサム州内のブラマプトラ川の上流から下流までを 7 つのセクションに分けて調査を行っているが、そのうちゴアルパラ橋からバングラ国境まで（ドゥブリを含む）のセクションが最もイルカの生息数が多いと推定される。ドゥブリ付近の集団は、3 月ごろから 7 月ごろにかけて繁殖を行う。年間を通じてドゥブリ付近に生息するが、冬季は川の水位が低下するため生息範囲が限られ、水深が深い場所に集まる傾

向がある。2008 年以降、イルカの保全のために密漁対策を行ってきたことが功を奏し、イルカの頭数は増加傾向にある。

イ) 水文・地形・地質

河床地形測量により、橋梁横断個所を含めた前後 20 km の範囲について、ブラマプトラ川の全幅の河床地形図を作成した。ブラマプトラ川の支流である北岸のガダダール川 (Gadadhar River) および南岸のジンジラム川 (Jinjiram River) についても、その影響を考慮する為に河床地形測量を実施した。

既存水理データは、ブラマプトラ川とバラック流域 (Barak Basin) を管理している中央河川委員会 (CWC) のシロン局の観測データ、流域や水理データの既存資料、地域住民へのヒアリング、上流に位置するナラナラヤン橋 DPR、北東州合同水理研究所 (NEHARI) の水理モデル等入手した。これらのデータに基づいて、計画洪水位 (HFL) や計画低水位 (LWL)、その他の分析に必要なパラメーターを設定した。分析ソフトは、河川の浸食分析に良く用いられる HEC-RAS を使用した。



出典：DPR

図 7-23：ドゥブリ橋横断個所の河床地形図

河川内に構造物を設置することで、堤防や河床が浸食される原因が二種類ある。河川断面縮小浸食と局部浸食である。河川断面縮小浸食は、河川内に構造物が設置されるために、河川の流水断面が小さくなり、流速が増すことにより浸食が促進されるものである。

局部浸食は、河川内の構造物の周りに渦や波が発生することで流速が増し、浸食が促進されるものである。この二つの種類の浸食が組み合わさって浸食量が決まる。分析に当たり使用した水理パラメーターは下表のとおりである。

表 7-44 : 水理パラメーター

パラメーター	値
設計洪水位 (HFL)	30.36 m
設計低水位 (LWL)	23.00 m
平均河床勾配	1/14,700
100 年確率洪水	100,306 m ³ /s
10 年確率洪水	71,225 m ³ /s
設計洪水位における最高流速	4.5 m/s

出典：DPR に基づいて JICA 調査団作成

分析の結果、次の結論を得た。

- 河川内への橋脚設置による川幅狭小による影響は発生しない。
- 局部浸食は、100 年確率の洪水時に最大で 11.08 m が橋脚基礎工に発生する。

この分析の結果を用いて、橋脚基礎工の構造設計を 100 年確率の洪水に対応する設計を行っている。局部浸食は洪水が終わると自然回復するために河川への影響は発生しない。また、10 年確率洪水は、本事業の工事期間中に発生する可能性があるために、施工計画において対応している。

(2) 影響予測・評価

ア) 生態系

植生への影響

植物種については、栽培種、在来種、移入種が確認されたが、いずれも希少種とされる種は含まれていなかった。植生に対する主な影響としては、ROW 内の樹木の伐採や地表植物の除去・踏みつけなど（用地取得に伴う作物や果樹の損失も含む）がある。また、一時的には植物の葉の表面に粉塵等が付着する場合もある。

陸生生物への影響

表 7-45 に示した希少種のうち、ガンジスカワイルカを除く 13 種については、陸上を主な生息地とする種である。いずれの種も地理的には比較的広い分布域を持つが、本プロジェクトによる陸上の改変部は面積が小さいため、本プロジェクトによってこれらの種の生息地の大規模な破壊や個体数に著しい負の影響を与えることはないと考えられる。希少種であるインドハゲワシの存在が確認されたが、本種の主な生息数減少の原因は農薬に汚染された餌の摂取による中毒とされており、本事業により農薬を使用することはないことから特段の影響は想定されない。また、ラングール（サルの 1 種）については、本事業により森林伐採が生じないため生息地の破壊などの大規模な負の影響は想定されないが、密猟や工事車両の通行による交通事故等の影響が出ないよう対策を講じる必要がある。

水生生物への影響

プロジェクト対象地には年間を通じてガンジスカワイルカが生息する。プロジェクト対象地周辺では、渡河船が頻繁に往来し、漁業も盛んに行われていることから、ガンジスカワイルカは日常的に密猟・混獲・騒音等の人間活動の影響に晒されており、原生な自然生息地とは言えないが、現状ではガンジスカワイルカと人間の経済活動が共存している。また、Wakid 博士への聞き取り調査の結果、上流に建設されたゴアルパラ橋の周辺の地域でアッサム州内の他の地域よりガンジスカワイルカが高い生息密度で見られることから、橋の建設によりガンジスカワイルカの生息数の減少につながっているとは考えにくい。さらに、ガンジスカワイルカの分布域はアッサム州内及びその上流のネパール・アルナーチャル・プラデーシュ州、さらに下流のバングラデシュまで広範囲にわたっており、プロジェクト対象地はそのごく一部であることから、プロジェクトの影響が直ちにガンジスカワイルカの絶滅につながるとは考えにくい。本プロジェクトによる直接的な影響は想定されないが、工事騒音や水質の変化、餌生物の変化等によりガンジスカワイルカの生息環境に一時的かつ局所的な影響が生じる可能性はあるが、工事完了後は元に戻り、生息環境の悪化につながるような恒常的な影響は想定されない。また、ガンジスカワイルカの減少の要因の一つとしてダム等の構造物による生息地の分断があげられるが、本プロジェクトは橋梁であり、工事中及び供用後においてイルカの通行を完全に妨げることはないことから、プロジェクトの影響はないと考えられる。水質への影響としては、工事の影響により物理的な土砂の巻き上げや土砂の流入が発生するなど、濁度への影響が考えられるが、流速によって拡散範囲は変化するものの、土砂は自然に沈下するため影響は一時的である。ブラマプトラ川は自然の状態でも濁度が高く清澄な水質ではないため、水生生物は濁水環境にある程度適応していると思われるが、大きな水質の変化を防ぐため汚濁防止カーテン等の使用が推奨される。有害な化学物質等は使用されないため化学汚染による化学水生生物の生息や繁殖に悪影響はないが、建設機械等から油類が流出した場合は有害な影響が発生する可能性があるため、上記「水質」の項で示した緩和策を徹底することが重要である。またガンジスカワイルカの繁殖行動が工事騒音等によって影響を受ける可能性があるため、繁殖期間中は騒音を伴う工事をなるべく避けるべきである。

また、文献調査及びヒアリング調査により、ドゥブリ県内で数種のカメ及び渡り鳥等の希少種が存在することが分かった。橋梁建設の影響により、これらの種の生息地の改変が生じる可能性もあるが、これらの種の減少の主な原因は密漁とされているため、生息地の改変を最小限に留めるとともに、密漁対策をしっかりと取ることが重要である。また建設工事に伴う騒音を嫌って渡り鳥等が一時的に他の場所に避難することも考えられるが、その影響は一時的なものと予測される。

緩和策

生態系への影響を低減するため、ガンジスカワイルカの研究者の意見や他ドナーによる類似プロジェクトの事例等を参考に検討した結果、以下の対策が必要である。

<建設前>

- ガンジスカワイルカの生態についての情報が少ないことから、プロジェクト対象地周辺においてガンジスカワイルカの生息数や生態に関する詳細な調査を行い、モニタリングの際のベースラインデータとする。

<建設中>

- 除去が必要な最小限の樹木のみを伐採し、余分にまたは誤って樹木を伐採しないよう工事計画を順守する。工事用車両等については、周辺の植物を傷めないようROW内のみを通行する。
- 粉塵の飛散を防止するため、必要に応じ定期的に水の散布を行う。
- 密猟・密漁対策として、建設作業員等に関する教育・注意喚起を十分行う。具体的には、作業場周辺に看板を設置する、パンフレット等を配布する等の対策を行う。
- 森林局と協力してモニタリングを行う。
- 希少猛禽類の営巣が周辺にて確認された場合は、繁殖期間における大規模工事を避ける。
- 川の流れをブロックしてガンジスカワイルカの通行を妨げないようにする。
- ガンジスカワイルカの繁殖期（2月～7月）においては、騒音・振動を発生する作業を極力避ける。
- 毎朝始業前に30分間の見張りをを行い、付近にガンジスカワイルカがいないことを確認してから作業を開始する。工事中に作業場周辺にガンジスカワイルカが確認された場合には工事を中断し、イルカが去ったことを確認してから工事を再開する。
- ガンジスカワイルカの生態に詳しい専門家の監督下で工事を行い、その指示に従う。
- 騒音・振動が少ない工法を採用し、振動ハンマーを使用する。インパクトハンマーの使用が避けられない場合には、振動ハンマーでパイルをなるべく深く打ち込む。水中遮音壁やエアカーテンの設置、小さいサイズのハンマーを使用するなど騒音を低減するために必要な対策を行う。
- 汚濁防止カーテンの設置や土壌流出対策を行い、水質への影響を最小化する。
- 工事中に工事車両との衝突などにより希少種やその他の野生生物に害を与えないように安全な速度で注意深く運転する。希少種が目撃された場合には直ちに州森林局に報告し、対応を協議する。作業員に対し、下表のとおり遭遇する可能性がある希少種については予めブリーフィングしておく。
- 労働者キャンプや資材置き場等の設置のために樹木を伐採した場合は、元通りに植林を行う。また、ROW内の樹木を伐採した場合には、代替植林等を検討する。
- 橋脚の設置の際は、工事エリア内に希少種が存在しないことを確認し、もし渡り鳥やスッポン類等の希少種やその巣・産卵場所が確認された場合には、その動物や卵を専門家の指示に従って予め安全な場所に移動させる。

- 作業に従事する船舶や運搬船には、全てプロペラガードを付けて水生生物がプロペラに巻き込まれないよう対策を講じる。
- 川岸の自然な地形の改変や人工的な護岸の設置はカメや渡り鳥などの生息環境の破壊につながるため、橋脚の設置は川べりを避け、自然の地形を可能な限り保全する。また、川岸から 100 m 以内の場所に労働者キャンプや資材・廃棄物置場等を建設しない。
- 全ての緩和策及びモニタリング計画について、詳細計画段階で専門家により更に詳細な調査を行って内容を更新する。

表 7-45 : 事業対象地周辺の希少種及び重要な生物の分布状況

学名	英名	分布
<i>Trachipithecus pileatus</i>	Capped Langur	森林、農地、住宅地
<i>Platanista gangetica ssp. gangetica</i>	Ganges River Dolphin	ブラマプトラ川全域
<i>Pteropus giganteus</i>	Flying fox	森林、農地、住宅地
<i>Semnopithecus entellus.</i>	Langoor	森林、農地、住宅地
<i>Vulpes bengalensis</i>	Fox	草地
<i>Aythya baeri</i>	Baer's pochard	湖沼、河川
<i>Gracula religiosa</i>	Hill Myna	森林
<i>Gyps indicus</i>	Vulture	農地
<i>Leptoptilos javanicus</i>	Lesser Adjutant	川岸、草地、農地
<i>L. dubius</i>	Greater Adjutant	川岸、草地、農地
<i>Otus spilocephalus</i>	Mountain Scops Owl	森林
<i>Sturnus contra</i>	Grey-headed Myna	草地、農地、住宅地
<i>Aspideretes gangaticus</i>	Gangetic softshell turtle	深い河、泥または砂の堆積した湖沼
<i>Aspideretes hurum</i>	Indian peacock softshell turtle	河川、湖沼
<i>Bungarus fasciatus</i>	Common Indian Krait	川岸、草地、農地
<i>Chitra indica</i>	Narrow-headed softshell turtle	砂の堆積した水の澄んだ大きな川
<i>Melanochelys tricarinata</i>	Tricarinate turtle	草地、川岸
<i>Morenia petersi</i>	Indian eyed turtle	河川、湿地
<i>Naja naja</i>	Cobra	川岸、草地、農地
<i>Pangshura sylhetensis</i>	Assam roofed turtle	泥の堆積した水生植物のある川
<i>P. smithii</i>	Brown roofed turtle	浅い河、用水路、湖沼
<i>Varanus bengalensis</i>	Common Indian Monitor	川岸、草地、農地
<i>Hoplobatrachus tigerinus</i>	Indian Bull Frog	湿地帯

出典：JICA 調査団

<供用後>

- グリーンベルトの設置など周辺環境の緑化・環境保全に努める。
- グリーンベルトの設置など周辺環境の緑化において、現地の植生の植生を基に樹種等を選定する。
- 環境保護や希少種の保護に関する周辺住民の理解を促進するための教育普及活動を行う。
- ガンジスカワイルカに関するモニタリング調査を行い、研究・保全活動を推進する。

イ) 水文

影響

橋梁はブラマプトラ川及びその支流である Janihur 川を横断する予定であるが、本プロジェクトによってこれらの川の流れを改変することなく、水理解析の結果によっても水文に対する影響は軽微である。工事期間中に橋脚の設置作業により川の流れが阻害される可能性はあるものの、一時的かつ局所的で、工事終了後は自然に元に戻ると考えられる。陸上のアプローチ部においても、影響を受ける水路等は存在しない。供用後は特に影響は想定されない。

緩和策

水流シミュレーションを行い、水流を妨げないように橋梁のデザインを設計する。

ウ) 地形・地質

影響

アプローチ道路の建設や資材置き場・労働者キャンプ等の設置等に伴い、多少の地形の改変が生じる可能性がある。

緩和策

建設工事中は、現場周辺の植生などを維持し、土壌侵食等が発生しないように留意する。アプローチ道路の建設や資材置き場・労働者キャンプ等の設置等に関しては、使用後には土や植生などを回復し、元の状態に戻す。供用後は、自然の植生等によって河岸を保護する。

7.8.3 社会環境に対する主な影響

(1) 非自発的移転

本事業の用地取得による影響の規模は、761 世帯 (3,043 人) であり、そのうち、土地のみに影響を受けるのは 633 世帯 (2,538 人)、建物に影響を受けるのは 127 世帯 (500 人) である。また、商店が影響を受ける世帯は、1 世帯 (5 人) である。公共施設への影響は、1 つの政府施設のみであり、その他、学校や宗教施設等への影響はない。

表 7-46 : 被影響世帯概要

項目	被影響世帯	被影響者
全被影響世帯数	761	3,043
建物が影響を受ける（移転が必要）世帯の数	127	500
土地のみが影響を受ける世帯の数	633	2,538
商店が影響を受ける世帯の数	1	5

出典：JICA 調査団

緩和策

被影響世帯および被影響者に対しては、再取得価格による補償および適切な支援策を提供する。また、センサス調査では、大部分の被影響世帯が、現金での補償、自己移転を希望していたが、政府が移転先を提供する場合には、県政府がコミュニティとの協議の下、可能な限り元の居住地と同じ地域内に確保するように配慮する。

(2) 地域経済と生活・生計

本事業対象地における生計手段は、主に農業、家畜飼育、漁業、ボート業である。本事業により、生活・生計に影響を受けると考えられる対象者は、以下のとおり。

1) 農業労働者

本事業の周辺地域は稲作地域であり、稲作に加え裏作で豆類や野菜類が栽培されている。また、中州では、ジュートも多く栽培されている。本事業の用地取得により、土地所有者のみならず、農業労働者として雇用されている世帯の生計にも影響を与えることが想定される。これらの労働者は、親戚もしくは同じ村落の住民が主であり、栽培や収穫時の期間限定で雇用されている場合が多い。そのため、用地取得対象の土地で生計を立てている農業労働者にも影響があると想定される。

2) ボートオペレーター

ボートオペレーター組合との協議では、ドゥブリー県内で登録されているボートオペレーター数（従業員を含む）は、2,000 人程度であり、そのうち、250-300 人がドゥブリープルバリ間を接続するルートを運航している。その他は、他の地域および中州の間を運航している。内陸水運交通局（IWT）からの情報では、1 日旅客船 20 隻、物資輸送船 30-50 隻がドゥブリープルバリ間を運航しているとのことである。

ドゥブリープルバリ間の直行便を運航するボートオペレーターは、本事業によりビジネス機会が減少し、生計に影響を受けることが想定される。中州地域を結ぶルートを運行するボートオペレーターにおいては、本事業後にも継続的に運航需要があることが想定されるため、特段の影響は想定されない。なお、ボートオペレーター組合との協議時には、ドゥブリープルバリ間の運航に利用されるボートに対する補償の要請があった。本事業は、建設期間は 6 年と長く、その期間中は通常の運航に加え、工事のためのボート利用（要員・物資輸送等）も想定される。また、本事業後もボートの利用は継続することが想定さ

れる。本事業後はボートの運行が無くなると認められた段階で、ボートの補償についても検討する。

3) 漁業従事者

本事業の周辺地域の漁業従事者との協議では、農業および漁業を生計手段としている世帯が多く、その大部分が農業からの収入の方が多い。また、漁業を主要な収入源としている世帯は、本事業のアライメント内に約 100 人いるとのことである。漁業活動は主に夜間に行われ、地域内での販売許可も有するトレーダーに対して漁獲物を販売している。漁業従事者は、エンジンなしの手漕ぎボートを利用しており、漁業範囲は、4-5 km 圏内（上流、下流を含む）であり、漁場は特定されていない。対象地域の漁業従事者は、ブラマブトラ川周辺の村落および中州の住民であるが、雨季に川幅が広がる時期に限り、他の村落の住民も漁業を行うことがあるようである。

アライメント内における特定の漁場は確認されなかったことから、本事業が漁業に長期的な影響を及ぼす可能性は少ないと考えられる。また、漁業活動の範囲は、ブラマブトラ川を自由に利用しており、漁業時間も工事の終了後の夜間であることから、漁業活動に対する影響は大きくないと考えられる。ただし、工事中は、橋脚周辺での振動や、工事対象区間の出入りを制限する等も想定されるため、漁業従事者は、通常よりも遠方での活動を余儀なくされる可能性もあり、工事前に比べて生計への影響が出る可能性がある。

緩和策

本事業では、上記を含む被影響者に対して、補償および支援の両方が提供されるように計画する。本事業は、大規模な建設工事となるため、多くの雇用機会を創出することになる。そのため、被影響者に対しては、雇用条件を満たせるように、必要な訓練を提供することを計画する。さらに、物流ネットワークの改善に伴い、市場や物資へのアクセス向上や雇用機会の拡大による地域経済へのプラスの効果が期待できる。本事業がもたらすアクセス改善や雇用創出の機会を最大限に活用するために必要となる職業訓練や支援についても、支援策に含める。

(3) 土地利用

本事業の ROW 内の土地利用の変化が想定されるが、その大部分は農地である。センサス調査では、被影響世帯の多くが、土地補償ではなく現金補償を希望していることを確認したが、土地補償が要請された場合には、県長官は移転先の土地を選定する必要がある。また、労働者キャンプが整備される際には、短期的ではあるが、土地利用の変化が発生する。

緩和策

用地取得・住民移転のための補償オプションとして、土地補償が要請された場合には、県長官は、可能な限り既存の居住地と隣接した土地を選定し、基本的なインフラを整備した上で提供する。また、労働者キャンプについても、県長官の支援の下、対象コミュニテ

ィとの協議の上で、工事請負業者がリース契約を行う。これらの移転先および労働者キャンプが整備される際には、必要に応じて事前にEIAを実施する。

(4) 地域資源の利用

本事業では、建設資材として、大量に地元の資源が必要になると予想される。アッサム州とメガラヤ州は、骨材となる砕石を含む建設資材が豊富な地域であり、本事業では、既存の公的および民間の砕石場から調達される。そのため、新たに砕石場が開拓されることはなく、自然環境に影響を及ぼす活動には繋がらない。また、盛土や埋立砂は、本事業対象地の周辺で調達可能であるが、これらの地元の資源の使用にあたっては、所有者と協議した上で調達する。

緩和策

建設資材として地元の資源が大量に調達される場合、短期間ではあるが、地元で利用する際の価格高騰を招く可能性も考えられる。このような問題が発生する場合には、速やかに調達先を調整する。また調達量については、必要に応じて担当当局と相談し、負の影響を未然に避けるように配慮する。

(5) 水利用

ブラマプトラ川は、年中を通じて水の透明度は小さく、常にシルト分が混濁しているが、対象地域の特に、河川沿いの地域および中州地域では、河川を生活水として利用している。本事業の工事中には、河川の濁度が増すことが想定されるため、影響を緩和する措置が必要である。

緩和策

居住地域に近い場所には、シルトフェンスを設置する等、河川の水質への影響を最低限にする措置を講じる。

(6) 社会インフラ・サービス／配慮を要する施設

ドゥブリ県のアプローチ道路の始点に変更されたことに伴い、小学校への影響は発生せず移転は回避された。

(7) 被害と便益の偏在

用地取得・住民移転により、本事業から直接的に影響を受ける者と受けない者の間で不平等な便益の分配をもたらす可能性がある。また、本事業の橋梁は、中州を通して対岸を繋ぐため、橋の接続地点の住民と、中州地域の住民の間に利益の偏在が生じる可能性がある。

他方で、中州住民の生産物は、現在はトレーダーにより、ドゥブリ側もしくはプルバリ側に販売されている状況であるが、物流網が改善することにより、トレーダーを介してよ

り広範な地域に生産物の市場が拡大し、販売価格が向上することが考えられる。また、物資や日用品についても同様に、調達の範囲が広がることから、本事業による物資や市場へのアクセス向上が見込めると想定される。

緩和策

不均等な便益の分配を緩和する措置としては、補償・支援策の計画段階で、直接的に影響を受ける者に優先的に雇用機会および支援が提供されるように配慮する。また、特に中州の住民については、本事業からの利益が最大限得られるように、外部専門家等を活用しつつ、現地状況に合わせた支援策を計画し実施する。

(8) 地域内の利害対立

被害と便益の偏在により、地域内の利害対立が発生する可能性がある。現地調査では、対象地域全体で、本事業の理解および期待は高く、深刻な利害対立が発生するリスクは低いと考えられる。ただし、実際に事業を実施するプロセスにおいては、用地取得・住民移転の被影響者とそうでない者に対して、適切な情報共有と説明がなされることが重要である。

緩和策

本事業による被影響者、影響の内容、それに対する補償・支援策の内容、その根拠を適切に説明し、理解を得ることが必要である。そのため、被影響者に限らず対象地域の住民に対して、同様の説明がなされるように配慮する。また、中州地域の住民については、本事業の恩恵が受けられるような配慮と、それを実現する計画を盛り込むことが求められる。

(9) 貧困層

貧困層は、大規模なプロジェクトに晒される機会が少ないため、圧倒されて、懸念や苦情、要望等を発言出来ない可能性も考えられる。センサス調査では、被影響世帯に貧困ライン以下の世帯が多く含まれることを確認している。特に中州地域住民は、低収入であるとともに非識字者であることが多いため、現地の状況に合わせた影響緩和策・支援策を検討する必要がある。

緩和策

用地取得・住民移転の実施過程において、貧困層・非識字者が参加できる機会を設けるため、十分な情報共有を行い、また彼らの問題や苦情が適切に反映されるように配慮する。支援策を計画する際には、貧困層・非識字者の対応能力を考慮して、1 回限りの補償支払いよりも、継続的に所得が得られるような支援策を検討する。また、支援策には、適切な職業訓練が含まれるように計画する。

(10) ジェンダー

センサス調査では、女性が世帯主となる世帯が複数確認された。対象地域は、ムスリム教の地域であるため、女性と男性の発言力が異なり、経済活動への従事や行動範囲も女性の方が限定される可能性がある。

緩和策

本事業では、女性のニーズが男性と異なる場合を考慮し、女性の視点や意見を取り入れるため、各ステージで女性が参画する機会を設ける必要がある。そのため、用地取得・住民移転の実施過程では、村長やNGO等の協力を得ながら、女性への情報共有や女性の代表が協議に含まれるように配慮する。また、必要に応じて、女性世帯主の名義で口座開設が行われる支援も提供する。さらに、建設工事において、対象者のニーズや適性、対象地域の社会的な背景等を踏まえた均等な雇用機会が設けられるような仕組み（従事する職種や時間帯の配慮等）を検討する。

(11) 子どもの権利

インド国憲法の24条では、児童労働は違法である。建設工事やその他関連の業務に労働者を雇用する際には、児童労働は厳しく禁止する必要がある。

緩和策

本事業により創出される雇用機会に従事する労働者は、成人に限定される必要がある。そのため、工事請負業者との契約内容には、雇用条件として成人以上であることを盛り込む等の対策が取られるようにする。

(12) 公衆衛生と労働安全衛生

工事中および供用段階において、以下の労働安全対策が必要である。

表 7-47 : 労働安全対策

段階	項目	対策
工事中	建設作業場での健康被害	<ul style="list-style-type: none"> 国内基準に基づく良質な飲用水を用意し、水系伝染病の予防と労働者の健康を確保する 建設作業場での排水・衛生施設を整備し、また廃棄物処理がなされるようにする 現場では予防医療が実施されるよう、常備薬と救急キットを用意する
	建設キャンプでの健康被害	<ul style="list-style-type: none"> 適切な水準および規模の労働者の宿舎および関連施設（短期的）を整備する 国内規制に基づく良質な飲用水の提供およびトイレの整備を行う ゴミ箱を配置し、定期的に回収し埋立処分場に廃棄する
	性的暴力や性病の被害	<ul style="list-style-type: none"> 感染症等に関する教育を提供する 建設キャンプでの女性と男性の宿泊地を分ける

段階	項目	対策
	作業中の事故の防止	<ul style="list-style-type: none"> 作業は全て安全上の基準や手続きに従って行う 請負工事業者は、ゴーグル、ヘルメット、マスク等の安全保護具を労働者およびスタッフに提供する 請負工事業者は、足場、梯子、作業台、通路、階段、掘削、溝、出入口等に関する安全規制を順守する 採石場とトラック出入り口間に防護柵を設ける
	マラリア	<ul style="list-style-type: none"> 蚊の発生源となる水たまりを埋めるなどの対策を講じる
供用後	交通安全の確保	<ul style="list-style-type: none"> 学校および住宅地の近隣では、スピード制限を含む交通規制を設け順守させる 交通渋滞が起こりうる場所では歩行者の安全のため、交通管理計画を整備する 交通量が多くなると予測される場所には、歩道や路肩を整備する 近隣住民および学校を対象とした交通安全啓発を行う。具体的には、道路沿いの歩行、道路の横断、安全な通学路の指導を含む。 上記の関連設備についてはコントラクターが整備する。また、安全教育については、学校および警察と連携し、実施されるように調整する。これらの条件をコントラクターの契約内容に含めることとする。

出典：JICA 調査団

7.8.4 その他

(1) 事故

本事業により、建設工事中は、重機や工事車両の交通量が増え、また供用後は、交通量や速度が増すことが想定されるため、事故のリスクが増大すると予想される。

緩和策

工事中は、工事区間を明確に区分けして、適切な標識等を整備するとともに、事前に対象地域の住民に対して留意事項等について情報共有を行う。また、供用時については、特に住宅密集地および既存道路と橋梁アプローチ道路の接続地点には、交通標識を設置する等の事故防止に努め、道路に路肩や横断歩道を設置することで歩行者の安全、円滑な移動を確保する。

(2) 洪水

対象地域では、ブラマプトラ川の雨季と乾季の水量と水位の変動が大きく、通常の雨季でも中州の一部は水没し、中州住民は、雨季のみ近隣地域に移動するか、もしくは水没リスクの少ない地域に居住地を移動しているのが現状である。また、過去の自然現象による大洪水時には、地方政府が避難の支援を行っている。

本事業では、橋脚の間隔は 125 m と広く、川の流れを遮る構造物とはならないため、流況の変化により、対象地域の洪水危険性が高まることは想定されない。一方で、自然現象による洪水対策については、過去の経験と同様に必要な措置が講じられると考えられる。

7.9 影響評価

7.8の調査結果に基づき事業による影響を評価し、スコーピング案との対比を以下の通り行った。

表 7-48 : スコーピング案および調査結果

項目	スコーピング時の影響評価			調査結果に基づく影響評価			評価理由
生活環境							
大気汚染	D	B-	B-	D	B-	B-	P: 特に影響はない。
							C: 工事車両・重機からの排ガス・粉塵飛散により一時的に大気汚染が発生する。
							O: 交通量は増加するが、大気質に対する影響は軽微である。
水質汚染	D	B-	D	D	B-	D	P: 特に影響はない。
							C: 工事中には濁度の上昇など河川の水質に一時的な影響が生ずる可能性はあるが、有害物質による恒久的な水質汚染は生じない。
							O: 特に影響はない。
廃棄物	D	B-	D	D	B-	D	P: 特に影響はない。
							C: 建設工事及び労働者キャンプからの廃棄物が発生するため、適切に処理する必要がある。
							O: 特に影響はない。
土壌汚染	D	B-	D	D	B-	D	P: 特に影響はない。
							C: 建設機材の潤滑油や燃料漏れによる限定的な影響は想定されるが、有害物質による汚染は想定されない。現時点では土壌汚染の問題は発生していない。
							O: 特に影響はない。
騒音／振動	D	B-	B-	D	B-	B-	P: 特に影響はない。
							C: 建設機械の稼働による騒音と振動が生ずるため、対策が必要である。
							O: 交通量の増大により騒音と振動が事業前より高くなるため、継続的なモニタリングや緩和策が必要である。
底質	D	C	C	B-	B-	D	P/C: ボーリング調査及び橋脚の設置による底質の移動はあるが、軽微なものであり、建設後は元に戻る。
							O: 特に影響はない。
自然環境							
生態系	D	A-	B-	D	B-	B-	P: 特に影響はない。
							C: 建設地周辺にガンジスカワイルカ等の希少種が生息しており、工事中に影響を与えないよう対策が必要である。
							O: 供用後の影響は未知数なため、継続的なモニタリングが必要である。
地形・地質	D	B-	D	D	B-	D	P: 特に影響はない。
							C: 工事中に一時的な地形の改変が生じる。
							O: 特に影響はない。
水文	D	B-	B-	D	D	D	P/C/O: 本事業による影響はない。

項目	スコーピング時の影響評価			調査結果に基づく影響評価			評価理由
社会環境							
非自発的住民移転	A-	D	D	A-	D	D	P: 本事業により、700 世帯を超える非自発的住民移転が発生すると見込まれ、そのうち 30%の世帯は建物に影響を受ける。
							C/O: 住民移転は工事開始前に終了するため、この段階での影響は発生しない。
地域経済と生活・生計	A-	B+/B-	B+/B-	A-	B+/B-	B+/B-	P: 住民移転および所有地の大半が用地取得対象となる場合に、生計手段への負の影響が見込まれる。
							C: 工事中は、漁業従事者への負の影響の可能性はある。一方で、工事中に様々な技能レベルの雇用機会が地域住民に与えると想定される。更に、工事中の作業者の増加により、道路沿いなどで、飲食系の行商の増加が想定される。
							O: 耕作地の損失による生計への負の影響が考えられる。また、ボートオペレーターの経済活動への負の影響が見込まれる。一方で、交通網の改善により、市場や雇用機会へのアクセスが向上し、地域経済への正の影響が見込まれる。中州地域は、直接橋梁とは接続しないが、地域の物流アクセス改善により、市場や物資へのアクセスの向上が期待できる。
土地利用	B-	B-	D	B-	B-	D	P: 用地取得・住民移転により、既存の土地利用が変化する可能性がある。
							C: 工事用ヤード等に必要な土地利用により変化する可能性があるが、一時的なものであり、影響は限定的と考えられる。
							O: アプローチ道路の部分については、土地利用が変化するが、負の影響は想定されない。また、工事後、工事用ヤードは、建設業者により元の状態に還元される。
地域資源利用	D	B-	D	D	B-	D	P: 特段の影響はない。
							C: 建設資材（粗・細骨材、砂）は、稼働中の採石場および建設用地の周辺から調達する。大量の建設資材のための地域資源利用により、資材の価格が高騰する可能性がある。
							O: 供用中は、地域資源の利用は想定されていないため、影響はない。
水利用、水利権および共同体の権利	D	B-	D	D	B-	D	P: 特段の影響は想定されない。
							C: 河川を生活用水として利用している住民に短期的に影響が及ぶ可能性がある。
							O: 特段の影響は想定されない。
社会インフラや社会サービス	B-	D	B+/-	D	D	B+	P/C: アプローチ道路の始点の変更されたため、想定されていた学校への影響はない。
							O: 交通ネットワークの改善により、社会インフラやサービスへのアクセス向上が期待される。
社会組織や地域の意思決定組織	D	D	D	D	D	D	P/C/O: 用地取得・住民移転は、既存の意思決定組織構造に基づいて行われるため、特段の影響は想定されない。

項目	スコーピング時の影響評価			調査結果に基づく影響評価			評価理由
被害と便益の偏在	B-	B+/B-	B+/B-	B-	B+/B-	B+/B-	P: 用地取得・住民移転の対象住民と非対象者で、事業による影響および裨益の度合いが異なる。ただし、対象住民には適切な補償パッケージを提供する住民移転計画を策定、実施することで緩和することが可能である。
							C: 用地取得、住民移転の対象住民を優先的に建設工事に雇用する等の配慮が必要である。
							O: 橋梁の接続地点となる陸側と、直接接続しない中州との間で、便益の差が生まれる可能性がある。長期的には、交通アクセスの改善が、地域全体の経済活動の活性化に貢献し、市場および雇用機会へのアクセス向上につながることを期待される。
地域内の利害対立	B-	B-	B-	B-	B-	B-	P/C/O: 被害と便益の偏在に伴う、利害対立が発生する可能性がある。
配慮を要する施設 (例:病院、学校等)	B-	D	B-	D	D	D	P/C/O: アプローチ道路の始点に変更されたため、想定されていた学校への影響はない。
貧困層	A-	B+	B+/-	A-	B+	B+/-	P: 特に中州地域には、貧困層および非識字者が多いため、彼らの限られたスキルを考慮した生計回復支援を策定、実施する必要がある。
							C: 貧困層は、環境や状況の変化に対応するのが他のPAPと比べ難しい場合が想定されるが、建設工事への雇用機会から利益を受けることができる。
							O: 用地収用により生計手段が変わる場合は、他のPAPに比べ生計回復に時間がかかることが想定される。長い移行期間を想定した支援を計画することが必要である。長期的には、事業が生み出す地域の経済発展により、貧困層にも正の影響があると考えられる。
少数民族／先住民	C	C	C	D	D	D	P/C/O: 事業対象地が位置する県単位で見ると少数民族・指定民族が多い地域であるが、事業対象地のPAH/PAPs (ムスリム人) の中に少数民族、指定民族は確認されなかった。
ジェンダー	B-	B-	D	B-	B+/-	D	P: 用地取得および住民移転の過程において、女性の参加が確保されるような配慮が必要である。
							C: 建設工事への雇用において均等な機会が提供されるような配慮が必要である。
							O: 特段の影響は想定されない。

項目	スコーピング時の影響評価			調査結果に基づく影響評価			評価理由
子どもの権利	B-	C	D	D	D	D	P: アプローチ道路の始点に変更されたため、想定されていた学校への影響はない。
							C: インド憲法により、児童労働は禁止されている。そのため、建設工事労働者の雇用は成人に限定される。予防措置として、工事請負業者との契約条件の中に、未成年者の雇用を禁止する条項を含むようにする。
							O: 特段の影響は想定されない。
公衆衛生 (伝染病)	D	B-	D	D	B-	D	P: 特段の影響は想定されない。
							C: 労働者の移入により、STD 等の感染症が蔓延するリスクがある。
							O: 特段の影響は想定されない。
労働安全衛生	D	B-	B-	D	B-	B-	P: 特段の影響は想定されない。
							C: 工事現場の衛生、労働者の健康や安全は、環境管理計画の実施を通じて適切に管理される必要がある。
							O: メンテナンスや補修作業の担当作業員の衛生や安全にも十分に配慮する。
その他							
事故	D	B-	B-	D	B-	B-	P: 特段の影響は想定されない
							C: 重機や工事用車輛の増加による交通事故リスクが想定される。
							O: 交通量の増加および通行速度の上昇により事故リスクは増大する。特に居住区付近では、交通事故対策が取られる必要がある。
O: 新橋梁により大幅なトラック輸送距離の短縮で、GHG 排出削減効果が期待される一方、交通量の増加も想定される。ただし気候変動や越境影響を与える程の影響は殆どないと考えられる。							

A+/-: 重大な正/負の影響が想定される。
 B+/-: ある程度の正/負の影響が想定される。
 C: 影響が不明であり、今後の調査が必要。
 D: 影響は皆無、あるいは軽微であり、今後の調査は不要。
 出典: JICA 調査団

7.10 環境管理およびモニタリング計画

7.10.1 環境管理計画

本プロジェクトにかかる環境管理計画を、計画段階、建設段階、供用後の 3 つの段階に分けて下表に示す。ガンジスカワイルカ等の水生生物に対する緩和策については、ガンジスカワイルカの生態に詳しい専門家の意見や、他の類似プロジェクトの事例を参考にした。

表 7-49：計画段階における環境管理計画

Sl. No	項目	緩和策	場所	時期	主体	
					実施	監督
P1	底質	<ul style="list-style-type: none"> 底質の移動の防止のため汚濁防止カーテンを使用する。 	ブラマプ トラ川	ボーリン グ調査中	調査受注者	PIU (Project Implementation Unit)
P2	被影響者 (PAP) / 地域 経済と生 活・生計	<ul style="list-style-type: none"> RAP に含まれる補償および支援の提供は、工事開始前に実施される。主な活動内容は、土地・建物の取得、共有施設の移設、補償の支払、支援の提供となる。 PAP の生活・生計手段等の実態を把握する調査を行い、必要に応じて NGO 等の協力を得ながら、再取得価格の算定と適切な支援内容を検討する。 	全域	建設開始 前	アッサム・メガ ラヤ州の州政 府、 県長官、 NHIDCL、NGO	PIU
P3	土地利用/ 移転地の選 定・移転	<ul style="list-style-type: none"> PAP からの要請があれば、村長と県長官との協議の下、移転地を選定し、移転を支援する。 移転先は、水や電気等の必要なインフラを整備する。 	元の居住 地の近隣	建設開始 前	県長官、施工業 者	PIU
P4	被害と便益 の偏在	<ul style="list-style-type: none"> 直接的に影響を受ける者に優先的に雇用機会および支援が提供されるように支援策を計画する。 中州の住民には、本事業からの利益が最大限得られるように、NGO や専門家を活用し、現地の状況に合わせた支援策を計画する。 	ROW 内	建設開始 前	県長官、 NHIDCL、NGO	PIU
P5	地域内の 利害対立	<ul style="list-style-type: none"> 被影響者に限らず対象地域の住民に対しても、本事業による被影響者、影響の内容と、それに対する補償・支援策の内容、その根拠を適切に説明し、理解を得る。 	全域	建設開始 前	県長官、 NHIDCL、NGO	PIU
P6	貧困層/ ジェンダー	<ul style="list-style-type: none"> 用地取得および住民移転の過程において、貧困層・女性の参加が確保されるよう配慮を行う。 貧困層（非識字者を含む）の限られたスキルを考慮した生計回復支援を策定する。 村長や NGO 等の協力を得ながら、女性への情報共有や女性の代表が協議に含まれるように配慮する。 	ROW 内	建設開始 前	県長官、 NHIDCL、NGO	PIU

出典：JICA 調査団

表 7-50 : 建設段階における環境管理計画

Sl. No	項目	緩和策	場所	時期	主体	
					実施	監督
土壌						
C1	土取場における土壌侵食（地形・地質に対する影響）	<ul style="list-style-type: none"> 州政府に指定された深さ以上の掘削をしてはならず、掘削地域の側面の勾配は1:4を維持する。 工事終了後は当該地域の環境を元どおりに復旧し、湛水するような地形を残してはならない。 	許可を受けた土取場	建設段階	施工業者及び施工管理コンサルタント	PIU
C2	土取場における表土流出（地形・地質に対する影響）	<ul style="list-style-type: none"> 建設材料取得地域は農業地域に設定しない。 表土は農業及び植林等に用いられることから、指定された方法で仮置きをして州政府の指示により再使用する。 	許可を受けた土取場	建設段階	施工業者及び施工管理コンサルタント	PIU
C3	土の締め固め・沈下（地形・地質に対する影響）	<ul style="list-style-type: none"> 建設用重機は工事指定地域内を通行し、工事区域外における不要な土の締め固めを避ける。 	工事区間全域	建設段階	施工業者及び施工管理コンサルタント	PIU
C4	斜面における土壌侵食（地形・地質に対する影響）	<ul style="list-style-type: none"> IRCのガイドラインに指定された方法で締め固める 	切土及び盛土斜面	建設段階	施工業者及び施工管理コンサルタント	PIU
C5	土壌汚染	<ul style="list-style-type: none"> 建設機械等からの燃料等が流出しないよう整備する。 給油所・建設用重機置き場におけるオイル類の取り扱い場所はコンクリート床版等を施工した場所で行い、側溝を設けてオイル等の流失を防止する。また側溝に油ろ過装置を設置する。 廃油やこぼれたオイルは法令に従って処理する。 	建設労務者のキャンプ及び建設資機材置き場	建設段階	施工業者及び施工管理コンサルタント	PIU
C6	廃棄物の処理	<ul style="list-style-type: none"> 建設工事中に生じたアスファルトやコンクリートなどの廃棄物は州政府指定の廃棄物処理場へ持ち込むか、または指定された方法で再利用する。 アスファルトは他の廃棄物とは分別して州政府が指定した廃棄物処理場へ持ち込む。 	州政府が指定した廃棄物置き場全域	建設段階	施工業者及び施工管理コンサルタント	PIU

Sl. No	項目	緩和策	場所	時期	主体	
					実施	監督
C7	工事区域の表土	<ul style="list-style-type: none"> 工事区域における表土は州政府が指定した方法で仮置きをし、指定された方法で再利用する。 	工事区間全域	建設段階	施工業者及び施工管理コンサルタント	PIU
水質						
C8	水質汚染	<ul style="list-style-type: none"> 建設機械等からの燃料等が流出しないよう整備する。 燃料の貯蔵場所は排水路や貯水池等から離れた場所に設置する 建設用重機置場におけるオイル類の取り扱い場所はコンクリート床版等を施工した場所で実施し、側溝を設けてオイル等の流失を防止する。 駐機場の排水溝に油ろ過装置を設置する。 	建設労務者のキャンプ及び建設資機材置き場.	建設段階	施工業者及び施工管理コンサルタント	PIU
C9	建設労務者のキャンプ	<ul style="list-style-type: none"> 建設労務者用キャンプからの排水が近隣の表流水や地下水を汚染させないように、汚濁槽等を設ける 	建設労務者のキャンプ	建設段階	施工業者及び施工管理コンサルタント	PIU
C10	工事区域に隣接する井戸の水質汚染	<ul style="list-style-type: none"> 工事区域に隣接する井戸には塵埃等が入らないよう井戸にはカバーを施す 	工事区域全域に存在する井戸すべて	建設段階	施工業者及び施工管理コンサルタント	PIU
C11	土砂による表層水の汚濁	<ul style="list-style-type: none"> 水路の近くでの建設作業は避け、表土が露出している場所では植生を回復して表土の流出を防ぐ。 モンスーン期においては川の付近や水辺での工事は避けられるべきである。 水中で行う工事については、汚濁防止カーテンを使用する。 	工事区間全域	建設段階	施工業者及び施工管理コンサルタント	PIU

Sl. No	項目	緩和策	場所	時期	主体	
					実施	監督
大気質						
C12	建設重機による排気	<ul style="list-style-type: none"> 建設用重機のマフラー等は定期的なメンテナンスを実施して、インド国内の排気基準を満たす。 燃料用ディーゼルは国内の燃料基準を満たした低硫黄成分のものを使用する。 大気質のモニタリングを定期的に行い、インド国内の基準を満たしていることを確認する。 	工事区間全域	建設段階	施工業者及び施工管理コンサルタント	PIU
C13	プラント類からの排気	<ul style="list-style-type: none"> アスファルト・プラント、コンクリート・プラントなどの据え置き型のプラント類は住民居住地から 500 m 以上離れた場所に設置し、粒子除去装置を取り付ける。 	プラント設置場所	建設段階	施工業者及び施工管理コンサルタント	PIU
C14	粉塵	<ul style="list-style-type: none"> 粉塵の拡散を防ぐため、散水を行う。 建設資材を運搬する際に荷台をシートで被う。 	プラント設置場所	建設段階	施工業者及び施工管理コンサルタント	PIU
廃棄物						
C15	廃棄物	<ul style="list-style-type: none"> 工事中に生じた廃棄物は、可能であれば再利用し、または埋立等に利用する。 建設工事中に生じた廃棄物で再利用できないものは SPCB の定める廃棄場所に適切な方法で廃棄する。使用された土地は廃棄物をすべて撤去し完全な状態で明け渡す。 	工事区間全域、SPCB 指定の廃棄物集積所	建設段階	施工業者及び施工管理コンサルタント	PIU

Sl. No	項目	緩和策	場所	時期	主体	
					実施	監督
騒音						
C16	建設用重機による騒音	<ul style="list-style-type: none"> 建設機械等から発生する騒音については、CPCB の基準を順守する。建設重機や車両等を定期的にモニタリングし、消音装置やマフラーのメンテナンスを行う。 90 dB(A)以上の大きな騒音が発生する場所では、作業員に耳栓・ヘルメットの使用を義務付ける。 住宅地の近くでは夜 10 時から朝 6 時までは作業を中断する。 作業プラントを設置する場所は学校や病院などの影響を受けやすい施設から 500m以上離れた場所とするか、または遮音壁などを設置して騒音を軽減する。 騒音や振動を発生する作業は一度に複数の作業を行わず、タイミングをずらす。 建設機械は住宅地から離れた場所に設置する。 無駄な騒音が発生しないよう、効率的な作業計画を立てる。 建設用重機の騒音は CPCB の騒音基準を満たすものを用い、定期的なメンテナンスを実施する。 建設用重機の排気管には消音器を取り付け、病院や学校の近隣地域には駐車することが禁じられている。また、必要に応じて工事用遮音壁を設置する。 工事期間中は定期的に騒音測定を実施し、インド国内の騒音基準を満たしているか確認する。 	工事区間全域	建設段階	施工業者及び施工管理コンサルタント	PIU
底質						
C17	底質の移動	<ul style="list-style-type: none"> 底質の移動を防止するため、汚濁防止カーテンを作業所の周辺に設置する。 洪水警報が出ている際には工事を中断する。 	工事区間全域	建設段階	施工業者及び施工管理コンサルタント	PIU

Sl. No	項目	緩和策	場所	時期	主体	
					実施	監督
生態系						
C18	RoW 内の樹木の伐採	<ul style="list-style-type: none"> 除去が必要な最小限の樹木のみを伐採し、余分にまたは誤って樹木を伐採しないよう工事計画を順守する。 工事用車両等については、周辺の植物を傷めないよう ROW 内のみを通行する。 粉塵の飛散を防止するため、必要に応じ定期的に水の散布を行う。 	工事区間全域	建設段階	施工業者及び施工管理コンサルタント	PIU
C19	希少種への影響	<ul style="list-style-type: none"> 工事中に観測された希少種は速やかに州政府環境森林局へ連絡する。 工事関係者は工事区域全域において希少種の存在について工事開始前に希少種の取り扱いについて講習を受けなければならない。また、密猟防止看板等を設置して作業員への注意喚起を行う。 工事中に工事車両との衝突などにより希少種やその他の野生生物に害を与えないように安全な速度で注意深く運転するよう工事関係者に周知徹底するとともに、立て看板等を設置し注意喚起する。 労働者キャンプや資材置き場は川岸から離れた場所に設置し、土地の改変を必要最小限にとどめる。 騒音・振動を伴う作業はガンジスカワイルカの繁殖期（2月～7月）を避ける。 工事中にガンジスカワイルカの通行を妨げないよう、川をせき止めない。ガンジスカワイルカが付近に確認されたときは作業を中断する。 汚濁防止カーテンの設置や土壌流出対策を行い、水質への影響を最小化する 	工事区間全域	建設段階	施工業者及び施工管理コンサルタント	PIU

Sl. No	項目	緩和策	場所	時期	主体	
					実施	監督
C19	希少種への影響	<ul style="list-style-type: none"> ガンジスカワイルカの生態に詳しい専門家の監督下で工事を行う。 ガンジスカワイルカの好む生息場所である浅瀬の下流側や支流との合流地点付近での作業は最小限にする。 川の深さが 4～6mの場所は特にガンジスカワイルカの生息に適しているため、川の深さが人為的に変動しないよう底質の移動や土砂の流入を防止する。 付近に猛禽類の生息が確認された場合には、繁殖期の工事作業を避ける。 橋脚の設置の際は、工事エリア内に希少種が存在しないことを確認し、もし渡り鳥やスッポン類等の希少種やその巣・産卵場所が確認された場合には、その動物や卵を専門家の指示に従って予め安全な場所に移動させる。 作業に従事する船舶や運搬船には、全てプロペラガードを付けて水生生物がプロペラに巻き込まれないよう対策を講じる。 川岸の自然な地形の改変や人工的な護岸の設置はカメや渡り鳥などの生息環境の破壊につながるため、橋脚の設置は川べりを避け、自然の地形を可能な限り保全する。また、川岸から 100m 以内の場所に労働者キャンプや資材・廃棄物置場等を建設しない。 全ての緩和策及びモニタリング計画について、詳細計画段階で専門家により更に詳細な調査を行って更新する。 	工事区間全域	建設段階	施工業者及び施工管理コンサルタント	PIU
C20	水生生物に対する騒音・振動の影響	<ul style="list-style-type: none"> 振動ハンマーを使用する。インパクトハンマーの使用が避けられない場合には、振動ハンマーでパイルをなるべく深く打ち込む。 騒音・振動を測定し、国際基準に適合しているか確認する。基準を超えている場合には水中遮音壁やエアカーテンの設置、小さいサイズのハンマーを使用するなど必要な対策を行う。 作業場所の周りにガンジスカワイルカがいないことを常に確認する。 	工事区間全域	建設段階	施工業者及び施工管理コンサルタント	PIU
社会環境						

Sl. No	項目	緩和策	場所	時期	主体	
					実施	監督
C21	地域経済と生活・生計／被害と便益の偏在／地域内の利害対立	<ul style="list-style-type: none"> 工事の労働者は、PAP（女性、貧困層を含む）が最優先で雇用されるような仕組みとし、また、広く情報共有を行い、地元住民が最大限に雇用機会を得られるような配慮を行う。 また、NHIDCL は NGO 等の協力を得て、地元住民が労働者となる条件を満たせるような職業訓練を提供する。 	工事区間全域	工事期間中	施工業者及び施工管理コンサルタント、NHIDCL、NGO	PIU
C22	土地利用	<ul style="list-style-type: none"> 建設労働者用キャンプが設置される場合には、コントラクターは、現地住民と長官と協議を行い、土地所有者とリース契約を締結する必要がある。キャンプ建設前には、必要に応じてEIAを実施する。 	労働者用キャンプ設置場所	工事期間中	施工業者及び施工管理コンサルタント	PIU
C23	地域資源利用	<ul style="list-style-type: none"> 採石場は、既存の採石場を利用する。 地元で利用する際の価格高騰等の問題が発生する場合には、速やかに調達先を調整する。 砕石や盛土・埋立砂の調達量については、必要に応じて担当当局と相談し、負の影響を防ぐ対策を講じる。 	採石場	工事期間中	施工業者及び施工管理コンサルタント	PIU
C24	水利用	<ul style="list-style-type: none"> 工事中の河川の汚濁を最低限に抑えるため、居住地域に近い場所には、シルトフェンスを設置する等の措置を講じる。 	工事区間全域	建設段階	施工業者及び施工管理コンサルタント	PIU
C25	ジェンダー	<ul style="list-style-type: none"> 女性のニーズや適性、対象地域の社会的な背景等を踏まえた均等な雇用機会が設けられるように、従事する職種や時間帯を配慮する。 	工事区間全域	建設段階	施工業者及び施工管理コンサルタント	PIU
健康・衛生						
C26	建設作業場での健康被害	<ul style="list-style-type: none"> 作業場では、国内基準(IS 10500)に基づく良質な飲用水を用意し、水系伝染病の予防と労働者の健康を確保する。 適切な排水・衛生施設を整備し、また廃棄物処理がなされるようにする。 現場では予防医療が実施されるよう、常備薬と救急キットを用意する。 	建設キャンプ設置場所	建設段階	施工業者及び施工管理コンサルタント	PIU

Sl. No	項目	緩和策	場所	時期	主体	
					実施	監督
C27	建設作業中の事故	<ul style="list-style-type: none"> 請負工事業者は、国内法規（Factories Act）に基づき、ゴーグル、ヘルメット、マスク等の安全保護具を労働者およびスタッフに提供する。 	建設キャンプ設置場所	建設段階	施工業者及び施工管理コンサルタント	PIU
C28	建設キャンプでの健康被害	<ul style="list-style-type: none"> 適切な水準および規模の労働者の宿舎および関連施設（短期的）を整備する 国内法規（Regulation of Employment and Conditions of Service Act）に基づき、トイレは、宿舎および作業場それぞれに設置する。トイレ付近には、十分な水供給を確保する。 宿舎は、良質な飲料水、炊事・洗濯のための水供給が整備され、下水設備も整備される。 ゴミ箱を配置し、定期的に回収し埋立処分場に廃棄する。建設キャンプは、周辺住民の衛生・健康を考慮し、可能な限り居住地から離れた場所に設置する。 	建設キャンプ設置場所	建設段階	施工業者及び施工管理コンサルタント	PIU
C29	性的暴力や性病の被害	<ul style="list-style-type: none"> 感染症等に関する教育を提供する 建設キャンプでの女性と男性の宿泊地を分ける。 	建設キャンプ設置場所	建設段階	施工業者及び施工管理コンサルタント	PIU
C30	作業後の建設キャンプの整備	<ul style="list-style-type: none"> 建設作業の完了時には、一時的な構造物を解体し、ゴミは焼却、排泄物その他は、処理場に効果的に密封する。これらは、施工業者の負担で行う。 	建設キャンプ設置場所	建設段階	施工業者及び施工管理コンサルタント	PIU
C31	採石後の採石場の整備	<ul style="list-style-type: none"> 採石場の粉塵および廃棄物は再充填に使用する。残りの部分は木で覆うものとする。 	採石場	建設段階	施工業者及び施工管理コンサルタント	PIU

Sl. No	項目	緩和策	場所	時期	主体	
					実施	監督
安全						
C32	労働者の安全性	<ul style="list-style-type: none"> • 施工業者は、全ての労働者に対して、ゴーグル、ヘルメット、マスク等の安全保護具を提供する。特に、アスファルト材料等の混合作業、溶接作業、石砕作業、ペイント利用等には作業に合わせた保護具を提供する。 • 施工業者は、足場、梯子、作業台、通路、階段、掘削、溝、出入口等に関する安全規制を順守する • 電気設備を使用する際には、フェンスやライト等、安全確保に必要な措置をとる。国内基準（IS code）に基づく設備の利用、点検、メンテナンスを行う。 	全建設工事 サイト	建設段階	施工業者及び 施工管理コン サルタント	PIU
C33	災害等の予期しない事故	<ul style="list-style-type: none"> • 洪水、火事等の事故や災害予防のために、妥当な予防措置を講じる。 • 災害による負傷等に対する応急処置の体制を整える。 	全建設工事 サイト	建設段階	施工業者及び 施工管理コン サルタント	PIU
C34	労働者の健康	<ul style="list-style-type: none"> • 蚊の発生源となる水たまりを埋める等の対策を講じる 	全建設工事 サイト	建設段階	施工業者及び 施工管理コン サルタント	PIU
C35	交通管理と安全	<ul style="list-style-type: none"> • 施工業者は、建設中の交通安全のために、看板、旗、ライトを整備する等の必要な措置を講じる。看板、バリケード、路面標示等は、MORTHの仕様に基づく。 • 建設工事の開始前には、周辺住民に対して、適切な通知および必要な情報を提供する。 • 近隣住民および学校を対象とした交通安全啓発を行う。 • コントラクターの作業方法（サイト整備、品質管理システム、安全計画、安全・環境モニタリング計画）を見直し承認する。 	全プロジェ クトエリア	建設中	施工業者	エンジ ニア

出典：JICA 調査団

表 7-51 : 供用後における環境管理計画

	項目	緩和策	場所	時期	主体	
					実施	監督
O1	水質汚染	<ul style="list-style-type: none"> 必要な場所にはシルトフェンスを設置し、モニタリング計画に従って水質モニタリングを行う。 水質を汚染する可能性のある油流出事故が発生した際の対応マニュアルを作成する。 	モニタリング計画に従う	モニタリング計画に従う。対応計画・マニュアルはなるべく早期に作成する	PIU、SPCB	PIU
O2	土壌汚染	<ul style="list-style-type: none"> 土壌を汚染する可能性のある油流出事故が発生した場合の対応マニュアルを作成する。 	全域	対応計画・マニュアルはなるべく早期に作成する。	PIU、SPCB、 地方自治体	PIU
O3	排ガスによる大気汚染	<ul style="list-style-type: none"> モニタリング計画に従って大気質モニタリングを行う。 モニタリング結果を関係機関と共有し、必要な場合は対策を行う。 	モニタリング計画に従う	モニタリング計画に従う	PIU、SPCB	PIU
Q4	騒音・振動	<ul style="list-style-type: none"> 騒音が増加しないよう、路面のメンテナンスを定期的に行う。 住宅地の近くではドライバーが警笛を無駄に使用しないよう標識を設置する。 必要に応じ路肩に防音壁やグリーンベルトを設ける。 モニタリング計画に従ってモニタリングを行う。 	モニタリング計画に従う	モニタリング計画に従う	PIU、SPCB	PIU
O5	生態系	<ul style="list-style-type: none"> 希少種のモニタリングを行う。 ガンジスカワイルカに関する調査研究や保護活動を促進する。 	モニタリング計画に従う	モニタリング計画に従う	PIU、NGO	PIU

	項目	緩和策	場所	時期	主体	
					実施	監督
O6	地域経済と生活・生計／貧困層	<ul style="list-style-type: none"> • PAP の生計手段や収入の変化をモニタリングする。 • PAP の生活レベルが低下していることが確認された場合には、支援策を見直し、改善策を実施する。 	ROW 内	モニタリング計画に従う	PIU、NGO	PIU
O7	被害と便益の偏在／地域内の利害対立	<ul style="list-style-type: none"> • 対象地域住民の不満や対立の有無を、県長官や村長にヒアリングして確認し、必要に応じて説明や対策を行う。 	全域	問題が確認された時	県長官、PIU、NGO	PIU
O8	労働安全衛生	<ul style="list-style-type: none"> • メンテナンスや補修作業の担当作業員に対して、安全指導を行い、労働者の安全を確保する。 	メンテナンス・補修作業が実施される区画	メンテナンス・補修作業時	PIU	PIU
O9	交通安全	<ul style="list-style-type: none"> • 速度制限などの交通規則を徹底させる。 • 居住地区や既存道路とアクセス道路の交差点には、事故防止のため、交通信号を整備する。 • 路肩や横断歩道を整備し、歩行者の安全を確保する。 	全域	モニタリング計画に従う	PIU	PIU

出典：JICA 調査団

7.10.2 環境モニタリング計画

(1) 大気質

大気質のモニタリングで推奨される調査項目は PM10、一酸化炭素 (CO)、窒素酸化物 (NOX)、二酸化硫黄 (SO2) である。これらの項目のモニタリングを建設工事開始時より開始し、定期的に決まった場所でサンプルを採取する。サンプルの分析は、National Ambient Air Quality Standards 2009 に定められた方法で行う。モニタリング地点、期間、調査項目、および実施責任者の詳細は下表のとおりである。

(2) 水質

道路・橋梁開発プロジェクトに関連する水質モニタリングに推奨される物理的および化学的パラメータは、pH、濁度、油脂、COD、塩化物、鉛、亜鉛およびカドミウムである。モニタリング地点、期間、調査項目、および実施責任者の詳細は下表のとおりである。水質分析は、Indian Standard Drinking Water Specification - IS 10500: 2012 に従って実施する。

(3) 騒音

騒音レベルの測定は、1989 年に中央公害防止委員会 (CPCB) によって策定された Ambient Noise Standards に従って実施する。モニタリング地点、期間、調査項目、および実施責任者の詳細は下表のとおりである。

(4) 生物多様性

ガンジスカワイルカを含む生態系のモニタリングは、専門性のある NGO に再委託して行う。建設工事の開始前にガンジスカワイルカに関する詳細な調査を行い、プロジェクトの被影響地域におけるイルカの推定生息数、空間的分布、行動パターンなどを把握する。この事前調査の結果をベースラインデータとし、同様の調査方法を用いて、建設工事中は年 3 回のモニタリング調査を行う。各モニタリング調査の実施時には、その他の希少種の有無についても確認する。モニタリング計画の詳細や具体的な手法については、詳細設計段階までに専門家の指導の下で検討される。

建設時及び供用時におけるモニタリング計画は下表のとおりである。影響が A-または B-と判定された項目についてはモニタリングの対象とした。

大気質・騒音・振動については、本事業のモニタリング終了後も、関係機関において継続的なモニタリングが行われるように体制を構築する。

表 7-52 : 環境モニタリング計画

Sl. No	項目	段階	パラメーター	方法	基準	場所	頻度	期間	主体	
									実施	監督
M1	大気	建設時	PM ₁₀ , SO ₂ , NO _x , CO,	<ul style="list-style-type: none"> CPCB により指定された方法で行う。 粉塵の採集はプラントから 50 m 風下の地点で行う。 	Air (P&CP) Rules, CPCB, 1994	プラント周辺、工事個所周辺	年 3 回	9 年間	施工業者	PIU
M2		供用時	PM ₁₀ , SO ₂ , NO _x , CO,	<ul style="list-style-type: none"> CPCB により指定された方法で行う。 	Air (P&CP) Rules, CPCB, 1994	図 7-13 のサンプリング地点	年 3 回	2 年間	PIU	PIU
M3	水質	建設時	pH, 濁度, BOD, COD, DO, 全窒素, 全リン, 重金属, 炭化水素/ 鉱油, フェノール類, シアン化合物	<ul style="list-style-type: none"> インドの水質調査規程に従う インドの基準に基づく手法によるサンプル採取・分析 	CPCB 水質基準	図 7-15 のサンプリング地点及び建設労働者のキャンプ	年 3 回	9 年間	施工業者	PIU
M4	廃棄物	建設時	廃棄物の種類及び量	<ul style="list-style-type: none"> 廃棄物の種類と量を記録する。 	Municipal Solid Waste (Management & Handling) Rules, Hazardous Waste (Management, Handling & Trans boundary Movement) Rules	建設廃棄物集積所	年 3 回	9 年間	施工業者	PIU
M5	騒音	建設時	騒音レベル dB (A)	<ul style="list-style-type: none"> 建設機械から 1m 離れた場所で測定する。 	CPCB 騒音基準	工事個所付近	年 3 回	9 年間	施工業者	PIU
M6		供用時	騒音レベル dB (A)	<ul style="list-style-type: none"> 橋梁から 15m 離れた場所で測定する。 	CPCB 騒音基準	橋梁に沿って 4 か所で行う。	年 2 回	2 年間	PIU	PIU

Sl. No	項目	段階	パラメーター	方法	基準	場所	頻度	期間	主体	
									実施	監督
M7	地形・地質	建設時	盛土の状況	<ul style="list-style-type: none"> 盛土の側面が緩んでいないかを目視で確認する。 		工事個所周辺、資材置場等	年3回	9年間	施工業者	PIU
M8	土壌汚染	建設時	燃油類等の流出の有無	<ul style="list-style-type: none"> 目視による確認 		工事個所周辺、資材置場等	年3回	9年間	施工業者	PIU
M9	生態系	建設時及び供用時	ガンジスカワイルカの見撃頻度、希少種(注1)の有無(種名。確認地点)	<ul style="list-style-type: none"> 川岸からの目視による測定(日の出から日没まで×10日間)建設作業員や住民への聞き取り 	ベースライン調査を着工前に行う。	ドゥブリ、プルバリ	年2回	建設時9年間、供用後2年間	NGO	PIU
M10	PAPの生計	建設時及び供用時	サンプリングでのヒアリング調査	<ul style="list-style-type: none"> NGOを通じて、RAPの効果を内部・外部モニタリングで評価する。 	RAP計画時点でのセンサス調査	ROW内	年2回	建設時9年間、供用後2年間	9NGO	PIU
M11	土地利用	建設時	土地利用の変化	<ul style="list-style-type: none"> 現地視察 	工事前の土地利用	建設ヤード、労働者キャンプ	年2回	建設時9年間	施工業者	PIU
M12	地域資源利用	建設時	建設資材の価格	<ul style="list-style-type: none"> 現地建設会社へのヒアリング 	NA	ROW周辺	年2回	建設時9年間	施工業者	PIU
M13	被害と便益の偏在	建設時及び供用時	満足レベル	<ul style="list-style-type: none"> RAPモニタリング結果の評価 	NA	ROW周辺	年2回	建設時9年間、供用後2年間	PIU	PIU
M14	水利用	建設時	シルトフェンスの利用の有無	<ul style="list-style-type: none"> 現地視察 	NA	居住地区近隣の建設サイト	During construction near residential area	建設時9年間	施工業者	PIU
M15	ジェンダー	建設時	女性の雇用者数	<ul style="list-style-type: none"> 雇用記録 RAPモニタリング結果の評価 	NA	ROW内および周辺村落	年2回	建設時9年間	NGO、施工業者	PIU

Sl. No	項目	段階	パラメーター	方法	基準	場所	頻度	期間	主体	
									実施	監督
M16	公衆衛生	建設時及び供用時	適切な設備・施設の整備 健康関連の報告	<ul style="list-style-type: none"> 現地視察 健康診断の記録 	NA	建設ヤード、労働者キャンプ	年2回	建設時9年間、供用後2年間	施工業者	PIU
M17	労働安全衛生	建設時	適切な設備・施設の整備 作業関連の事故数	<ul style="list-style-type: none"> 現地視察 事故の記録 	工場法	建設ヤード、労働者キャンプ	年2回	建設時9年間	施工業者	PIU
M18	交通安全	建設時及び供用時	交通事故数	<ul style="list-style-type: none"> 交通事故の記録 	NA	ROW内	年2回	建設時9年間、供用後2年間	施工業者	PIU

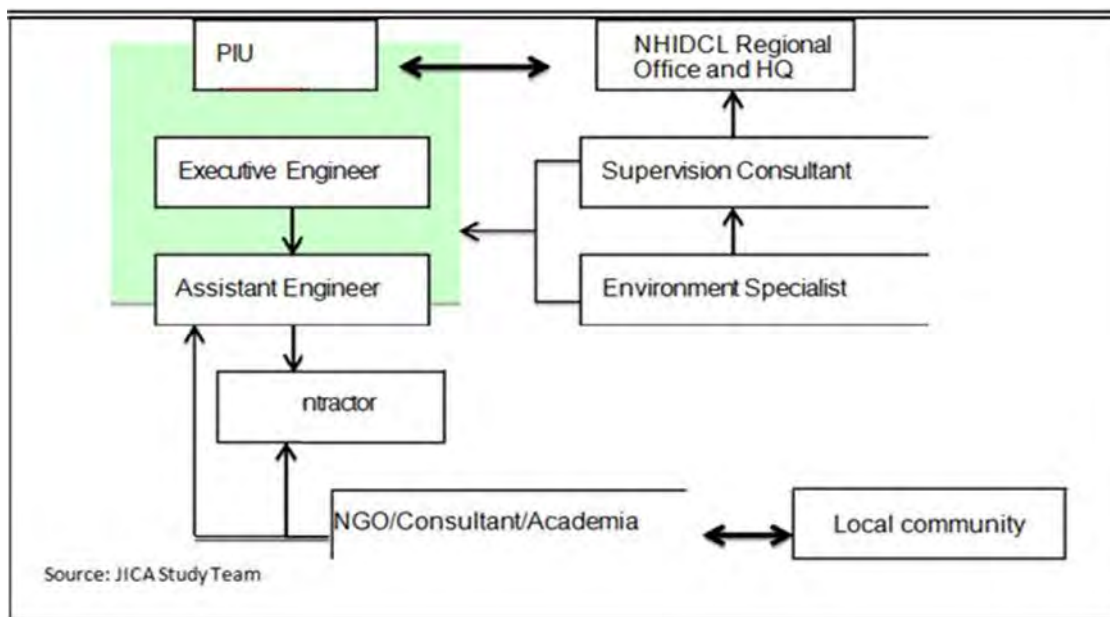
出典：JICA 調査団

注1：希少種は以下のとおり。

Trachypitecus pileatus,
Platanista gangetica gangetica
Pteropus giganteus
Semnopithecus entellus.
Vulpes bengalensis
Aythya baeri
Gracula religiosa
Gyps indicus
Leptoptilos javanicus
Leptoptilos dubius
Otus spilocephalus
Sturnus contra
Aspideretes gangaticus
Aspideretes hurum
Bungarus fasciatus
Chitra indica
Melanochelys tricarinata
Morenia petersi
Naja naja
Pangshura sylhetensis
Pangshura smithii
Varanus bengalensis
Hoplobatrachus tigerinus

7.10.3 組織体制

環境管理計画及びモニタリング計画を実施するための組織体制を下図に示す。工事中の環境管理及びモニタリング計画は原則的に NHIDCL が実施母体であるが、モニタリング作業全般は工事契約の中に含まれ、全ての環境管理及びモニタリング計画を建設工事業者が実施する。PIU は NHIDCL の中に設置されるプロジェクト実施チームで環境管理及びモニタリング計画の最終的な責任を負う。



出典：JICA 調査団

図 7-24：環境管理計画及びモニタリング計画に関連する組織体制

7.10.4 モニタリングフォーム

表 7-54 から表 7-61 に本件全体のモニタリング計画の概要に沿って実施される各項目の JICA プロジェクトにおける標準的なモニタリングフォームを示す。各種モニタリングは原則として 6 ヶ月に 1 度（雨期及び乾季）実施するのが望ましい。

なお、用地取得および住民移転に関連するモニタリングフォームは、7.12.9 に記載。

表 7-53：許認可（モニタリングフォーム）

建設段階	モニタリング項目	報告期間中の状況
	例：当局からの指摘事項への対応	

出典：JICA 調査団

表 7-54 : 汚染対策—大気質 (排出ガス測定値および周辺大気環境測定値)
(モニタリングフォーム)

建設段階

項目 (単位)	ベースライン 調査時の測定値 (最大値)	測定値 (最大値)	現地基準	参照した 国際的基準	備考 (測定場所、頻度、 方法等)
SO ₂	11.5µg/m ³		80µg/m ³	20µg/m ³	ベースライン調査位置と同様、年3回、National Ambient Air Quality Standard: NAAQS の分析方法を用いる
NO ₂	23.7 µg/m ³		80µg/m ³	200µg/m ³	同上
CO	780 µg/m ³		2000µg/m ³	-	同上
PM10	88.7		100µg/m ³ 50µg/m ³		同上

出典：JICA 調査団

共用段階

項目 (単位)	ベースライン 調査時の測定値 (最大値)	測定値 (最大値)	現地基準	参照した 国際的基準	備考 (測定場所、頻度、 方法等)
SO ₂	11.5µg/m ³		80µg/m ³	20µg/m ³	ベースライン調査位置と同様、年3回、National Ambient Air Quality Standard: NAAQS の分析方法を用いる
NO ₂	23.7 µg/m ³		80µg/m ³	200µg/m ³	同上
CO	780 µg/m ³		2000µg/m ³	-	同上
PM10	88.7		100µg/m ³ 50µg/m ³		同上

出典：JICA 調査団

表 7-55 : 水質 (モニタリングフォーム)

建設段階

項目 (単位)	ベースライン 調査時の測定値 (最大値)	測定値 (最大値)	現地基準	参照した 国際的基準	備考 (測定場所、頻度、 方法等)
pH	6.2-7.54		6.5-8.5	6-9	Chagal Chora (Latitude 26°
濁度	6.5NTU		10NTU	50mg/L	02°0.58"N & Longitude 89°
BOD/COD	4.2/16.0mg/L		-	30/125	56°15.22"E) (Bore well)、
DO	6.0-7.2 mg/L		10	-	Chaitarchar (Latitude 25°
全窒素	2.6-10.68 mg/L		-	-	55°49.65"N& Longitude
全燐	<0.01 mg/L		-	-	89° 59'30.77"E)(Brahmaputra
重金属	<0.05 mg/L		-	-	River)、Katiaralaga (Latitude

項目 (単位)	ベースライン調査時の測定値 (最大値)	測定値 (最大値)	現地基準	参照した国際的基準	備考 (測定場所、頻度、方法等)
炭化水素／ 鉱油	3.2 mg/L				250 57' 48.71" N & Longitude 890 58'34.52" E) (Hand
フェノール類	<0.01 mg/L				pump)、Bororavatari (Latitude 250 55' 00.77" N & Longitude 900 01' 45.56" E) (Jinger
シアン化合物	BDL				River) 、Phulbari (Latitude 250 53' 21.04" N & Longitude 900 02' 13.40" E) (Dug well) 年 3 回、Indian Standard Drinking Water Specification - IS 10500: 1991 の水質分析方法を用いる

出典：JICA 調査団

表 7-56：廃棄物（モニタリングフォーム）

モニタリング項目	廃棄物の種類と分量
建設工事中の残材処理：再利用	
建設工事中の残材処理：投棄	

出典：JICA 調査団

表 7-57：騒音・振動（モニタリングフォーム）

建設段階

項目 (単位)	ベースライン調査時の測定値 (最大値)	測定値 (最大値)	現地基準	参照した国際的基準	備考 (測定場所、頻度、方法等)
騒音レベル	40.5 dB	62.4 dB	インド 騒音基準		Chagal Chora (Latitude 26° 02'0.58"N & Longitude 89° 56'15.22"E)
振動レベル					Katiaralaga (Latitude 250 57' 48.75" N & Longitude 890 58'34.64" E) Bororavatari (Latitude 250 55' 05.21 N & Longitude 900 00' 54.81" E) Phulbari (Latitude 250 53' 20.91" N & Longitude 900 02' 15.30" E)、Thrice a year、年 3 回、インド騒音基準 (Noise Standard of India 2000) による分析方法を用いる

出典：JICA 調査団

供用段階

項目 (単位)	ベースライン 調査時の測定値 (最大値)	測定値 (最大値)	現地基準	参照した 国際的基準	備考 (測定場所、頻度、 方法等)
騒音レベル	40.5 dB	62.4 dB	インド 騒音基準		Chagal Chora (Latitude 26° 02'0.58"N & Longitude 89° 56'15.22"E)
振動レベル					Katiaralaga (Latitude 25 57' 48.75" N & Longitude 89 58'34.64" E) Bororavatari (Latitude 25 55' 05.21 N & Longitude 90 00' 54.81" E) Phulbari (Latitude 25 53' 20.91" N & Longitude 90 02' 15.30" E)、Thrice a year, 年3回、インド騒音基準 (Noise Standard of India 2000) による分析方法を用いる

出典：JICA 調査団

表 7-58: 地形・地質 (モニタリングフォーム)

建設段階	
モニタリング地点	斜面の状況、土壌侵食等
労働者キャンプ	
資材置場	
工事箇所	
その他	

出典：JICA 調査団

表 7-59: 土壌汚染 (モニタリングフォーム)

建設段階	
モニタリング項目	報告期間中の状況
油流出等の有無	

出典：JICA 調査団

表 7-60 : 自然環境—生態系 (モニタリングフォーム)

建設段階		
モニタリング項目	報告期間中の状況	備考
ガンジスカワイルカの日 撃頻度	頭/日	6地点以上で測定 (Dhubri 2地点、 Phulbari 2地点、中州 2地点)、年 2回、10日間連続
希少種の目撃状況 <i>Trachypithecus pileatus</i> , <i>Pteropus giganteus</i> <i>Semnopithecus entellus</i> .		* 詳細なモニタリング方法を詳細 設計段階に策定する。

モニタリング項目	報告期間中の状況	備考
<i>Vulpes bengalensis</i>		
<i>Aythya baeri</i>		
<i>Gracula religiosa</i>		
<i>Gyps indicus</i>		
<i>Leptoptilos javanicus</i>		
<i>Leptoptilos dubius</i>		
<i>Otus spilocephalus</i>		
<i>Sturnus contra</i>		
<i>Aspideretes gangaticus</i>		
<i>Aspideretes hurum</i>		
<i>Bungarus fasciatus</i>		
<i>Chitra indica</i>		
<i>Melanochelys tricarinata</i>		
<i>Morenia petersi</i>		
<i>Naja naja</i>		
<i>Pangshura sylhetensis</i>		
<i>Pangshura smithii</i>		
<i>Varanus bengalensis</i>		
<i>Hoplobatrachus tigerinus</i>		

出典：JICA 調査団

供用段階

モニタリング項目	報告期間中の状況	備考
ガンジスカワイルカの目撃頻度		6 地点以上で測定（Dhubri 2 地点、Phulbari 2 地点、中州 2 地点）、年
希少種の目撃状況		3 回、10 日間連続
種名		
目撃地点		

出典：JICA 調査団

表 7-61：土地利用

モニタリング項目	土地利用の変化による問題の有無
移転先サイト	
工事用ヤード	
その他	

出典：JICA 調査団

表 7-62：地域資源利用

モニタリング項目	価格高騰 (有/無)	有の場合、説明
砂		
砂利		
その他		

出典：JICA 調査団

表 7-63 : 被害と便益の偏在

モニタリング項目	サンプル数	不満と回答した PAP 数	理由
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満足度

*RAP モニタリング結果に基づく

出典：JICA 調査団

表 7-64 : ジェンダー

モニタリング項目	説明
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女性の雇用人数

出典：JICA 調査団

表 7-65 : 公衆衛生

モニタリング項目	説明
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患者の数

出典：JICA 調査団

表 7-66 : 労働安全衛生

モニタリング項目	説明
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施設および設備 適切／不適切、不適切の場合は説明

職業関連の事故の原因と数

出典：JICA 調査団

表 7-67 : 事故

モニタリング項目	説明
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負傷者／死亡者数

事故の場所

事故の種類と原因

出典：JICA 調査団

7.10.5 モニタリング予算

下表に本件事業に係る環境管理及びモニタリング予算（案）を示した。

表 7-68 : 環境管理及びモニタリング予算 (案)

No.	緩和策の内容	単位	数量	単価 (Rs.)	合計 (Rs.)
A. 建設時の予算					
1	環境モニタリング				
	大気質 (年 3 回×5 か所×8 年)	回数	120	8,000.00	960,000.00
	水質 (年 4 回×5 か所×8 年)	回数	160	6,000.00	960,000.00
	騒音 (年 3 回×10 か所×8 年)	回数	180	3,000.00	540,000.00
	生態系 (年 2 回×8 年)	回数	16	2,500,000.00	40,000,000.00
2	粉塵の飛散の防止 (1 日 2 回×300 日×8 年)	回数	4800	1,500.00	7,200,000.00
3	土壌流出防止・緑化			10,00,000.00	1,000,000.00
	合計				50,840,000.00
B. 人件費					
1.	専門家				600,000.00
2.	スタッフトレーニング				400,000.00
3.	情報公開				400,000.00
	合計				1,400,000.00
C. 供用時の予算					
1	環境モニタリング				
	大気質 (年 3 回×5 か所×2 年間)	回数	30	8,000.00	240,000.00
	騒音 (年 2 回×4 か所×2 年間)	回数	16	3,000.00	48,000.00
	生態系 (年 2 回××2 年間)	回数	4	2,500,000.00	10,000,000.00
				合計	10,288,000.00
合計 (A + B + C)					62,528,000.00
予備費 (10%)					6,252,800.00
総額 (Rs.)					68,780,800.00

出典：JICA 調査団

7.11 ステークホルダー協議

ステークホルダー協議は、プロジェクトの準備段階から実施することが重要である。協議の目的は、プロジェクトの概要と想定される環境社会面への影響に関する説明を行い、関係者からの意見を聴取し、計画策定に反映することである。このプロセスは、プロジェクトを実施するに当たり、広範な関係者との合意形成を構築する際にも有効である。

本調査では、EIA と RAP のステークホルダー協議を同時期に実施した。EIA プロセスの一環として事業説明や予測される影響について説明したが、質問の多くは用地取得や住民移転に集中した。ステークホルダー協議の詳細内容は、「7.13 ステークホルダー協議の詳細」の節に記載する。

7.12 用地取得および住民移転

7.12.1 用地取得・住民移転の必要性

本事業は、全長 19.282 km の橋梁プロジェクトであり、アッサム州のドゥブリ県、南サルマラ・マンカチャル県およびメガラヤ州の西ガロ・ヒルズ県に跨る。提案されている橋梁区間は、新たに指定された国道 127B 号の一部となり、ブラマプトラ川を横断し、アッサム州ドゥブリとメガラヤ州プルバリに接続し、アッサム州はスリランプール、メガラヤ州川はノングストインまでを繋ぐ国道となる。本事業は、4 車線で計画されており、インド国内の 4 車線道路の ROW 基準および仕様 (IRC:SP:84-2014) に基づき 60 m と設定されている。

IRC:SP:84-2014	A minimum Right of Way of 60m should be available for development of 4-lane highway. The authority would acquire the additional land required, if any.
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ROW 内には、18 つの村落が含まれる。これらの村落には、土地所有者および居住者が存在しており、ROW 内の用地取得と住民移転が必要となる。そのため、本調査では、インド国法規および JICA ガイドラインに基づき、対象となる県の用地取得担当官、県協議会、村長の関与のもとに、住民移転計画 (RAP) の策定支援を実施する。

(1) 事業コンポーネント・影響エリア

用地取得・住民移転の影響を及ぼす事業コンポーネントは、アッサム州ドゥブリ～メガラヤ州プルバリ間のアプローチ道路を含む新設橋梁区間である。影響エリアは、全区間の ROW (60 m) 内の土地、家屋等の建物および公共施設等となる。

表 7-69 : 事業コンポーネント・影響エリア

全長	19.282 km
ROW	60 m (4 車線)
対象地域	18 村落ドゥブリ県 : 13 村、南サルマラ・マンカチャル県 : 4 村、 西ガロ・ヒルズ県 : 1 村

出典 : JICA 調査団

(2) 初期設計代替案

移転を回避・最小化するために検討された初期設計代替案としては、前述「7. 代替案検討」に記載の通り、代替案の分析が行われた。橋梁オプションの用地取得および住民移転に関する項目を抜粋すると、下表のとおり。影響を受ける家屋数は、現地視察による目視での確認された数である。DPR 案で選定されたオプション 1 は、影響を受ける家屋数、農地の距離、中州地域の距離、用地取得面積ともに、影響が最も少ないと評価できるという結果となっている。下表は、「7.4.3 代替案の分析結果」に記載されている、3 つの代替案のうち、社会影響を検討した結果である。

表 7-70 : 代替案

	オプション1 (DPR 案)	オプション2	オプション3
影響を受ける家屋数 (No)	122	170	187
農地 (km)	2.00	2.95	5.86
影響を受ける居住地域の距離 (km)	0.90	0.85	1.00
影響を受ける中州地域の距離 (km)	6.30	6.70	5.10
用地取得面積 (ha)	55.20	63.00	71.76

出典：Inception Report, July 2015 (AECOM) に基づき調査団作成

(3) 移転を最小化するための方法

本事業のドゥブリ県側のアプローチ道路の接続地点は、当初の案では、住居が集積している既存道路に接続する計画であった。しかし、住民移転の影響を最小化させるため、現在州政府が計画しているシリランプールまでを繋ぐ国道 27 号線の線形を、既存道路を一部迂回させる形で調整し、本事業の始点が 300 m 程度短縮された。これにより、移転世帯が減少し、小学校の移転が回避された。始点の変更と国道 27 号線の計画道路は、下図に示す通り。



出典：JICA 調査団

図 7-25 : アッサム州ドゥブリ県の橋梁始点の変更

7.12.2 用地取得および住民移転のための法的枠組み

(1) 用地取得・住民移転にかかるインド・当該州の法制度の概要

本事業は、インドの中央政府、州政府、地方政府の関連法規に則り、また JICA のガイドラインとも整合性を図り実施されなければならない。インドにおいて本事業に関係する法的枠組みの概要は、以下のとおりである。

表 7-71 : プロジェクトに係る法律/政策/通達

No	名称	概要
1	用地取得と生活再建および移転における公正な補償と透明性に関する権利法、2013 年 (LARR 法 2013 年) ²³	本法律は 2014 年 1 月 1 日に施行され、ジャンムー・カシミール州以外の全土に適用されている。アッサム州・メガラヤ州における公共事業や公的な目的を含む用地取得の際に、補償や生活再建の内容については同法の規定が適用される。
2	アッサム州用地取得と生活再建および移転における公正な補償と透明性に関する権利規則、2015 年 (アッサム州 LARR 規則 2015 年) ²⁴	本規則は 2015 年 7 月 31 日に施行され、アッサム州に適用される。同規則は、上記の LARR2013 に基づき策定されているため、内容は同様である。一部、対象者からの合意の取り付け、補償金額等が詳細に規定されている。
3	国道法、1956 年 ²⁵	本法律は、中央政府が、国道建設、保守、運営のために、用地取得が必要と判断した場合の用地取得プロセスが規定されている。
4	メガラヤ州土地譲渡 (規制) 法、1971 年 ²⁶	先住民族が所有する土地を維持することを目的とし、管轄当局の事前の承認なしに、他の部族民に譲渡出来ないと規定している。ただし、本法律は、政府による用地取得には原則的に適用されない。
5	情報への権利法、2005 年 ²⁷	公的機関の透明性と説明可能性を高めるため、公的機関の管理下で人々が情報にアクセスできるように定めている。
6	世界銀行 OP4.12 (非自主的住民移転) ²⁸	プロジェクトが影響を与える土地や建物については、権利書や法的文書がない場合でも、最低限、プロジェクト実施前の生活レベルが確保されるような支援を行う必要があることを定めている。
7	JICA 環境社会配慮ガイドライン、2010 年 ²⁹	6) に後述

出典 : JICA 調査団

²³ <http://www.prsindia.org/uploads/media/Land%20and%20R%20and%20R/LAAR%20Bill%20as%20passed%20by%20LS.pdf>

²⁴ https://landrevenue.assam.gov.in/sites/default/files/Assam_right_to_Fair_compensation31072015.pdf

²⁵ <https://indiacode.nic.in/bitstream/123456789/1651/1/195648.pdf>

²⁶ <http://megrevenue.meg.gov.in/acts/land-transfer-act-1971.pdf>

²⁷ <http://meity.gov.in/writereaddata/files/rti-act.pdf>

²⁸ <https://policies.worldbank.org/sites/ppf3/PPFDocuments/090224b0822f89db.pdf>

²⁹ <https://www.jica.go.jp/environment/guideline/pdf/guideline01.pdf>

(2) 本事業の主な適用法令

1) 用地取得と生活再建および移転における公正な補償と透明性に関する権利法、2013年 (LARR 法 2013年)

本法律は、1984年の土地取得法を代替する形で、2013年9月5日に議会で可決され、2014年1月1日に施行された。本法律の目的は以下のとおりである。

- 産業化、重要なインフラ設備の開発および都市化のための用地取得に関して、地方自治政府機関および憲法により定められた村民総会と協議し、土地の所有者やその他の被影響世帯に対する影響を最低限に抑えた、人道的で透明性の高い手続を確保すること
- 用地取得により影響を受ける世帯に対し公正かつ公平な補償を行うこと
- 用地取得により影響を受ける者の生活再建および移転に対して適切な規定を設けること
- 用地取得の結果として、被影響者が用地取得後の社会的、経済的地位の改善につながる開発活動のパートナーとなるようにすること

LARR 法 2013年の施行当初、1956年国道法 (National Highway Act, 1956) は LARR 法 2013年の除外対象とされる「別表4」の13法に含まれていたが、2015年8月28日付の農村開発省の政令により、LARR の規定が同法により適用されることとなった。LARR 法 2013年の規定は、以下の場合に適用される。

- 政府が戦略的目的およびインフラ整備のために用地を取得し、保有、管理する場合
- 政府が、最終的には民間企業により申告された公共目的 (PPP プロジェクトを含むが州道または国道プロジェクトは含まない) のために用地を取得する場合
- 政府が、民間企業による公共目的で、即時のかつ申告された使用のために用地を取得する場合

メガラヤ州は、憲法別表6表に含まれ、同州の土地は、政府ではなく個人に帰属するため、LARR 法 2013年の適用外とされた。しかしながら、政府が公共の目的で土地を取得し、政府関係機関によって管理される事業の場合には、土地取得、補償、生計回復、再定住にかかる法規制は、LARR 法 2013年に基づいて実施されることになっている。

2) アッサム州用地取得と生活再建および移転における公正な補償と透明性に関する権利規則、2015年 (アッサム州 LARR 規則 2015年)

本規則は、2015年7月31日に施行され、アッサム州全土に適用されている。中央政府の法律である LARR2013 は、その手続および仕様の細則については、各州が定めることを認めており、本規則は、アッサム州が LARR2013 をベースに策定したものである。そのため、基本的な内容は同じであり、主に以下の項目が詳細化されている。

- 対象者との合意の取付の説明
- 土地収用前の土地権利書のアップデート
- 補償金額の再取得価格 (Multiplier) の設定方法

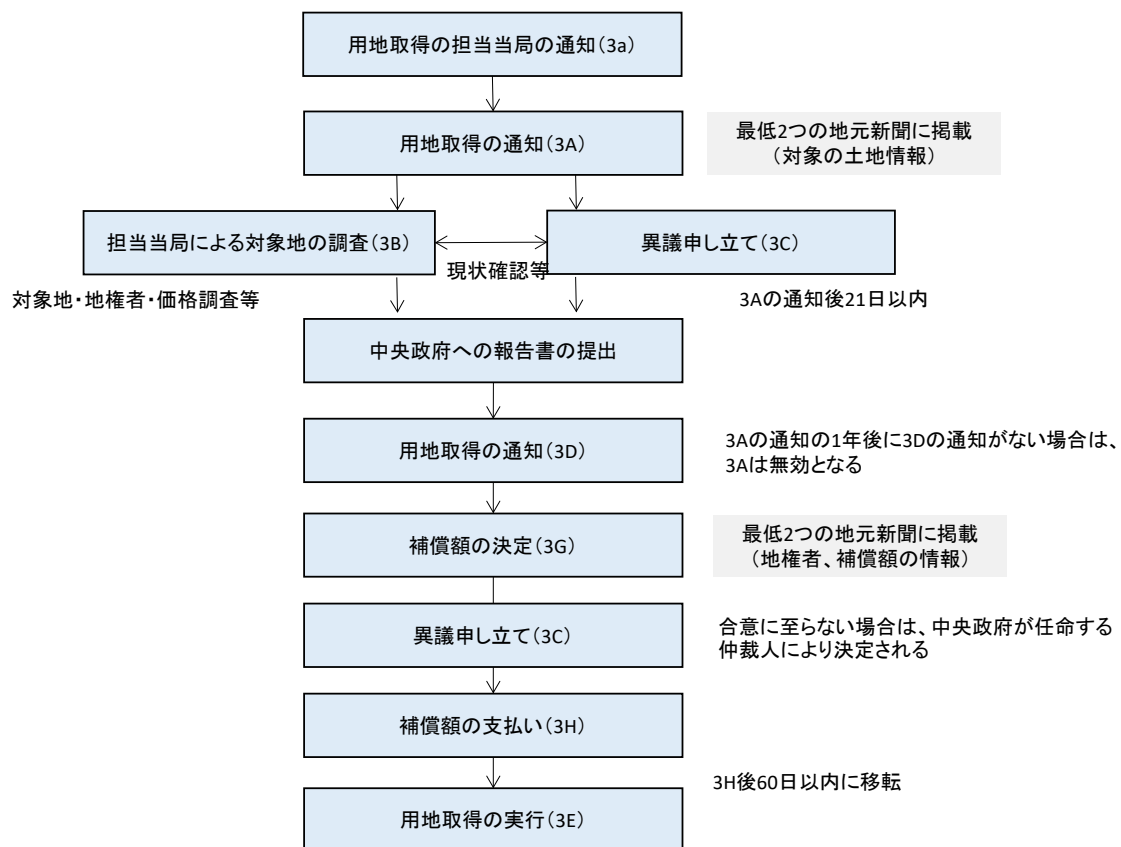
3) 国道法、1956年

本法律は、インド国全土に適用され、中央政府が国道を建設・保守・運営するために必要となる用地取得を行う場合に適用される。なお、国道の定義としては、以下を含むとされている。

- 境界の有無に関わらず、道路の付属地である
- 橋梁、排水渠、トンネル、舗装道路、車道、その他国道の上部もしくは交差して建設される構造物
- フェンス、木、境界を含む道路の付属構造物

本法律では、国道事業のための用地取得の方法が規定されており、中央政府によって選定された地方政府の所轄官庁が用地取得の実施機関となる。補償額は、所轄官庁の所有する土地売買に関する税金の記録もとに算出された市場価格により設定されるが、最終的には所有者の合意を得て、補償が行われ用地取得が実施される内容となっている。

用地取得の手続きは以下のとおり。



出典：調査団

図 7-26 : 国道法の用地取得手続き

4) 2005年情報への権利法

情報への権利法の基本的な目的は、国民に権限を与え、政府の活動の透明性と説明責任を推進することである。2005年情報への権利法は、政府の持つ情報に対する国民の要請に適時に対応することを規定している。2005年6月15日に制定され、2005年10月12日に施行された。本法律は、ジャンムー・カシミール州を除くインドの全地域を対象とし、情報組織およびセキュリティ組織には適用されない。

5) 世界銀行セーフガードポリシー OP 4.12 非自発的住民移転

本ポリシーの目的は、非自発的住民移転は可能な限り回避される、もしくは最低限に抑えられるべきであり、プロジェクト計画時点で代替案が検討することとしている。また、非自発的住民移転が回避できない場合には、被影響者の生計向上、少なくとも住民移転前の生活レベルを回復出来るように支援しなければならないと規定している。また、そのために、住民移転計画の策定および実施段階において、被影響者との協議が行われ、参加の機会が設けられるような配慮が必要であることも明記されている。

本ポリシーの定義する被影響者は、以下のとおりであり、非有権者も含む。

- 法的権利がある地権者（当該国の法規制で認められる慣習的、伝統的な権利を含む）
- センサス調査時には、正式な法的権利を有さないが、収用対象となる土地および財産の所有が主張され、当該国の法規制および住民移転計画の策定段階において、権利が認められると確認された場合
- 占有している土地に対する法的権利が確認できない者

また、補償および支援の対象となるプロジェクトの影響とは、用地取得により、(i) 移転もしくは住宅の損失、(ii) 財産の損失もしくは財産へのアクセスの損失、(iii) 移転の有無にかかわらず、収入源もしくは生計手段の損失などの経済社会的な影響が含まれる。

6) JICA 環境社会配慮ガイドライン、2010年

JICAの住民移転に関する方針は以下のとおりである。

- I. 非自発的住民移転および生計手段の喪失は、あらゆる方法を検討して回避に努めねばならない。
- II. このような検討を経ても回避が可能でない場合には、影響を最小化し、損失を補償するために、実効性ある対策が講じられなければならない。
- III. 移転住民には、移転前の生活水準や収入機会、生産水準において改善又は少なくとも回復できるような補償・支援を提供する。
- IV. 補償は可能な限り再取得費用に基づかなければならない。
- V. 補償やその他の支援は、物理的移転の前に提供されなければならない。

- VI. 大規模非自発的住民移転が発生するプロジェクトの場合には、住民移転計画が、作成、公開されていなければならない。住民移転計画には、世界銀行のセーフガードポリシーの OP4.12 Annex A に規定される内容が含まれることが望ましい。
- VII. 住民移転計画の作成に当たり、事前に十分な情報が公開された上で、これに基づく影響を受ける人々やコミュニティとの協議が行われていなければならない。協議に際しては、影響を受ける人々が理解できる言語と様式による説明が行われていなければならない。
- VIII. 非自発的住民移転および生計手段の喪失にかかる対策の立案、実施、モニタリングには、影響を受ける人々やコミュニティの適切な参加が促進されていなければならない。
- IX. 影響を受ける人々やコミュニティからの苦情に対する処理メカニズムが整備されていなければならない。

また、JICA ガイドラインには、「JICA は、環境社会配慮等に関し、プロジェクトが世界銀行のセーフガードポリシーと大きな乖離がないことを確認する。」と記載されていることから、上記の原則は、世界銀行 P 4.12 によって補完される。世銀 OP 4.12 に基づき追加すべき主な原則は以下のとおりである。

- X. 被影響住民は、補償や支援の受給権を確立するため、初期ベースライン調査（人口センサス、資産・財産調査、社会経済調査を含む）を通じて特定・記録される。これは、補償や支援等の利益を求めて不当に人々が流入することを防ぐため、可能な限り事業の初期段階で行われることが望ましい。
- XI. 補償や支援の受給権者は、土地に対する法的権利を有するもの、土地に対する法的権利を有していないが、権利を請求すれば、当該国の法制度に基づき権利が認められるもの、占有している土地の法的権利および請求権を確認できないものとする。
- XII. 移転住民の生計が土地に根差している場合は、土地に基づく移転戦略を優先させる)
- XIII. 移行期間の支援を提供する
- XIV. 移転住民のうち社会的な弱者、得に貧困層や土地なし住民、老人、女性、子ども、先住民、少数民族については、特段の配慮を行う。
- XV. 200 人未満の住民移転または用地取得を伴う案件については、移転計画（要約版）を作成する。

(上記の主要原則に加え、各事業の住民移転計画、実施体制、モニタリング・評価メカニズム、スケジュール、詳細な資金計画も必要である。)

表 7-72 : アッサム州とメガラヤ州における本事業の適用法

名称	アッサム州	メガラヤ州
LARR 法 2013 年	○	○
アッサム州 LARR 規則 2015 年	○	

名称	アッサム州	メガラヤ州
国道法、1956年	○	○
メガラヤ州土地譲渡（規制）法、1971年		○
情報への権利法、2005年 ³⁰	○	○
世界銀行 OP4.12（非自主的住民移転） ³¹	○	○
JICA 環境社会配慮ガイドライン、2010年 ³²	○	○

出典：調査団

(3) 本事業の適用法とプロセス

1) アッサム州

アッサム州のドゥブリ県と南サルマラ・マンチャカル県の県長官によると、本事業の用地取得については、国道法 1956 年が適用される。ただし、補償内容および生計支援にかかわるプロセスについては、補償および支援予算の算定も含めて、LARR 法 2013 年をベースとしたアッサム州 LARR 規則 2015 年が適用される。

用地取得プロセスにおける国道法 1956 年とアッサム州 LARR 規則 2015 年の主な相違点は、以下のとおり。

- アッサム州 LARR 規則 2015 年の場合、県政府が指定した機関による社会影響評価（SIA）の実施が規定されているが、国道法 1956 年では規定がない。実際には、ドナー資金プロジェクトの場合、DRP コンサルタントが、ドナーの要件を満たす形で、EIA と SIA/RAP を実施している。
- アッサム州 LARR 規則 2015 年の場合は、公聴会の期間が 60 日間であるが、国道法 1956 年の場合は 21 日間と短い。

本事業の用地取得プロセスは、以下のとおり。2017 年 7 月 4 日時点での進捗状況は、対象地域の通知（3A）ドラフト段階である。

表 7-73：アッサム州の土地収用プロセス

プロセス	責任機関
土地収用申請の提出	プロジェクト実施機関
対象地域の通知（3A） （対象村落、対象土地面積）	県政府（県長官）
異議申立期間	県政府（用地取得担当官）
資産評価のためのセンサス調査	県政府（用地取得担当官）
補償額の算出	県政府（県長官）
住民移転計画・支援策の通知（3D） （対象者、補償内容）	県政府（用地取得担当官）
異議申立期間	県政府（県長官）
被影響対象および補償内容の宣言	県政府（県長官）

³⁰ <http://meity.gov.in/writereaddata/files/rti-act.pdf>

³¹ <https://policies.worldbank.org/sites/ppf3/PPFDocuments/090224b0822f89db.pdf>

³² <https://www.jica.go.jp/environment/guideline/pdf/guideline01.pdf>

プロセス	責任機関
補償金額の支払い	プロジェクト実施機関→州政府→県政府→被影響者
土地取得	県政府（県長官）
被影響世帯の移転	県政府（県長官）

出典：JICA 調査団

2) メガラヤ州

メガラヤ州の西ガロ・ヒルズ県の県長官によると、本事業は土地取得および補償内容については、LARR 法 2013 年が適用される。ただし、メガラヤ州は、憲法別表 6 表に該当するため、多くの土地が政府ではなくコミュニティに帰属する。そのため、まずは事業実施の可否について、県自治評議会から事前許可（No Objection Certificate）を取得するというプロセスが追加で必要となる。NOC 発行後の用地取得のプロセス、補償内容および生活支援策、予算算出については、LARR 法 2013 年が適用される。

本案件のメガラヤ州における土地収用プロセスは、以下のとおり。2017 年 7 月 4 日時点では、NOC 取得済、SIA 通知前の段階である。

表 7-74：メガラヤ州の土地収用プロセス

プロセス	責任機関
土地収用申請の提出	プロジェクト実施機関
事前許可（NOC）	県自治評議会
SIA 通知	県政府（県長官）
SIA 実施	特定機関（MIG）
SIA 承認	県レベル専門家グループ
予備的通知	州政府
異議申立期間	県政府（県長官）
補償額の算出	県政府（県長官）
住民移転計画・生計回復策の作成	県政府（県長官）
異議申立期間	県政府（県長官）
被影響対象者および補償内容の宣言	県政府（県長官）
補償金額の支払い	プロジェクト実施機関→州政府→県政府→被影響者
土地取得	県政府（県長官）／州政府
被影響世帯の移転	県政府（県長官）

出典：JICA 調査団

(4) インドと JICA 環境社会配慮ガイドラインの主な相違点／本事業における用地取得・住民移転方針

下表は JICA ガイドラインと、インド国関連法規である、LARR 法 2013 年、アッサム州 LARR 規則 2015 年、国道法 1956 年の主な相違点を以下に示す。また、本事業における相違点に対する対応策についても、表内に示す。

表 7-75 : インド国内法規と JICA 環境社会配慮ガイドラインの主な相違点

JICA ガイドライン	インド国 LARR 法 2013 年/ アッサム州 LARR 規則 2015 年	インド国国道法 1956 年	ギャップ	対応案
非自発的住民移転および生計手段の喪失は、代替案を検討し回避に努めねばならない (JICA GL)	不当な立ち退き、インフラ、生態系に与える障害、影響を受ける人への悪影響を最小限にする (Ch.2)	記載なし	LARR : なし 国道法 : あり	代替案の検討を行う。
非自発的住民移転が回避できない場合には、影響を最小化し、損失を補償するための対策が講じられなければならない (JICA GL)	管轄政府が公共目的で土地を取得しようとする場合は、必ず影響を受ける人々と協議し、社会的影響評価調査 (SIA) を実施する (Ch.2)	記載なし	LARR : なし 国道法 : あり	適切な補償・生計再生策を RAP に反映する。
移転住民には、移転前の生活水準や収入機会、生産水準において改善又は少なくとも回復できるような補償・支援が提供されなければならない (JICA GL)	センサス調査に基づき再定住・移転計画 (補償および生計再生支援を含む) が作成される (Ch.4, 別表 2)	補償金額の決定に当たっては、土地、用地喪失による影響、建物、移転に必要となる費用に対する考慮が必要である (3G)	LARR : なし 国道法 : 生計再建支援に関する記載はない	同上
補償は可能な限り再取得価格に基づき行われなければならない (JICA GL) 資産の喪失に係る補償額は、再取得価格に基づき算出されなければならない (WB OP4.12 Para.10)	取得する土地の補償金額は、県長官が市場価格をベースに算出。都市部で市場価格の 2 倍、農村部で最大 4 倍となる。建物についても、市場価格で算出される。建物についても市場価格に基づき算出される。土地・建物に係る税金および登録費用については、政府が負担する。(Ch.4,8,別表 1)	取得する土地の補償金額は、担当当局が市場価格をベースに決定する (3G)	LARR : 土地の再取得価格は、市場価格の 2-4 倍となり、世銀ガイドラインの条件 (土地価格、土地整備費) を満たす。同じく、建物の再取得価格も市場価格の 2 倍となるため、世銀ガイドラインの条件 (資材費、資材の輸送費、人件費、税金) を満	補償額は、市場価格調査等に基づいた再取得価格をベースに補償費用を算定する。また、再取得価格の算出は、減価償却を考慮しない市場価格をベースとする。

JICA ガイドライン	インド国 LARR 法 2013 年/ アッサム州 LARR 規則 2015 年	インド国国道法 1956 年	ギャップ	対応案
			たす。しかしながら、減価償却が考慮される。 国道法: 担当当局の算出価格が実際の市場価格より低い可能性がある	
補償やその他の支援は、物理的移転の前に行われなければならない (JICA GL)	資格を有する人が補償金全額を受け、生活再建および再定住の資格が与えられたことを確認した後に土地収用が行われる (Ch.5)	取得前に補償の支払いが行われることが規定されている (3H)	LARR: なし 国道法: なし	NA
大規模な非自発的住民移転が伴う事業では、住民移転計画の作成および情報公開が行われなければならない (JICA GL)	管轄政府により SIA 報告書および SIA 管理計画が作成され、現地語で現地機関にも提供される (Ch.2)	管轄政府は、取得用地の情報の公開および対象者と補償金額について現地新聞にて情報公開を行う (3A,3G)	LARR: なし 国道法: なし	NA
住民移転計画の作成に当たり、事前に十分な情報が公開された上で、影響を受ける住民およびコミュニティとの協議が行われなければならない (JICA GL)	公聴会の開催日時・場所について適切な情報公開が行われ、協議内容が SIA に記載される。SIA は、現地語で作成され現地機関にも提供される (Ch.2)	現地新聞での通知後、異議申し立て期間が設けられる (3A,3G)	LARR: なし 国道法: 情報の周知については不十分な可能性がある	情報の周知が十分行われるような配慮が必要。また、住民参加によるステークホルダー協議を実施し、調査に反映させる
協議においては、影響を受ける人々が理解できる言語と様式による説明が行われていなければならない (JICA GL)	同上	同上	LARR: なし 国道法: 情報の周知については不十分な可能性がある	同上

JICA ガイドライン	インド国 LARR 法 2013 年/ アッサム州 LARR 規則 2015 年	インド国国道法 1956 年	ギャップ	対応案
非自発的住民移転および生計手段の喪失に係る対策の立案、実施、モニタリングには、影響を受ける人々やコミュニティの適切な参加が促進されていなければならない (JICA GL)	中央レベル、州レベルのモニタリング委員会が設置される必要がある。また当該分野の専門家を担当者として雇用することも可 (Ch.7)	特別な記載はない。	LARR:なし 国道法:あり	コミュニティの参加が可能な適切なモニタリング体制を設置する。
影響を受ける住民およびコミュニティ苦情処理メカニズムが整備されていなければならない (JICA GL)	取得する土地情報の公表日から 60 日以内に、異議申し立てができる (Ch.4)	取得する土地情報の通知並びに地権者・補償金額の通知の 2 段階で異議申し立ての期間が設けられる (3C,3G)	LARR:あり 国道法:あり	RAP において苦情処理委員会の設置が明記され、県政府を中心とした委員会を設置して対応する。
被影響住民は、補償や支援の受給権を確立するため、初期ベースライン調査を通じて特定・記録される (WB OP4.12 Para.6)	現地調査により、土地収用により影響を受ける世帯、土地・財産が特定される (Ch.2)	現地調査により、土地収用により影響を受ける世帯、土地・財産が特定される (3B)	LARR:なし 国道法:なし	NA
補償や支援の受給権者は、法的権利を有するもの、法的権利を有していないが、権利を請求すれば、当該国の法制度に基づき権利が認められるもの、法的権利および請求権を確認できないものとする (WB OP4.12 Para.15)	法的権利を有するもの (政府用地の譲渡を受けたものを含む) は、補償対象となる。また法的権利を有さないものも 3 年以上居住もしくは継続的にその土地から生計を得ていれば補償対象となる (Ch.3)	土地利用者は、用地価格の 10% が補償対象となる (3G)	LARR:法的権利を有さないものは、3 年以上の居住および生活実態が必要 国道法:法的権利を有さないものは対象外	法的権利を有さないもの (期間を問わず) も補償対象者とする。
移転住民の生計が土地に根差している場合は、土地に基づく移転戦略を優先させる (WB OP4.12 Para.11)	灌漑事業の場合、土地での補償が検討される。指定部族等、生計が土地に根差している場合は、土地による補償が行われる (別表 2)	特別な記載はない。	LARR:なし 国道法:あり	土地での補償を希望した場合には、県長官が土地提供を優先するように支援する

JICA ガイドライン	インド国 LARR 法 2013 年/ アッサム州 LARR 規則 2015 年	インド国国道法 1956 年	ギャップ	対応案
移行期間の支援を提供する (WB OP4.12 Para.6)	移転対象者は、事業による雇用機会と必要な職業訓練の享受、1 回の定額金の受取、20 年間の月額手当の受取を選択できる(別表 2)	補償金額の決定に当たっては、用地喪失による影響、移転に必要な費用に対する考慮が必要である(3G)	LARR:なし 国道法:生計再建策の提供規定はない	生計再建策を住民移転計画に含める。
移転住民のうち社会的な弱者、特に貧困層や土地なし住民、老人、女性、子供、先住民族、少数民族については、特段の配慮を行う (WB OP4.12 Para.8)	社会的弱者および指定部族、指定カーストに対しては、追加的な支援内容が記載されている(別表 2)	特別な記載はない。	LARR:なし 国道法:あり	センサス調査時に、社会的弱者、指定部族、指定カーストを特定し、特別手当を住民移転計画に含める。

出典：JICA 調査団

7.12.3 用地取得・住民移転の規模・範囲

(1) 調査方法

本事業による用地取得の影響および住民移転の規模を確認するため、センサス調査を実施した。センサス調査では、非影響世帯のプロファイルおよび土地および建物を含む資産のインベントリを作成することを目的として、調査票を用いてインタビュー調査を実施した。調査内容は、人口センサス、資産調査、家計・生計調査を含み、補償および支援にかかる費用の概算算出を行った。センサス調査の期間と対象は、以下のとおり。

- 期間：2016年11月下旬～2017年2月下旬
- 対象：家屋・店舗等の建物、農地や住宅用地等の土地が影響を受ける世帯

調査手法としては、DPR コンサルタント（AECOM）が作成した土地取得計画図に基づき、ドゥブリ県および南サラマラ・マンカチャル県の用地取得担当官が作成した、対象村落の土地区画リストをベースに調査を実施した。土地区画リストには、土地所有者、土地の種類および面積が記載されている。西ガロ・ヒルズ県では、土地区画リストが整備されていなかったため、現地踏査での確認に基づき、調査を行った。

本調査では、全対象地を調査対象とすることを試みたが、調査期間中に土地所有者が確認できなかった区画（31.4%）については未調査となった。本調査では、各村落の村長の協力を得て、インタビュー実施日時を事前に連絡し、調査時にも親戚等から所有者に連絡する等の対応は行っている。

下表は、事業の影響を受ける村落と、土地区画の数および未調査の土地区画数を示している。また、網掛け部分は、中州地域の村落を示す。

表 7-76：調査対象の村落と土地区画数

対象県	No.	対象村落	対象の土地区画数	未調査の土地区画数
ドゥブリ県	1	Adabari Part-II	62	25
	2	Chagal chora Part-I	19	5
	3	Chagal chora Part-II	67	24
	4	Chagal chora Part-III	70	24
	5	Airanjangla Part-I	85	20
	6	Airanjangle Part-II	80	17
	7	Bhassanir char Part-I	41	14
	8	Kathiar Alga	66	14
	9	Bauskata IV	1	-
	10*	Bauskata VI	1	-
	11*	Bororawatre Part-I	9	4
	12*	Bororawatre Part-II	5	2
	13	Aminerchar	13	1

対象県	No.	対象村落	対象の土地区画数	未調査の土地区画数
南サルマラ・マンカチャル県	14	Basir Char	1	-
	15	Chaiter Chor Part-I	168	75
	16	Baladoba	47	6
	17*	Sebaltari	1	-
西ガロ・ヒルズ県	18	Phulbari	1	0
		Total	736	231

出典：JICA 調査団

注：網掛け部分は、中州地域を示す。

注：*印の村は、政府の土地であるため、土地区画が整備されていない。

(2) 人口センサス

人口センサス調査では、世帯構成、民族、宗教等の基本情報、土地、建物等を含む財産・用地調査、生計手段や所得等を含む生計・家計調査を実施した。

1) 被影響世帯の概要

本事業の用地取得による影響世帯は、761 世帯であり、そのうち、土地のみが影響を受けるのは 633 世帯 (2,538 人)、土地と建物が影響を受けるのは 127 世帯 (500 人)、商店が影響を受けるのは、1 世帯 (5 人) である。

生計に影響を受ける対象は、農業従事者が 95 世帯、ボートオペレーターが約 300 世帯、漁業従事者が約 100 世帯である。

表 7-77：調査結果概要

項目	被影響世帯		被影響者	
	合法	非合法	合法	非合法
全被影響世帯	671	90	2706	337
建物が影響を受ける (移転が必要) 世帯	124	3	491	9
土地のみ影響を受ける	546	87	2,210	328
商店が影響を受ける世帯	1	0	5	0
生計に影響を受ける世帯	495	-	-	-
農業従事者	95	-	-	-
ボートオペレーター	300	-	-	-
漁業従事者	100	-	-	-

出典：JICA 調査団

注：生計に影響を受ける世帯については、本調査では世帯数の特定に留まる。

以下に、センサス調査の詳細を示す。

2) 被影響世帯数

本調査で特定された被影響世帯および被影響者数は、下表のとおり。被影響世帯が 761 世帯、被影響者が 3,042 人である。県毎の被影響者数をみると、ドゥブリ県が 59.2%、南サ

ルマラ・マンカチャル県が 40.6%、西ガロ・ヒルズ県は、0.1%となっており、全体に占める中州居住者は、全体の 61.1%を占める。

表 7-78 : 被影響世帯および被影響者数

県名	被影響世帯	被影響者	中州地域の被影響者
ドゥブリ県	621	2,550	1,109
南サルマラ・マンカチャル県	138	485	485
西ガロ・ヒルズ県	2	8	0
合計	761	3,042	1,858

出典：JICA 調査団

村落別の統計は、下表のとおり。

表 7-79 : 村落別の被影響世帯および被影響者数

県名	No.	対象村落	被影響世帯	被影響者
ドゥブリ県	1	Adabari Part-II	46	171
	2	Chagal chora Part-I	14	60
	3	Chagal chora Part-II	63	290
	4	Chagal chora Part-III	69	279
	5	Airanjangla Part-I	17	87
	6	Airanjangle Part-II	168	701
	7	Bhassanir char Part-I	56	213
	8	Kathiar Alga	93	360
	9	Bauskata IV	58	252
	10	Bauskata VI	2	8
	11	Bororawatre Part-I	16	65
	12	Bororawatre Part-II	5	20
	13	Aminerchar	14	44
南サルマラ・マンカチャル県	14	Basir Char	0	0
	15	Chaiter Chor Part-I	63	212
	16	Baladoba	52	196
	17	Sebaltari	23	77
西ガロ・ヒルズ県	18	Phulbari	2	8
		Total	761	3,043

出典：JICA 調査団

3) 雨季の移動有無

中州地域では、雨季に水位が上昇するために、中州の川岸は水没する地域もある。被影響世帯のうち、雨季に別の場所に移動する世帯は、全体の 18.7% (142 世帯) であり、その内訳は、ドゥブリ県と南サルマラ・マンカチャル県で約半数ずつである。そのうち、乾季に同じ場所に戻らないと回答した世帯は、ドゥブリ県では約 26.1% (18 世帯) であるのに対して、南サルマラ・マンカチャル県では、約 72.6% (20 世帯) であり、移動型の世帯が

多いことが分かる。また、後述する土地所有との関連では、移動型の世帯も、移動前の土地の所有権もしくは使用権を示す書類があれば、土地も補償の対象となることを確認している。所有権、使用権がない場合は、建物および収穫前作物等のみが補償の対象となる。

表 7-80 : 雨季の移動状況

県名	被影響世帯数	雨季に別の場所に移動する	乾季に同じ場所に戻らない
ドゥブリ県	621	69	18
南サルマラ・マンカチャル県	138	73	53
西ガロ・ヒルズ県	2	0	0
合計	761	142	71
割合	-	18.7%	9.3%

注) 雨季に別の場所に移動し、乾季に同じ場所に戻らないと回答した世帯は、Bororawatre Part-1、Part-2、Baladoba、Chaiteer Chor Part-1 の4村に限られている。

出典：JICA 調査団

4) 被影響者の男女比

被影響世帯の大部分が、男性が世帯主であり、女性が世帯主である被影響世帯は 51 世帯 (6.7%) である。被影響者で見ると、69.0%が男性、31.0%が女性である。

表 7-81 : 被影響世帯および被影響者の男女比

被影響世帯			被影響者		
世帯主 (男性)	世帯主 (女性)	合計	男性	女性	合計
710	51	761	2,099	944	3,043
93.3%	6.7%	-	69.0%	31.0%	-

出典：JICA 調査団

5) 被影響世帯の家族人数

被影響世帯の平均家族人数は、4 名である。ドゥブリ県では 3~5 人、南サルマラ・マンカチャル県では 3~4 人の家族が大半である。

表 7-82 : 被影響世帯の家族人数

	1	2	3	4	5	6	7+	Total
ドゥブリ県	13	62	145	177	131	63	30	621
南サルマラ・マンカチャル県	1	15	59	45	13	3	2	138
西ガロ・ヒルズ県	0	0	0	2	0	0	0	2
合計	14	77	204	224	144	66	32	761
割合	1.8%	10.1%	26.8%	29.4%	18.9%	8.7%	4.2%	-

出典：JICA 調査団

6) 社会的カテゴリー

センサス調査では、全ての被影響世帯が、指定カースト、指定部族を含む、低位カースト階級に属しないと回答した。

7) 民族と言語

対象地域の大部分は、7.3.3 (5) に記載した通り、歴史的背景からアッサム人とベンガル人が同化した民族である。そのため、対象地域では、全世帯において、アッサム語およびベンガル語が使用されている³³。

8) 宗教

761 世帯の宗教構成をみると、99.3%がムスリム教であり、わずか0.7% (5 世帯) がヒンドゥー教となっている。対象地域であるドゥブリ県、南サルマラ・マンカチャル県、そして西ガロ・ヒルズ県のうちプルバリを含む平野地域では、ムスリム教徒が大部分であり、社会的・文化的に主流である。

表 7-83 : 被影響世帯の宗教構成

県名	ムスリム教	ヒンドゥー教	その他
ドゥブリ県	619	2	0
南サルマラ・マンカチャル県	137	1	0
西ガロ・ヒルズ県	0	2	0
合計	756	5	0
割合	99.3%	0.7%	-

出典：JICA 調査団

(3) 財産・用地調査

1) 被影響世帯の土地所有

センサス調査では、政府の土地所有者リストが更新されておらず、登録書に記載されている所有者と現在の居住者が一致していない場合が多いことが確認された。そのため、所有権の有無に関しては、土地を登記している者を「(1) 所有権を有する」とし、登記はされていないが、土地を相続している、もしくは、土地の売買契約を締結済みであり、その根拠となる書類がある者を「(2) 所有権を有さないが権利を主張できる」と分類することとする。また、政府用地に権利書等を保有せずに居住している世帯については、「(3) 所有権を有さない」と分類している。上述の定義を踏まえて対象地域の土地所有の実態を整理すると、下表のとおり。

本事業では、(1) 所有権を有する世帯と (2) 所有権を有さないが権利を主張できる世帯を「合法」、(3) 所有権を有さない世帯を「非合法」と分類する。

³³ アッサム語はベンガル語から派生した言語であるため、両言語は非常に類似している。また、対象地域では、政府関係者は主にアッサム語を使用し、学校教育はアッサム語で実施されているため文字はアッサム語が利用されている。他方で、生活レベルではベンガル語が使用されている。

表 7-84 : 所有権の有無に関する分類

土地所有者 リスト	現状	所有権の有無	補償・支援対象
所有者と現状の 居住者と一致	現在の居住者が登録者と同じ	(1) 所有権を有する	補償・支援.
所有者と現状の 居住者が不一致	現在の居住者が登録者の家族 もしくは権利書を保有	(2) 所有権を有さない が権利を主張できる	補償・支援
政府用地	現在の居住者が権利書等を保 有していない	(3) 所有権を有さない	支援のみ

出典：JICA 調査団

上述の定義により所有者と非所有者を統計した結果は下表のとおり。被影響世帯 761 世帯のうち、449世帯 (59.0%) が所有権を有し、222世帯 (29.1%) が所有権を有さないが権利を主張できる世帯であり、残りの 90 世帯 (11.8%) が所有権を有さない世帯となった。所有権を有さない世帯は中州地域にみられ、地域的に見ると、ドゥブリ県は 71 世帯 (11.4%)、南サルマラ・マンカチャル県で 19 世帯 (13.8%) となっている。

本プロジェクトでは、所有権を有さない世帯についても、支援が提供されるように住民移転計画に含むものとする。

表 7-85 : 被影響世帯の土地所有の状況

県名	所有権を 有する	所有権を有さないが 権利を主張できる	所有権を 有さない
ドゥブリ県	365	185	71
南サルマラ・マンカチャル県	82	37	19
西ガロ・ヒルズ県	2	0	0
合計	449	222	90
割合	59.0%	29.2%	11.8%

出典：JICA 調査団

本事業の建設区画（橋梁及びアクセス道路）毎の合法・非合法別の被影響世帯数は、下表のとおり。

表 7-86 : 建設区画毎の合法・非合法別の PAHs 数

建設区画	合法	非合法
橋梁	332	81
アクセス道路	339	9
合計	671	90

出典：JICA 調査団

2) 民間所有土地への影響

本事業による用地取得対象地の大部分が農業用地である。農業用地への影響を受ける世帯数は 633 世帯 (83.2%)、住宅用地への影響は 102 世帯 (13.4%)、農業と住宅用地への

影響は 25 世帯 (3.3%)、商店の用地に影響を受ける世帯は、1 世帯のみである。なお、住宅用地が影響を受ける世帯は、127 世帯 (16.7%) となる。

表 7-87 : 影響を受ける土地の種類

種類	被影響世帯	被影響者	被影響者の割合
農業用地	633	2,538	83.4%
住宅用地	102	406	13.3%
農業・住宅用地	25	94	3.1%
商業用地	1	5	0.2%
合計	761	3,043	-

出典：JICA 調査団

表 7-88 : 県毎の土地利用

県名	農業用地	住宅用地	農業・住宅用地	商業用地
ドゥブリ県	527	69	24	1
南サルマラ・マンカチャル県	106	31	1	0
西ガロ・ヒルズ県	0	2	0	0
合計	633	102	25	1
割合	83.2%	13.4%	3.3%	0.1%

出典：JICA 調査団

3) 土地への影響度合い

所有地に占める用地取得対象地の割合について、回答があった 393 世帯のうち、影響を受ける面積が 25%以下となる世帯が 46.1%、50%以上影響を受ける世帯は 30.3%である。他の被影響世帯は、全体の所有面積が確認出来なかったため、統計に含まれていない。

表 7-89 : 土地への影響度合い

影響の範囲	被影響世帯	被影響世帯の割合
10%以下	73	18.6%
10% - 25%	108	27.5%
25% - 50%	93	23.7%
50% - 75%	58	14.8%
75%以上	61	15.5%
合計	393	-

注) 他の世帯は、所有地の面積を把握しておらず未回答となっている。

出典：JICA 調査団

4) 建物への影響

本事業の用地取得により、273 の建物が影響を受け、127 世帯 (500 人) が住居を移転する必要がある。地域別に見ると、移転が必要となる建物の 72.3%、被影響者数の 71.4%がドゥブリ県の住民である。

表 7-90 : 民間所有の建物への影響

県名	影響を受ける建物数	移転が必要となる被影響世帯	移転が必要となる被影響数	被影響世帯数の割合
ドゥブリ県	200	93	357	71.4%
南サルマラ・マンカチャル県	65	32	135	27.0%
西ガロ・ヒルズ県	8	2	8	1.6%
合計	273	127	500	-

出典：JICA 調査団

5) 影響を受ける建物のタイプ

本事業により影響を受ける建物のタイプは、常設、半常設、仮設タイプに分けられる。用地取得により影響を受ける 273 の建物のうち、32 の建物（11.7%）が常設であり、78 の建物（28.6%）が半常設、半数以上の 163 の建物（59.7%）が仮設タイプとなっている。

表 7-91 : 影響を受ける建物のタイプ

県名	常設タイプ	半常設タイプ	仮設タイプ
ドゥブリ県	23	55	122
南サルマラ・マンカチャル県	1	23	41
西ガロ・ヒルズ県	8	0	0
合計	32	78	163
割合	11.7%	28.6%	59.7%

出典：JICA 調査団

6) 公共施設への影響

本事業による公共施設への影響は、プルバリに位置する森林局の事務所のみである。移設場所等に関しては、西ガロ・ヒルズ県の長官と森林局が協議した上で決定される。その他、教育施設や宗教施設等に影響はない。

7) 樹木および作物への影響

ROW 内には、合計 2,559 本の樹木が影響を受ける。そのうち、74.1%（1,897 本）が果樹であり、25.9%（662 本）がその他の樹木である。センサス調査時には、果樹は、バナナ、ジャックフルーツ、グランドナッツ等、樹木は、竹が多く見られた。

表 7-92 : 樹木への影響

県名	果樹	その他の樹木
ドゥブリ県	1796	594
南サルマラ・マンカチャル県	62	29
西ガロ・ヒルズ県	39	39
合計	1897	662
割合	74.1%	25.9%

出典：JICA 調査団

対象地域の作物は、稲作がベースであり、裏作として、豆類、ジュート、トマトや芋を含む野菜、唐辛子が栽培されている。センサス調査時には、正確な栽培面積および各作物別の面積が特定できなかった。下表は、被影響世帯の年間を通じた栽培作物を示したものであり、年間に複数作物を栽培している場合は、複数回答となっている。

ドゥブリ県の被影響世帯は、稲作（99.6%）の裏作として、豆類（74.9%）、ジュート（40.7%）、そして一部野菜（31.4%）を栽培している。南サルマラ・マンカチャル県では、豆類（84.9%）、稲作（49.1%）、ジュート（3.8%）が栽培されている。実際の用地取得の際には、各県の用地取得担当官が収穫前の作物の面積と種類を調査し、市場価格で補償金額を決定することになる。

表 7-93 : 作物への影響

県名	被影響世帯数	米	豆類	ジュート	野菜
ドゥブリ県	526	99.6%	74.9%	40.7%	31.4%
南サルマラ・マンカチャル県	106	49.1%	84.9%	3.8%	0.1%
西ガロ・ヒルズ県	0	0	0	0	0

出典：JICA 調査団

8) 生計への影響

用地取得により直接的に財産を失う者の他に、用地取得対象地で雇用されている農業労働者も生計に影響を受けることになる。センサス調査では、主にドゥブリ県で合計 95 人の農業労働者が確認された。その多くは、季節労働者であり、作付けおよび収穫時に短期的に雇用されている。これらの農業労働者も支援策の対象者に含む。

また、橋梁が繋ぐドゥブリとプルバリ間を運航しているボートオペレーターも本事業により影響を受けることになる。ドゥブリ県の内陸水運局によると、直行便は、毎日客船が 20 隻、物資輸送船が 30-50 隻運航している。ドゥブリおよびプルバリのボートオペレーター組合の情報では、同地域に合計 2,000 のボートオペレーター（従業員を含む）が登録されており、そのうち 250-300 人が直行便を運航している。これらの直行便を運航しているボートオペレーターも支援の対象者に含む。その他は、中州地域を結ぶ航路を運航しており、橋梁完成後も引き続き運航需要があると考えられる。

さらに、本事業周辺地の住民は、漁業も生計手段の一つとなっている。漁業従事者との協議では、本事業のアライメント内には、約 100 世帯が漁業を主要な収入源としてしていると報告された。彼らの漁業範囲は特定されておらず、通常は 4-5 km 圏内で漁業を行っているようであり、建設中もアライメント外で漁業を継続することは可能と考えられる。ただし、保有しているボートが、手漕ぎボートであることを考慮すると、長距離の移動は困難であると考えられ、建設中に漁獲量が減少する可能性もある。そのため、これらの漁業従事者も工事期間中の雇用機会が与えられるように配慮する。

(4) 家計・生計調査

1) 被影響世帯の教育レベル

被影響世帯の大半を占める 60.7%が教育を受けていない。教育を受けている世帯主の教育レベルは、12.2%が初等教育の低中学年（6～10 歳）、9.8%が初等教育の高学年（11～12 歳）、9.0%が中等教育までであり、高等教育および大学教育を受けた世帯主は、それぞれ 4.1%と 4.8%と少ない。

表 7-94：被影響世帯の教育レベル

県名	教育なし	初等 (低中)	初等 (高)	中学	高校	大学	合計
ドゥブリ県	348	78	69	62	30	33	620
南サルマラ・ マンカチャル県	111	13	5	6	1	2	138
西ガロ・ ヒルズ県	0	1	0	0	0	1	2
合計	459	92	74	68	31	36	760
割合	60.7%	12.2%	9.8%	9.0%	4.1%	4.8%	-

出典：JICA 調査団

2) 識字率

教育を受けていない世帯主を非識字者と考えると、ドゥブリ県と南サルマラ・マンカチャル県の識字率は、それぞれ 43.9%と 19.6%である。被影響世帯の識字率は、県の平均値である 58.3%と 40.0%よりも低い、特に南サルマラ・マンカチャル県が非常に低い水準となっている。プルバリの被影響世帯は 2 世帯のみであるが、1 世帯は初等教育、1 世帯は大学教育を受けている。

表 7-95：被影響世帯の識字率

県名	識字率	県平均
ドゥブリ県	43.9%	58.3%
南サルマラ・ マンカチャル県	19.6%	40.0%
西ガロ・ヒルズ県	-	67.6%

出典：JICA 調査団

3) 生計手段

下表は、被影響世帯の生計手段を示す。全被影響世帯が農業に従事しており、次に建設業等に従事する非熟練労働者が 46.3%を占める結果となった。また、自営業が 7.6%、民間企業が 3.0%、政府関係が 4.5%である。被影響世帯の主要な生計手段は農業であり、加えて、非熟練労働に従事している状況が分かる。

表 7-96 : 被影響世帯の生計手段

県名	農業	家畜	非熟練 労働	熟練 労働	自営業	民間 企業	政府 関係	その他	合計
ドゥブリ県	554	11	273	40	4	19	25	68	994
南サルマラ・ マンカチャル県	117	1	38	11	3	0	5	5	180
西ガロ・ヒルズ県	0	0	0	0	0	1	0	1	2
合計	671	12	311	51	7	20	30	74	1176
割合	100%	1.8%	46.3%	7.6%	1.0%	3.0%	4.5%	11.0%	-

注) 複数回答を可とした。

出典 : JICA 調査団

4) 所得

被影響世帯の月額所得は、1,000 ルピー以下の世帯が 0.8% であり、大部分となる 42.2% は 1,001~5,000 ルピー、36.8% は 5,001~9,000 ルピーの所得がある。また、月額 13,001~21,000 ルピーは 3.7%、23,000 ルピー以上を所得とする世帯は 6.1% となっている。地域別にみると、ドゥブリ県と南サルマラ・マンカチャル県では、月額所得が 1,001~9,000 ルピーである世帯が大半を占め、西ガロ・ヒルズ県の世帯は 9,001~17,000 ルピーである。

対象地域は、自給自足の農業が主流であるため、所得の金額のみで生活水準が測れないと言えるが、貯金や新しい投資を行う資金が少ないということが分かる。

表 7-97 : 被影響世帯の月額所得 (ルピー/月)

県名	1,000 以下	1,001- 5,000	5,001- 9,000	9,001- 13,000	13,001- 17,000	17,001- 21,000	21,001 以上	合計
ドゥブリ県	6	260	207	72	14	11	42	612
南サルマラ・ マンカチャル県	0	57	70	5	1	1	4	138
西ガロ・ヒルズ県	0	0	0	1	1	0	0	2
合計	6	317	277	78	16	12	46	752
割合	0.8%	42.2%	36.8%	10.4%	2.1%	1.6%	6.1%	-

出典 : JICA 調査団

5) 脆弱性

センサス調査では、女性が世帯主となる世帯が 51 世帯 (6.7%)、障害者を持つ世帯は 8 世帯 (1.1%)、扶養者のいない高齢者が世帯主となる世帯が 1 世帯 (0.1%)、貧困ライン以下であると認識している世帯が 414 世帯 (54.4%) となった。貧困ライン以下の世帯数は、自己申告された数であり、世帯所得を確認したわけではないが、これらの世帯については、環境の変化に対応する能力に配慮する必要がある。

表 7-98 : 被影響世帯の脆弱性

県名	女性の世帯主	障害者を持つ世帯	扶養者のいない高齢世帯主	貧困ライン以下の世帯*	合計
ドゥブリ県	47	8	1	363	419
南サルマラ・マンカチャル県	4	0	0	51	55
西ガロ・ヒルズ県	0	0	0	0	0
合計	51	8	1	414	474
割合	6.7%	1.1%	0.1%	54.4%	

*貧困ライン以下の世帯数は、センサス調査時に回答があった数を記載しており、実際の世帯所得を確認した数字ではない。

出典：JICA 調査団

7.12.4 補償・支援の具体策

(1) カットオフデート

本調査実施の開始段階では、インド側の正式なカットオフデートは通知されていなかったため、本調査のカットオフデートは調査開始時と設定する。その後、インド側のインベントリー調査が開始された2017年3月が正式なカットオフデートとして設定された。

- 本調査のカットオフデート：2016年11月下旬
- インド側のカットオフデート：2017年3月

(2) 補償・支援の対象者

本プロジェクトにおける補償・支援の対象者は、以下のように分類される。

- 民間用地に居住し、土地使用权を保有する（所有権を有する）
- 民間用地に居住し、土地使用权もしくは土地購入証明書を保有するが政府登録されていない（所有権を有さないが権利が主張できる）
- 政府用地に居住し、権利書等を保有しない（所有権を有さず権利が主張できない）

(3) 補償の方針

住民移転の影響を最小限に抑える対策を行っても、本事業は土地および建物への影響は避けられない。そのため、非自主的住民移転の対応においては、移転住民に公正な補償及び適正な支援を提供する住民移転計画が整備されなければならない。

1) 土地での補償

被影響世帯が補償金ではなく土地での補償を望む場合は、県長官が適切な代替土地を特定して提供する責任がある。移転が必要な場合には、県長官は、既存の土地と可能な限り近隣の場所を提供することが求められる。提供する移転先の条件としては、必要なインフ

ラが整備され、住環境が整った場所であるとともに、雇用機会へのアクセスも確保されている場所である必要がある。

2) 現金での補償

センサス調査によると、数世帯を除き、現金での補償、自己移転を希望していた。そのため、市場価格の再取得価格での補償と移転にかかる支援を提供するのが現実的な補償方法になると考えられる。現金補償の場合、土地および建物は、所有権を保有する者のみ、作物については、所有権を有さない者も補償の対象となる。補償及び支援に関する具体的なパッケージは、エンタイトル・マトリックス（表 7-100）に記載されている。

3) 補償・支援の基本方針

補償および支援は、以下の6つのパッケージから成る。

- a) 土地は再取得価格で補償する。
- b) 建物（住宅、商業用）は、再取得価格（減価償却を考慮しない）で補償する。
- c) 樹木および作物は市場価格で補償する。
- d) 生計手段の損失については、生計回復支援を提供する。
- e) 移転にかかる支援を提供する。必要であれば、移転先を整備して提供する。
- f) 共有施設は、移築あるいは新設する。

(4) 支援策の方針

支援策の方針としては、被影響住民が、最低限、用地取得・移転前の生活水準を維持するために必要な支援を提供することを目的とする。本事業における支援策の対象者は、次のとおりとする。

- 土地及び財産（住居、商店等）の損失を受ける住民
- 土地及び財産の損失に伴い生計に影響を受ける住民（農業労働者等）
- プロジェクトの実施により生計に影響を受ける住民（ボートオペレーター、ボート所有者、漁業従事者等）

表 7-99 支援策の対象者と内容のまとめ：

対象者	人数	影響内容	支援策
農業労働者	95 人	用地取得対象の土地において、栽培や収穫時の期間限定農業労働者として雇用されている。用地取得により、収入機会が減少し、生計に影響を与えることが想定される。	a) 農業労働者：200 日間の最低賃金の提供 b) 建設事業で生じる雇用機会の優先的提供 c) 職業訓練等を受ける機会の優先的提供

対象者	人数	影響内容	支援策
ボートオペレーター	250-300 人	直行便を運航するボートオペレーターは、本事業によりビジネス機会が減少し、生計に影響を受けることが想定される。 (中州地域を結ぶルートを運行するボートオペレーターにおいては、本事業後にも継続的に運航需要があることが想定されるため、特段の影響は想定されない。)	a) 建設事業で生じる雇用機会の優先的提供 b) 職業訓練等を受ける機会の優先的提供
漁業従事者	100 人	漁業範囲は、4-5 km 圏内（上流、下流を含む）であるが、工事中は、橋脚周辺での振動や、工事対象区間の出入りを制限する等も想定されるため、漁業従事者は、通常よりも遠方での活動を余儀なくされる可能性もある。エンジンなしの手漕ぎボートを利用しているため、遠方での移動が難しいことも想定される。	a) 建設事業で生じる雇用機会の優先的提供 b) 職業訓練等を受ける機会の優先的提供

出典：JICA 調査団

生活再建策の検討にあたっては、被影響住民の経済社会状況を確認するとともに、対象地域内外の状況を踏まえた機会を見越して計画する必要がある。また、オプションの特定を含む計画および実施は、RAP 実施 NGO の支援を受けて地方政府が行うが、計画段階では、関係者とコミュニティからの意見を取り込むための協議が実施される必要がある。

現時点で検討している生活再建のための支援策は、以下のとおり。

1) 本プロジェクトでの雇用機会の提供

建設工事期間のワーカー確保においては、被影響住民を含む地域住民の活用が見込まれる。ボートオペレーターや漁民等の本プロジェクトにより生計に影響を受ける住民についても、建設工事における雇用機会を提供する。特に非影響住民の中でも脆弱者や女性については、優先的に雇用機会にアクセスできるように、彼らのニーズや能力を考慮しつつ、事前に求められる建設業、輸送業、事務作業などに必要な基本技能の研修を提供することが重要となる。

また、NHIDCL 地方事務所は必要に応じて NGO の支援を受け、被影響者が雇用機会を得られるように、工事請負業者と調整を行う。特に女性の雇用に関しては、NGO が、子育てや介護などのケア役割を担う必要がある女性のニーズを把握し、実施機関が、NGO 等と連携し、働く場所や時間帯に配慮する等、コントラクターに提案する。また、工事請負業者との契約条件の中に、社会的貢献の方法として、地元住民を優先的に雇用する等の条項が含まれるように働きかける。

2) スキルアップのための職業訓練の提供

NGO等の専門家の支援を受け、対象地域の職業機会について調査を実施し、職業訓練の希望者と、技能向上および新たな職業に対する要望等を把握するとともに、職業訓練の内容を検討する。また、周辺地域の職業訓練所およびプログラムを調査し、既存プログラムの利用可能性を確認する。

具体的には、以下に関連する職業訓練の提供が考えられる。

- 農業が主要な生計手段であることを考慮し、農業の生産性向上や栽培作物の品種改善に関連する指導として、Krishi Vigyan Kendras (KVK³⁴)等の農業・営農指導の活用も考えられる。
- 河川輸送に加え陸上輸送が活発化することを踏まえ、三輪車やトラック等の訓練およびライセンス登録の支援等が考えられる。
- 物流ネットワークの改善により、市場へのアクセス向上が見込めるため、生産物の輸送、販売にかかるマーケティングに関する指導も有効であると考えられる。

3) 新規事業の立ち上げに対する支援を提供

NGO等の専門家により、対象地域および市場性などを踏まえ、新規事業の可能性をレビューし、必要に応じた助言を行う。また、地元銀行のマイクロファイナンスに低金利でアクセスできるような支援を実施する。これには、地元銀行のプログラムの紹介、地元銀行との協議による金利低減、条件緩和の調整、NGOを通じたマイクロファイナンス利用に関する研修を実施する等が考えられる。

具体的には、以下のような新規事業の支援が考えられる。

- 小規模商店の立ち上げや生產品の販売拠点の設置などにより、輸送・販売に関するビジネスの可能性が考えられる。
- 新たな輸送手段の購入のための資金調達等、新ビジネスを開始するための初期投資にクレジットの活用が考えられる

4) 既存の貧困削減プログラム参加の支援

インドでは、村や県レベルの政府機関が、中央政府および州政府の予算で実施される貧困削減プログラムを計画する仕組みとなっている。具体的には、貧困層を対象としたSwarnjayanti Gram Swarojgar Yojna (SGSY³⁵)等の活用が考えられる。NGOは、地元の政府と協議・調整し、被影響者がプログラムに参加できるように働きかけるとともに、被影響者に対しても情報提供を行い、必要に応じて組織化を支援するなどして、様々な貧困削減プログラムにアクセスできるような支援を行うことも有効と考えられる。

³⁴ Krishi Vigyan Kendras (KVK) は、インド農業研究協議会 (ICAR) の農業技術普及センターであり、各州に複数の地方普及センターを有する。KVK ドゥブリの提供する研修内容は、農業、家畜、漁業に関する技術提供を含む。

³⁵ Swarnjayanti Gram Swarojgar Yojna (SGSY) は、貧困層の生計手段の提供を目的とし、個人企業家の支援を行うプログラムである。支援内容は、セルフヘルプグループの組成、研修およびローンの提供、マーケティング支援等を含む。

5) 被影響世帯への月額生活手当の支給対象

対象地域の住民は、識字率や所得水準が低く、変化に脆弱であると考えられるため、移動の必要有無に関わらず、月額生活手当の支給対象とする（インド国内法規制では、移動の必要がある世帯のみに月額生活手当が支給される）。

(5) エンタイトルメント・マトリックス

影響の種類、被影響者、エンタイトルメントを以下の表に示す。

表 7-100 : エンタイトルメント・マトリックス

影響の種類	被影響者	エンタイトルメント	詳細
土地の喪失	所有者	再取得価格での補償・支援	a) 最低 60 日前の事前通知 b) 再取得価格 ^(※2) での補償。 c) 移転手当として Rs. 50,000/世帯 d) 月額生活手当 Rs.3000/世帯×12 カ月 ^(※1)
	占拠者	支援	a) 最低 60 日前の事前通知 b) 移転手当として Rs. 50,000/世帯 c) 月額生活手当 Rs.3000/世帯×12 カ月 ^(※1)
建物の喪失 ³⁶	所有者・占拠者	再取得価格での補償・支援	a) 最低 60 日前の事前通知 b) 市場価格に基づいて算出した再取得価格での補償 ^(※1) c) 撤去する構造物から利用可能なものを持っていく権利 d) 移転手当 ³⁷ として Rs.50,000/世帯 e) 引越手当 ³⁸ として Rs.50,000/世帯 f) 月額生活手当 Rs.3000/世帯×12 カ月 ^(※1)
樹木・作物の喪失	全 PAH	補償	a) 最低 60 日前の事前通知 b) 事前の作物の収穫。事前通知が出来ない場合は市場価格で補償。
店舗の喪失	所有者	補償・支援	a) 最低 60 日前の事前通知 b) 市場価格に基づいて算出した再取得価格での補償 ^(※2) c) 撤去する構造物から利用可能なものを持っていく権利
生計手段の喪失	所有者・占拠者	支援	a) 生計支援として Rs. 25,000/世帯 b) 建設事業で生じる雇用機会の優先的提供 ^(※3) c) 職業訓練等を受ける機会の優先的提供 ^(※3)
	農業労働者	支援	d) 農業労働者：200 日間の最低賃金の提供 e) 建設事業で生じる雇用機会の優先的提供 ^(※3) f) 職業訓練等を受ける機会の優先的提供 ^(※3)
	ボートオペレーター	支援	a) 建設事業で生じる雇用機会の優先的提供 ^(※3) b) 職業訓練等を受ける機会の優先的提供 ^(※3)

³⁶ センサス調査時には、家屋をレンタルしている世帯は確認されなかった。そのため、建物を喪失する世帯は移転を必要とする世帯と同義となる。

³⁷ 全 PAH を対象にした住民移転に係る費用に対する手当を指す。

³⁸ 単なる移動・輸送費に対する手当を指す。

影響の種類	被影響者	エンタイトルメント	詳細
	漁業従事者	支援	a) 建設事業で生じる雇用機会の優先的提供 ^(※3) b) 職業訓練等を受ける機会の優先的提供 ^(※3)
社会的弱者 ³⁹⁾	全 PAH	支援	a) 上記に加え、追加支援として Rs.25,000/世帯 b) 建設事業で生じる雇用機会の優先的提供 c) 職業訓練等を受ける機会の優先的提供
公共物の喪失	県政府	移築あるいは新設	a) 現地のニーズに応じて移築、あるいは新設
工事中の影響	所有者	補償・支援	a) 土地利用の場合、市場価格でのレンタル料で補償し、工事前の元の状態で返却 b) 建物が影響を受ける場合、市場価格で補償 c) 生計手段の喪失の場合、月額生活手当 Rs.3000/世帯×レンタル期間中
	占拠者	支援	a) 生計手段の喪失の場合、月額生活手当 Rs.3000/世帯×レンタル期間中
予期せぬ影響	被影響者	支援を検討	a) 移転方針に基づき、苦情処理メカニズムを活用して適切に対応する

出典：JICA 調査団

^(※1) 各種手当は、LARR 法 2013 年に基づく金額が適用される。農業労働者については、アッサム州 LARR 規則の方が詳細に規定されているため、そちらに基づく金額が適用される。また、本事業の住民は変化に脆弱であると考えられるため、移動の必要有無に関わらず、月額生活手当の支給対象とする。

また、資金的な支援の受給者の条件は以下のとおり。

- 移転手当 (Rs.50,000) 全被影響世帯
- 引越手当 (Rs. 50,000) 移転を必要とする世帯
- 月額生活手当 (Rs. 3,000×12 か月) 全被影響世帯
- 生活支援 (Rs. 25,000) 生活手段の喪失を伴う世帯
- 追加支援 (Rs. 25,000) 社会的弱者を有する世帯

^(※2) アッサム州 LARR 規則 2015 年および LARR 法 2013 年に基づき、再取得価格については、土地代および建物代ともに、地方政府が通知した市場価格（市場価格は用地取得担当官によりアップデートされる）が適用されることになる。また、新しい土地や建物の登録等にかかる経費（税金や手数料）は、州政府の負担となる。再取得価格の計算式は、以下のとおり。

- 土地代の計算式
 - 農村部：A(市場価格×Multiplier(1.5-2.0))+A×100%+A×12%
 - 都市部：A(市場価格×Multiplier(1.0))+A×100%+A×12%
- 建物代の計算式
 - 市場価格×100% Solatium

世界銀行ガイドライン（WB OP4.12）による再取得価格の定義は、資産の減価償却を考慮せずに算出することとなっている。本事業でも補償額の算出に当たっては、同ガイドラインに準拠する。

^(※3) 被影響世帯に対しては、以下の選択肢が提供される。本事業では、本事業による就業機会と適切な職業訓練の提供を想定している。

- 本事業による就業機会と適切な職業訓練の提供
- Rs. 5,00,000/世帯
- Rs. 2,000/世帯×20 年間

³⁹⁾ 社会的弱者とは、女性の世帯主、障害者を持つ世帯、扶養者のいない高齢世帯主、貧困ライン以下の世帯を含む。

7.12.5 苦情処理メカニズム

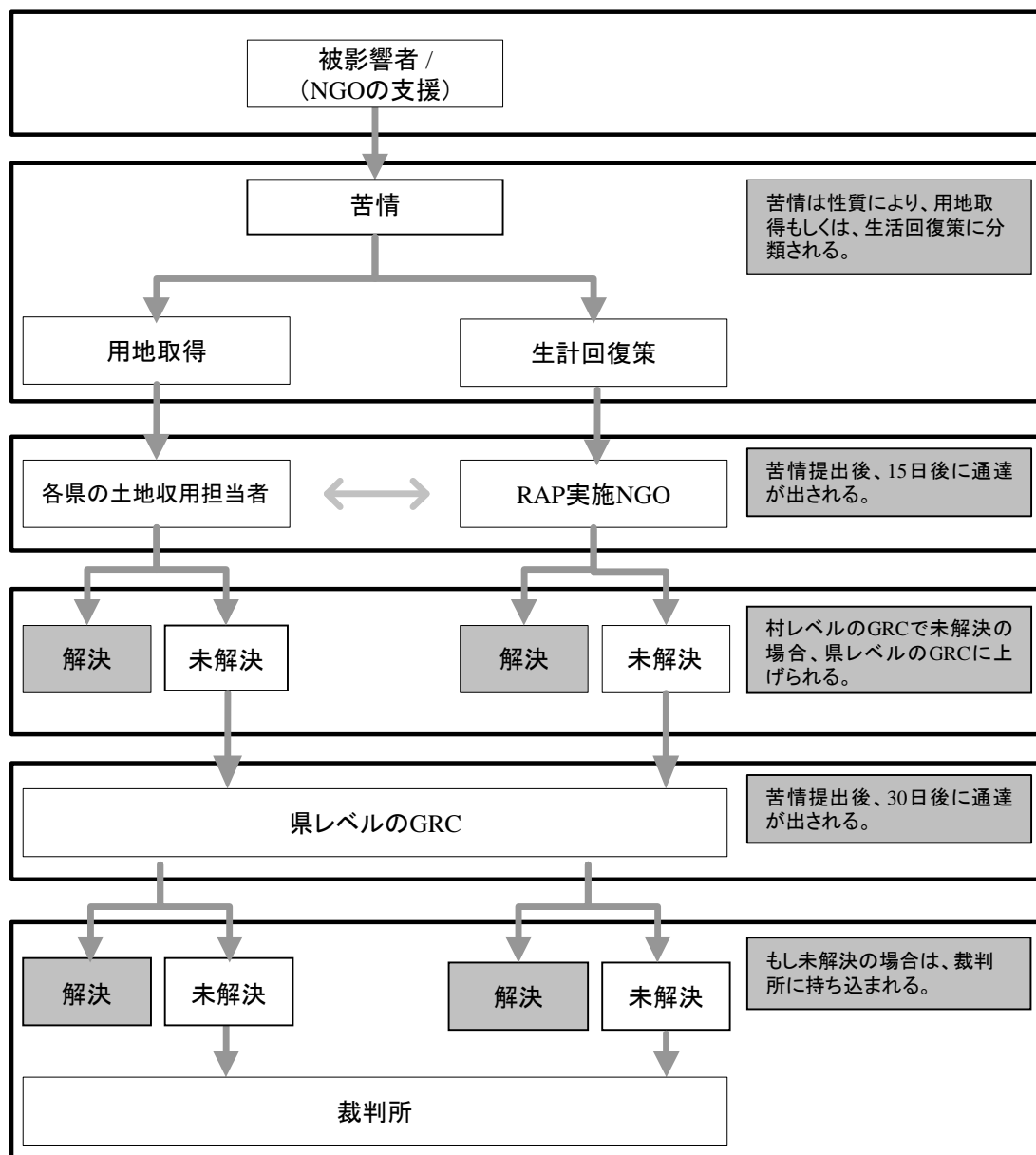
住民移転計画の実施においては、被影響住民の懸念や問題を申し立てる機会を設け、苦情や紛争を調整するための苦情処理メカニズム（GRM）が構築される必要がある。そのため、プロジェクト内に苦情処理委員会（GRC）を設置し、苦情処理や紛争解決にあたる。

本事業では、村レベルと地方レベルで苦情対応が行われる仕組みとする。村レベルでは、用地取得担当官、NHIDCL 地方事務所、RAP 実施 NGO、被影響住民、必要に応じて村長が参加し協議を行う。地方レベルでは、県長官もしくは県長官の代表者が GRC の首席を務め、NHIDCL 地方事務所、被影響住民の代表者、対象となる村の代表者、RAP 実施 NGO が集まり協議を行う。西ガロ・ヒルズ県では、県自治評議会（ADC）が GRC に参加する。なお、被影響住民の代表者には女性、非地権者、脆弱者グループからの代表者が含まれるように構成される。

GRC は、月 2 回に事前に決められた日程で実施される。GRC では、被影響住民の苦情申し立てに対して、対応する機関を特定し、期限内に対応および解決策を通知しなければならない。決定事項の通知にかかる期間としては、村レベルでは、苦情申し立てが GRC に提出された後 15 日以内、地方レベルでは 30 日以内と設定する。被影響住民は、GRC に苦情申し立てを行う際に、必要に応じて RAP 実施 NGO に支援を求めることができる。

また、被影響住民が GRC の決定に満足しない場合は、EA に直訴することができ、EA でも解決できない場合は、法的手段をとることができる。RAP 実施 NGO は、可能な限り GRC のレベルで解決するような支援を行う。なお、全ての苦情申し立て（文書、口頭）は適切に記録され、EA は外部モニタリング機関に公開する仕組みとする。

GRM の手続きは、両州で共通であり、各段階での担当機関の役割は以下のとおり。



出典：JICA 調査団

図 7-27：苦情処理メカニズム

7.12.6 実施体制

インドにおける SIA および RAP の実施においては、様々なレベルの機関がプロジェクトの実施段階に関わる。インドの規定では、用地取得、住民移転と生活再建は州政府によって実施されることになっている。

本事業の対象地であるアッサム州においては、実際の業務は、県長官を長とする地方政府に委ねられている。実務については、県長官管轄の用地取得担当官が担う仕組みとなっている。

また、メガラヤ州は憲法別表 6 条に従って、州内に設立された自治県協議会が用地取得および RAP に係る事前許可 (NOC) を発行する権限を持つ。また、県長官および土地管理に主要な役割を持つ伝統的な首長が、用地取得において重要な役割を持つ。

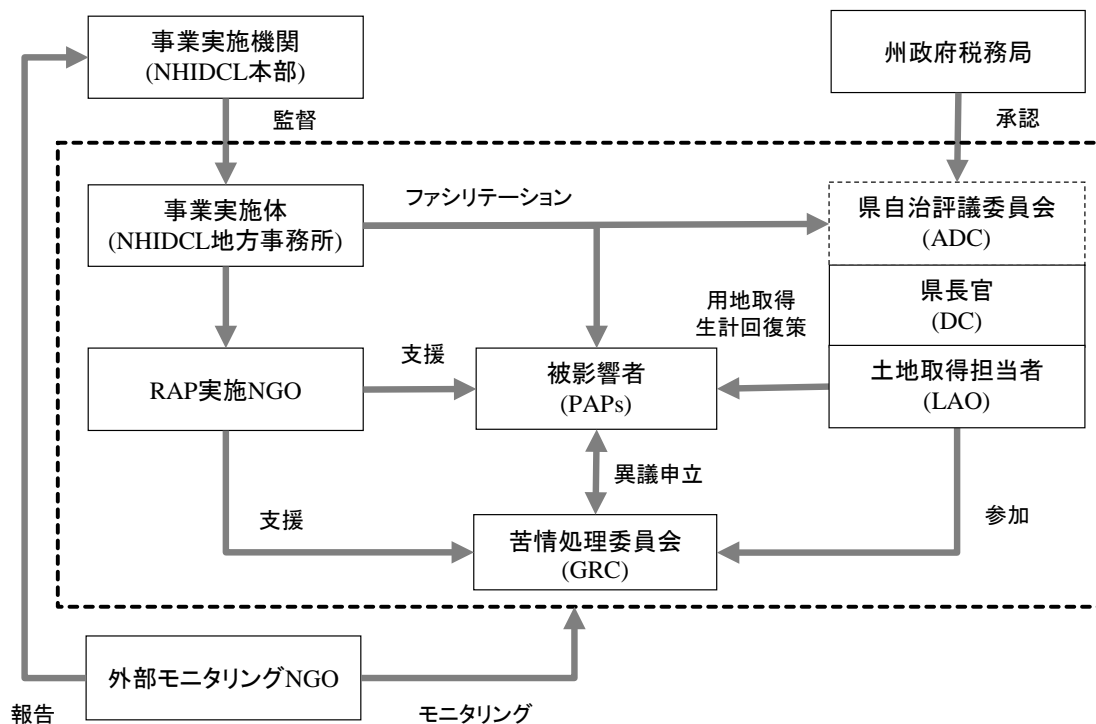
用地取得、移転と生活再建の手続きや実施に関連する主な機関および団体は以下のとおり。また、実施体制および其々の役割については、下表に示すとおり。

- NHIDCL 本部 (事業実施機関 : EA)
- NHIDCL 地方事務所 (事業実施体 : PIU)
- 県自治評議会 (ADC)
- 県長官 (DC)
- 非政府組織 (NGO)
- 苦情処理委員会 (GRC)

表 7-101 : 事業実施機関と役割

実施機関	役割
中央政府	
NHIDCL (EA)	<ul style="list-style-type: none"> • 事業実施機関 • 土地取得および移転・生計回復策にかかる予算の確保 • 全体のプロセスの調整・モニタリング
州政府	
歳入・災害管理局	<ul style="list-style-type: none"> • 用地取得のプロセスの承認
Meghalaya Institute of Governance (MIG)	<ul style="list-style-type: none"> • メガラヤ州の SIA 実施機関
地方政府	
西ガロ・ヒルズ県自治評議会 (ADC)	<ul style="list-style-type: none"> • 土地取得の事前許可 (NOC) の発行
各県の県長官 (DC)	<ul style="list-style-type: none"> • 土地取得および移転・生計回復策の責任機関
各県の用地取得担当官 (LAO)	<ul style="list-style-type: none"> • 土地取得および移転の実施
その他実施機関	
NHIDCL 地方事務所 (PIU)	<ul style="list-style-type: none"> • NGO の支援を得て、地方政府が実施する R&R を監督 • 内部モニタリングの実施
非政府組織 (NGO)	<ul style="list-style-type: none"> • PAP の代弁者として地方政府・NHIDCL 地方事務所と調整 • 用地取得および移転・生計回復プロセスにおいて PAP を支援 • 外部モニタリングの実施
苦情処理委員会 (GRC)	<ul style="list-style-type: none"> • PAP から提出された苦情の調整および解決
被影響者 (PAP)	<ul style="list-style-type: none"> • 用地取得および移転・生計回復のプロセスに参加
工事請負業者	<ul style="list-style-type: none"> • 工事キャンプの場所について DC およびコミュニティと相談 • 工事完了後、利用した土地を元の状態に戻し返却

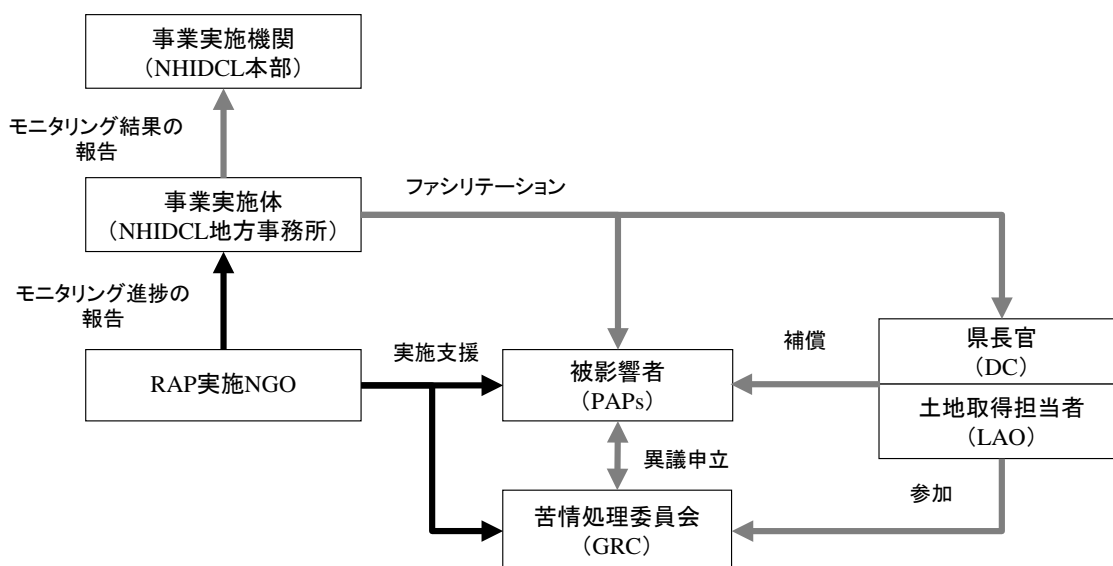
出典 : JICA 調査団



NHIDCL：国道インフラ開発公社、GRC：苦情処理委員会、PAP：被影響者
注) メガラヤ州においては、県自治評議会（ADC）が実施体制に加わる。
出典：JICA 調査団

図 7-28：RAP の実施体制

RAP の実施については、RAP 実施 NGO が支援する。支援体制は下図の通り。



出典：JICA 調査団

図 7-29：RAP 実施の支援体制

7.12.7 実施スケジュール

用地取得、住民移転、生活再建活動は、以下の3つの段階に分割することが出来る。各段階における具体的な活動内容は、以下のとおり。

(1) 準備段階

準備段階の主な活動は、RAPの準備およびRAPの政府への提出、またRAP実施NGOの選定およびGRCの設立等となる。また、住民協議を含む情報キャンペーンは、プロジェクトの開始から終了までのプロセスを通じて実施される。情報の共有については、パンフレット等を活用し、対象住民に再定住に関する政策、補償を受ける権利、その他プロジェクトの円滑な実施に必要な情報について情報提供する。

(2) 実施段階

RAP実施段階では、県長官がRAP実施NGOを通じて、土地収用、補償の支払い、対象となる支援が実施される。この間、RAP実施NGOの支援を受け、必要時応じてGRMを通じたPAPとの協議が実施される。また、PAPの移転および生計回復支援策の活動も実施される。用地取得が完了したところで、建設工事開始の通知が発行される。

(3) モニタリング段階

モニタリングは、NHIDCL 地方事務所の責任の下、プロジェクト開始の初期段階からプロジェクト終了までRAP実施NGOが実施する。本事業は、比較的大規模な被影響者への影響が想定されていることから、第三者による外部モニタリングも実施される。

実施スケジュール及び主な活動内容は次表に示されているとおりであるが、外部要因により遅延等がある場合には、活動の期間や時期は変更される可能性があり、その都度、実施計画は調整される。

表 7-102 : 実施スケジュール

No.	活動	2015		2016				2017				2018				2019				2020				実施機関	
		3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	監督	実施
準備期間																									
1	準備、アライメントの最終化																							NHIDCL	AECOM
2	事前許可 (NOC) の取得																							NHIDCL	ADC
3	DPR/JICA 調査でのセンサス調査の実施																							NHIDCL	AECOM
4	SIA/RAP の作成 (JICA 調査)																							NHIDCL	AECOM
5	SIA/RAP の作成 (インド政府)																							DC	DC
6	カットオフデートの通知																							DC	DC
7	県政府による PAP の特定、補償内容の特定																							DC	DC
8	RAP の情報公開																							NHIDCL/DC	DC
9	PAP との協議																							NHIDCL	DC
10	NGO の選定																							NHIDCL	PIU
11	RAP のレビュー																							NHIDCL	NGO
12	苦情処理委員会 (GRC) の設立																							NHIDCL	DC/NGO
実施機関																									
13	用地取得																							DC	DC
14	補償の支払い																							NHIDCL	DC
15	住民移転の実施																							DC	DC
16	苦情処理																							DC	NGO
17	PAP との協議																							DC	NGO
18	ROW のクリアランス																							DC	DC
19	生計回復策の実施																							NHIDCL	NGO
20	建設工事開始の通知																							NHIDCL	DC
21	建設工事																							NHIDCL	Contractor
モニタリング機関																									
22	情報システムの管理																							NHIDCL	NGO
23	内部モニタリング																							NHIDCL	PIU
24	外部モニタリング																							NHIDCL	NGO

NHIDCL : 国道インフラ開発公社、DC : 県長官、ADC : 自治県協議会、
出典 : JICA 調査団

7.12.8 費用と財源

用地取得・移転支援にかかる予算は、影響を受ける土地、家屋、樹木、移転支援、RAPの実施にかかるコストを含む。本調査での予算算出は、センサス調査でカバーした範囲、全体の土地区画数の約70%を対象とする。また、再取得価格は、地方政府の長官が、市場価格調査に基づき価格をアップデートして確定することになる。本調査では、確定される前の段階であったため、現地調査結果に基づく金額としている。そのため、実際の予算は、用地取得時に見直しがなされる必要があるが、現時点での概算では、約5.18億ルピーとなる。

これらの財源は、NHIDCLの申請に基づき、MORTHが国家予算から確保する。費用の支払いについては、MORTHからNHIDCLを通じて県長官に支払われ、県長官から対象世帯に支払われる流れとなる。

表 7-103 : 予算概算

項目	単位	単価 (Rs. In Lakh)	数量	合計 (Rs. In Lakh)
I. 補償				
土地 (農村部) *	Acre	7.73	95.13	735.15
土地 (都市部) *	Acre	36.06	42.30	1525.63
建物 (Permanent)	Sq. m	0.15	1296	194.40
建物 (Semi Permanent)	Sq. m	0.1	3024	302.40
建物 (Temporary)	Sq. m	0.05	4100	205.00
政府/公共建物	No.	Lump sum	1	12.00
樹木 (果樹)	No.	0.15	1897	284.55
樹木 (その他)	No.	0.1	662	66.20
作物		Lump sum		22.00
小計 (I)				3,347.34
II. 支援				
移転手当	Household	0.5	761	380.50
引越手当	Household	0.5	127	63.50
月額生活手当	Household	0.36	761	273.96
生計手段の喪失への支援	Household	0.25	761	190.25
農業従事者への支援	Household	0.5	95	47.50
脆弱者への支援	Household	0.25	474	118.50
トレーニング費用	Household	0.2	1256	251.20
小計 (II)				1,325.41
III. 実施				
NGO フィー	Per year	3	5 years	15.00
スタッフトレーニング	Lump sum			3.00
情報共有/GRM	Lump sum	2	5 years	10.00
生計回復支援	Lump sum			10.00
小計 (III)				38.00

項目	単位	単価 (Rs. In Lakh)	数量	合計 (Rs. In Lakh)
小計 (I+II+III)				4,710.75
予備費				471.75
合計				5,182.50

注) 中州地域内の村落は農村部とし、それ以外は都市部と想定している。

注) II. 支援の数量の根拠は、以下のとおり。

- 移転手当 = 全被影響世帯
- 引越手当 = 移転が必要な世帯
- 月額生活手当 = 全被影響世帯
- 生計手段の喪失への支援 = 全被影響世帯
- 脆弱者への支援 = 女性の世帯主 + 障害者を持つ世帯 + 扶養者のいない高齢世帯主 + 貧困ライン以下の世帯
- トレーニング費用 = 全被影響世帯 + 農業従事者 + ボートオペレーター + 漁業従事者

出典：JICA 調査団

7.12.9 モニタリング体制

モニタリングは、計画の実施状況を定期的に評価し、活動や方向性について必要なフィードバックおよび提案を行うために実施される。また、評価は、計画の実施後に活動を総括し、当初の目的と目標が達成されたかどうかを確認するために実施される。本事業のモニタリングは、内部モニタリングと外部モニタリングの二重構造で構成される。

(1) 内部モニタリング

内部モニタリングは、RAP 実施機関 NGO の支援を得て、NHIDCL 地方事務所が実施する体制とする。RAP 実施機関 NGO は、NHIDCL 地方事務所に毎月モニタリングの進捗を報告する。NHIDCL 地方事務所は、進捗報告をレビューし、RAP 実施状況の進捗およびその結果を確認する。また、NHIDCL 地方事務所も半年毎に、現場視察による現状把握を行い、必要に応じて計画の見直しを行う。

内部モニタリングの目的は、以下のとおり。

- (i) 実施工程に照らし RAP の進捗を計測
- (ii) 非影響者に約束された権利が付与されたかを確認
- (iii) プロジェクトの進捗や非影響者に対して重大な課題の特定と対応策の提起
- (iv) GRM の効果のモニタリング
- (v) 非影響者の満足度の評価

内部モニタリングフォームを以下に示す。

表 7-104 : 内部モニタリングフォーム

主な活動	具体的なアクション	進捗 (定量的)	進捗 (%)	想定 終了日
要員確保・研修・配置	コンサルタント・担当者のアサイン (MM)			
	研修の実施、投入要員 (研修を受けた人数)			

主な活動	具体的なアクション	進捗 (定量的)	進捗 (%)	想定 終了日
RAP のレビュー	RAP のレビュー (%)			
	PAPs の確定 (%)			
	修正 RP の承認 (%)			
社会経済調査	現地調査による補償対象者リストの最終化 (%)			
	用地・建物の評価による再取得価格の評価と最終化 (%)			
	現地調査による PAHs の生計手段、収入等の変化の確認 (%)			
情報キャンペーン	補償内容・支援内容を記載したブローシャールの配布 (配布数)			
	公聴会・フォーカスグループ協議 (回数)			
PAP の特定	ID 番号の発行 (人数)			
補償の支払い	銀行口座開設 (人数)			
	PAP の補償の受取支援 (人数)			
	銀行口座への振込確認 (人数)			
住民移転	DC との移転先の調整 (世帯数)			
	PAH の移転支援 (世帯数)			
生計回復プログラム	現地調査による支援プログラムの構築 (%)			
	研修プログラム、支援活動の実施 (件数)			
苦情処理	GRC の組成 (%)			
	PAP の苦情の受付 (件数)			
	PAP の苦情の解決 (件数)			
監督、管理	投入要員 (MM)			
	関係機関との会議 (回数)			
進捗報告	インセプション・月毎進捗・ドラフト報告書			

出典：JICA 調査団

(2) 外部モニタリング

外部モニタリングは、第 3 者機関により実施され、移転の実施および影響をモニタリングし、必要に応じて補償や支援の実施方法や手続きに対する提案を行う。評価は、ベースラインとの比較によって、移転後に移転支援プログラムの効果を確認する。

基本的な外部モニタリングの目的は、以下のとおり。

- (i) RAP で計画された内容が実施されているかをモニタリングする
- (ii) RAP で計画された補償および支援が対象世帯に提供されたかをモニタリングする
- (iii) ベースラインとの比較により、移転後の生活の質が向上したかの評価
- (iv) 生計手段や生活レベルが回復したかを評価する

外部モニタリングと評価の項目を次表に示す。

表 7-105 : 外部モニタリングフォーム

項目	詳細 (細目)	確認	備考
RAP のレビュー	• RAP 内容は効果的で、エンタイトルメントは十分か	はい/いいえ	
	• 目的を達成するための期間と予算が十分か	はい/いいえ	
実施プロセスのモニタリング	• センサス調査および財産の算定は実施されているか	はい/いいえ	
	• 異議申立プロセスの実施時期と期間は妥当か	はい/いいえ	
	• 課題解決のための NGO・NHIDCL・政府機関との効果的な調整がなされているか	はい/いいえ	
ステークホルダーとの協議、参加	• 適切な情報公開の実施回数	回数	
	• コミュニティ・PAP・脆弱者・女性等との協議の実施回数	回数	
	• GRC の実施回数、政府関係者・NHIDCL・PAP を含む適切なステークホルダーの参加	回数・参加者	
	• 提起・解決された苦情の内容、解決までにかかった期間	説明	
土地・財産の取得	• 土地取得前の合意取得、土地取得後の所有者登録の変更	進捗	
	• 土地の取得 (民間・政府用地、農地、住宅・商業用地、他)	進捗	
	• 建物の取得 (民間・政府の建物、インフラ、他)	進捗	
	• 樹木、作物の取得	進捗	
エンタイトルメントの供与	• 補償・支援の提供内容と時期	進捗	
	• 再定住地が適切に準備されたか (必要な場合)	はい/いいえ	
	• 工事中の影響に対して補償が支払われ、工事後に土地が還元されたか	はい/いいえ	
	• 満足度の確認	正の回答(%)	
生計手段の回復	• 収入源の損失に対して雇用機会が提供されたか	はい/いいえ	
	• 職業訓練・他の支援プログラムは、生計回復の手段として妥当性であったか	はい/いいえ	
	• 生計回復のための財政的・技術的支援が十分か	正の回答(%)	
	• 満足度	正の回答(%)	
PAP の経済活動	• 就業状況	正の回答(%)	
	• 職業の変化、収入源の安定性	正の回答(%)	
	• 世帯収入の変化	正の回答(%)	
	• 技能レベルの変化	正の回答(%)	
インフラ・市場等へのアクセス	• 交通へのアクセス状況・交通手段の変化	正の回答(%)	
	• 市場へのアクセス状況の変化	正の回答(%)	
	• 保健衛生、教育機関、他の公共施設へのアクセス状況の変化	正の回答(%)	

出典：JICA 調査団

7.13 ステークホルダー協議の詳細

本事業のステークホルダー協議は、スコーピング段階とドラフト計画の段階の2段階で実施され、プロジェクト策定プロセスに、プロジェクト地域のコミュニティの関与が確保され、双方間の意見交換が行われるように実施された。

第1回目の協議は、2か所で実施し、プロジェクト地域をカバーする目的と多様なグループの意見を確認するため、5か所でのコミュニティ協議と3つのフォーカスグループ協議を行った。第2回目の協議は、対象地域の被影響者が、アクセスしやすい場所4か所で実施した。

本センサス調査期間中に、土地所有者が不在であったために未調査となった被影響世帯に対しても、各県の用地取得担当官、村長、近隣住民の支援を受け、ステークホルダー協議の情報、ドラフト計画の要約を配布する等による情報共有を図った。また、用地取得のプロセスの一環である異議申し立て期間にも、同様に情報が周知されるように配慮する必要がある。

7.13.1 第1回協議

第1回目のステークホルダー協議の目的は、プロジェクトの目的と概要、環境社会への影響のスコーピング結果を説明し、被影響者の意見を確認することである。対象地域がブラマプトラ川を跨ぐため、開催地は、ドゥブリ側とプルバリ側の2か所を設定した。

協議の主なポイントは以下のとおり。

- 1) プロジェクトの目的と概要
- 2) アライメントの説明
- 3) プロジェクトにより想定されるプラスとマイナスの影響
- 4) 懸念やコメントについては、プロジェクトに反映されるように検討することを説明

ステークホルダー協議実施に関する情報の周知は、県の用地取得担当官への訪問、地元新聞への掲載、村長およびEIA コンサルタント (EIS) によるパンフレットの配布を通じて行った。また、非識字者への情報共有は、主に村長を通じて口頭で説明がなされるよう配慮した。

住民協議は、実施機関の管轄の下で行われ、当日の参加者は、地方政府の用地取得担当官、村長、村民、DRP コンサルタント (AECOM)、公共事業局担当者等が集まった。協議は、対象地域で使用されているアッサム語の資料を提示し、当日の説明および質疑応答は、主に日常的に利用されているベンガル語で行われた⁴⁰。ステークホルダー協議の概要は、下表のとおり。

⁴⁰ 対象地域では、読み書き等の教育はアッサム語で行われており、日常生活ではベンガル語が利用されている。アッサム語とベンガル語は非常に類似しており、地域住民はアッサム語を理解できるが、ベンガル語の方が発言しやすい。

表 7-106 : ステークホルダー協議の実施場所等

No.	開催日	場所	合計	男性	女性	中州	対象地域
1	24/10/2016	Irrigation IB, Dept. Of Water Resources, Phulbari	68	68	0	2	Phulbari and South Salmara-Mankachar District
2	25/10/2016	EQRA Academy School, Adabari Chomor, Dhubri	119	119	0	23	Dhubri District

出典 : JICA 調査団

表 7-107 : ステークホルダー協議の概要

No.	協議内容	回答
1	<ul style="list-style-type: none"> 土地の補償金額は、政府指定価格ではなく、市場価格をベースに決定してほしい 被影響村落をカバーするため、個別のコミュニティ協議を開催してほしい ボート所有者やオペレーターに対する補償や雇用創出策を検討してほしい 橋からの道路への接続は、周辺地域に影響が少ない形で計画してほしい 	<ul style="list-style-type: none"> 補償金額は、市場価格をベースに算出される 対象地をカバーするため、複数のコミュニティ協議を予定している 他の交通手段への雇用機会が増えることが考えられる。別の職業移行については、職業訓練を含め、生計再建プログラムにて検討する。 複数オプションから影響の少ないアライメントが選定された。影響を受ける世帯に対しては、適切な補償内容を提供するように計画する。
2	<ul style="list-style-type: none"> 橋までの接続道路の起点を、より影響が少ない場所に移す検討をしてほしい 補償方法は、土地の提供を希望する 被影響村落をカバーするため、個別のコミュニティ協議を開催してほしい ボート所有者やオペレーターに対する補償や雇用創出策を検討してほしい 	<ul style="list-style-type: none"> 将来的な国道への接続性を検討した上で、影響が少ないアライメントが選定された。ただし、始点はまだ確定しているわけではなく、影響が少ない形で検討が続いている。 土地については、コミュニティとの協議の下、DCが土地を提供することになる 対象地をカバーするため、複数のコミュニティ協議を予定している 他の交通手段への雇用機会が増えることが考えられる。別の職業移行については、生計再建プログラムにて検討する。

出典 : JICA 調査団

(1) コミュニティ協議

ステークホルダー協議に加え、地域毎の社会経済状況や懸念および意見を確認することを目的に、被影響世帯が集中する 5 つの拠点において、コミュニティ協議を開催した。コミュニティ協議の参加者は、村長、被影響世帯および脆弱者グループを含む村民が集まった。

協議の主なポイントは以下のとおり。

- 1) プロジェクトの目的と概要
- 2) アライメントの説明
- 3) プロジェクトにより想定されるプラスとマイナスの影響
- 4) 対象コミュニティの社会経済状況

コミュニティ協議により、始点および終点の位置に対する地元住民のコメントが確認された。その結果、始点については、位置が変更されることによる影響の軽減が図られ、終点については、当初案の妥当性を説明することにより、地元住民の理解向上に繋がった。

コミュニティ協議の概要は以下のとおり。

表 7-108 : コミュニティ協議の実施場所等

No.	日時	場所	合計	男性	女性	中州	対象地域
1	26/10/2016 @12:00	M. E. School, Adabari, Dhubri	22	16	6	15	Starting point of Dhubri
2	26/10/2016 @16:00	Ponchu Ghat in Dhubri	17	17	0	9	Ferry point in Dhubri
3	27/10/2016 @11:00	Phulbari	20	10	10	3	Lower Phulbari
4	27/10/2016 @13:30	South Salmara	15	15	0	5	South Salmara
5	27/10/2016 @16:30	Bauskata and Bororavatari	22	22	0	20	Bauskata, Bororavatari, Phulbari

出典：JICA 調査団

表 7-109 : コミュニティ協議の概要

No.	協議内容	回答
1	<ul style="list-style-type: none"> ● 土地収用前に、対象住民に対して補償内容や価格査定方法等を説明してほしい ● 事業地の周辺住民に対して建設工事への雇用機会を優先的に提供してほしい ● 橋梁始点を 500 m 程度西側 (Chandachal Bridge) に移動させる案を検討してほしい (学校の移転を回避するため) 	<ul style="list-style-type: none"> ● 補償金額は市場価格をベースに DC が決定する。補償内容や金額については、再度説明する機会を設ける ● 非熟練労働者が必要な作業においては、周辺住民を優先的に雇用するような仕組みを検討する ● 将来的な国道への接続性を検討した上で、影響が少ないアライメントを示している。今後さらに検討を行い、最終アライメントが選定される予定である。

No.	協議内容	回答
2	<ul style="list-style-type: none"> 本事業により水域環境が悪化し、漁業への影響があるか確認してほしい 橋梁完成後にボートサービス提供の機会が減少することを懸念している 被影響者には、新しい生計手段を検討してほしい、また、建設工事への雇用機会を優先的に確保してほしい 	<ul style="list-style-type: none"> 工事期間は短期的。漁業への影響については調査し、影響があれば緩和策を検討する 中州へのボートサービスは継続する。雇用機会のロスに関しては、生計再建プログラムにて検討する 被影響者に対する建設工事での雇用および生計再建プログラムを検討する
3	<ul style="list-style-type: none"> アライメントの位置を正確に理解していない住民が多いため、被影響者が誰になるかという説明がほしい 補償金額は公正な価格で、かつ遅延なく支払われるように配慮してほしい 	<ul style="list-style-type: none"> センサス調査を実施する際に、アライメントの説明および被影響者の特定を行う 補償金額は市場価格をベースに決定される。支払遅延がないような配慮を行う
4	<ul style="list-style-type: none"> 建設工事が、作物に影響を及ぼすか心配である 土地収用時に、収穫前の作付済みの作物に対する支払いが行われるように配慮してほしい 被影響者および周辺住民が建設工事に参加できる機会を確保してほしい 	<ul style="list-style-type: none"> 建設工事前に用地取得を行うため、工事中の作物への影響はない 収穫前の作物済みの作物は、補償対象となる 建設工事では、被影響者および周辺住民を優先的に雇用するような仕組みを検討する
5	<ul style="list-style-type: none"> 橋梁の終点を 300m 北側 (Bangshidua Bridge) に移動させ、道路と橋の接続が良くなるようにしてほしい 建設工事中に川流が変化することで、水中生物の減少や多様性への影響があるか 	<ul style="list-style-type: none"> 指摘された地点とプルバリの国道を接続するために、もう一つ橋梁が必要となる。道路と橋の接続性から見ると、提案アライメントの方が、接続が良くなる。なお、橋梁の終点については、複数オプションから影響が少ないアライメントが選定されている 建設工事中の影響は配慮する。ただし、川流れが大きく変化する工事は想定していない

出典：JICA 調査団

SHM で言及された始点および終点の場所を下図に示す。始点として言及があった場所は、検討が進められていた国道 27 号線の接続地点であり、最終的には既存道路を迂回する形でそちらに接続するアライメントとなった。その結果、想定されていた学校への影響が回避された。また、終点については、最近建設された橋への接続が提案されたが、プルバリ側の国道に接続するためには、もう一つ橋を設置する必要がある。そのため、要望である道路と橋の接続性を考慮すると、既存道路に接続するアライメントの方が適切であることが説明された。



出典：JICA 調査団

図 7-30：会議で言及された始点の場所



出典：JICA 調査団

図 7-31：会議で言及された終点の場所

(2) フォーカスグループ協議

女性グループ、ボートオペレーター、漁業従事者の経済社会状況と、対象グループの懸念、コメント等を把握するため、3つのフォーカスグループ協議を実施した。参加者は、対象地域の女性、ボートオペレーター組合のオペレーター、漁業従事者を対象とした。

主要な説明、協議事項は以下のとおり。

- 1) プロジェクトの目的と概要
- 2) アライメントの説明
- 3) プロジェクトにより想定されるプラスとマイナスの影響
- 4) 対象グループの社会経済状況

フォーカスグループ協議の結果、特に、ボートオペレーターや漁業従事者については、彼らの活動範囲、生計手段や要望を確認し、彼らを補償・支援対象に含めることに繋がった。

フォーカスグループ協議の概要は以下のとおり。

表 7-110 : フォーカスグループ協議の日時・場所

No.	日時	場所	合計	男性	女性	中州	対象地域
1	26/10/2016 @10.00	M.E.School, Adabari Dhuburi	9	0	9	2	女性グループ
2	26/10/2016 @14.00	Panchu Ghat, Dhuburi	13	13	0	7	ボートオペレーター
3	30/06/2017 @10.00	M.E.School, Adabari Dhuburi	50	50	0	18	漁業従事者

出典：JICA 調査団

表 7-111 : フォーカスグループ協議の概要

No.	協議内容	回答
1	<ul style="list-style-type: none"> • 用地取得・住民移転に係る補償は、移行期間に家族を支えるために十分な金額である必要がある。 • 補償は遅延のないような配慮が必要。 • 建設時には、女性に優先的に雇用機会が与えられるようにしてほしい。 	<ul style="list-style-type: none"> • 補償金額は、再取得価格に基づく補償が行われ、住民移転対象者に対しては、移転支援費が追加的に提供される。 • 支払遅延がないように、NHIDCL と DC 等を調整するような手立てを検討する。 • 建設工事には、女性に対しても対象住民のニーズや適性、対象地域の社会的な背景等を踏まえた均等機会が提供されるような提案を検討する。
2	<ul style="list-style-type: none"> • 建設時には、優先的に雇用機会が与えられるようにしてほしい。 • 橋梁完成後には、ボート業に代わる収入源が必要となる。別の職業移行（道路輸送等）に関する支援がほしい。 • 生計再建プログラムを希望する。 	<ul style="list-style-type: none"> • 建設工事での雇用機会は、被影響者に優先的に提供されるような提案を行う。 • 中州へのボートサービスは継続し、物資や人の往来が多くなることで想定されるため需要は高まると想定される。影響を受けるボートオペレーターに対しては、工事期間中の雇用に加え、別の職業移行については、オペレーターの意見を聴取しつつ研修プログラムおよび支援策を検討する。
3	<ul style="list-style-type: none"> • 漁業が出来なくなることはあるか、漁獲量の減少への影響はあるか。 • プロジェクトによる雇用機会があれば、従事を希望する。 	<ul style="list-style-type: none"> • 橋脚の建設場所で振動等による影響が出る可能性がある。振動は建設時（日中）に限られ、長期的な影響は想定されないと考えられるが、漁獲量の減少等の可能性も考慮し、建設工事での雇用のオプションも提供することを検討する。 • 建設工事での雇用機会は、漁民を含む被影響者に優先的に提供されるよう提案する。

出典：JICA 調査団

7.13.2 第2回協議

第2回目のステークホルダー協議の目的は、EIA 調査の結果を報告し、環境社会への影響評価と緩和策を説明し、事業周辺の住民の合意を得ることである。

協議の主なポイントは以下のとおり。

- 1) 事業の概要、目的
- 2) 線形選定の理由
- 3) 環境影響評価結果（正の影響、負の影響）
- 4) 緩和策

また、RAP に関しても同様に、RAP 調査の結果を報告し、用地取得の影響範囲、補償・移転・生活再建方針を説明して、合意を得ることを目的とした。

協議の主なポイントは以下のとおり。

- 1) センサス調査に基づく用地取得・住民移転の影響
- 2) 補償方針
- 3) 移転・生計再建方針

ステークホルダー協議実施に関する情報の周知は、第1回目と同様に、県の用地取得担当官への訪問、地元新聞への掲載、村長およびローカルコンサルタント（EIS）によるアッサム語の資料をパンフレットの配布を通じて行った。当日の参加者は、NHIDCL、DRP コンサルタント（AECOM）、各県の用地取得担当官、公共事業局（PWD）、村長、被影響者、ボートオペレーター、漁業従事者を含む周辺住民等が集まった。協議は、対象地域で使用されている言語により実施され、文書はアッサム語、説明および質疑応答は主にベンガル語で行われた。

ステークホルダー協議の概要は、下表のとおり。

表 7-112：第2回ステークホルダー協議の実施場所等

No.	開催日	場所	合計	男性	女性	中州	対象地域
1	7/4/2017 @11:00	M.E. School, Chagalchora II, Dhuburi	121	113	8	47	Adabari Part-II, Airanjangla Part-I&II, Bhassanir char Part-I, Chagal chora Part- I&II&III
2	7/4/2017 @15:00	Boat operator office, Jogmaya ghat, Dhuburi	56	53	3	18	Kathiar Alga, Bauskata Part-IV&VI, Basir Char, Aminerchar, Chaiter Chor Part-I
3	7/5/2017 @11:00	Phulbari Youth Club, Phulbari	100	94	6	34	Phulbari, Baladoba, Bauskata, Saboratory, Chaiter Chor Part-I, Hatsingwari
4	7/5/2017 @14:00	M.V. School, Bororawatre part-I, Dhuburi	28	16	12	21	Bororawatre Part-I&II

出典：JICA 調査団

ステークホルダー協議の質疑応答の概要は以下のとおり。なお、最終的な線形では、始点の変更により、当初想定されていた学校への影響は回避されたことが説明された。

表 7-113 : 第 2 回ステークホルダー協議の概要

No.	コメント	回答
1	<ul style="list-style-type: none"> 農業従事者に対する補償の内容と金額について説明してほしい。 土地の市場価格はどのように算出されるか。 用地取得のプロセスを説明してほしい。 政府の土地権利者リストに載っていない地権者は、補償の対象になるか。 土地所有者でなくても補償の対象になるか、雇用の対象者となるか。 対象の村には大学院生もいるが、雇用機会はあるか。 	<ul style="list-style-type: none"> 農業従事者に対しては、最低、対象地の最低賃金レベルの金額×200 日間は提供される。また、建設工事中の雇用機会、職業訓練も提供される。 市場価格は、周辺地の土地販売記録に基づき、算出される。 用地取得プロセスは、3A が通知された後に、土地登録書に基づく現地調査により、補償の対象者を特定する。その内容が 3D に記載され、異議申し立ての期間が設けられる。 政府の土地権利者リストに載ってなくても、土地権利書、土地購入証書等があれば、補償の対象となる。補償対象者の特定は、現地調査を実施して現状を確認した後に最終化される。 土地所有者でない場合は、土地の補償はないが、建物や作物は補償の対象となり、支援策を受けることが出来る。また、雇用の前に研修を提供し、証明書等を発行することで、雇用機会を得やすくすることも検討する。 大学卒業者に対しては、県内で実施している National Skill Development プログラムでも職業訓練を受けられる。また、建設工事でも能力を考慮したポジションへの起用があると考えられる。
2	<ul style="list-style-type: none"> ボートオペレーターは支援を得られるか、雇用機会が与えられるか。 直行船を保有するボートオーナーに対する補償はあるか。 漁業に影響が出る可能性があるか。 漁業従事者も補償を受けることが出来るか。 	<ul style="list-style-type: none"> ボートオペレーターも建設工事への従事機会が提供される。その期間中に、新しい職業へ移行するための職業訓練の機会が提供される。 建設期間は6年と長く、その期間中は通常の運航に加え、工事のためのボート利用(要員・物資輸送等)も想定される。また、本事業後もボートの利用は継続することが想定される。必要が認められれば、ボートを補償対象にすることも検討する。 建設期間中、アライメント内では多少影響はあるが、少し上流・下流に行けば漁業は継続できる。 漁業従事者に対しても、建設工事で雇用機会を得られるような配慮を行う。

No.	コメント	回答
3	<ul style="list-style-type: none"> • 雇用機会は、いつ、誰に提供されるか。誰に申請すべきか。 • 橋梁に沿って鉄道が整備される計画はあるか。 • 補償は、いつ、どのように提供されるか。 • 土地・建物の市場価格は、何をベースに決められるか。 • 土地所有に関する問題がある場合は、どうすればよいか。 • 土地をリースしており、その土地に建物を保有している場合には、どのような補償が受けられるか。 	<ul style="list-style-type: none"> • 建設工事が行われる際に、対象地域の住民に雇用機会が提供される。具体的には、NHIDCLが工事請負業者と契約し、彼らに申請することになる。NHIDCLは、契約条件に地元の雇用を優先する旨を記載することを検討している。 • 本事業では、鉄道整備は計画に含まれていない。 • まずDCが現地調査を行い、対象地、対象者と価格が確認された後で、補償が支払われ、用地取得が開始される。 • 土地については、土地売買価格に基づきゾーン毎に価格が設定されている。建物についても市場価格で算出される。評価については、今後現地調査を行い決定することになる。 • 土地所有の問題がある場合には、DC オフィスに相談に来てもらえれば、権利書等を再確認する。 • 土地に対する補償はないが、建物や作物は補償の対象となり、支援策を受けることが出来る。既に長期で土地のリース代を払っている場合は、用地取得後の分は払い戻しとなる。
4	<ul style="list-style-type: none"> • 所有地が水没し、過去に政府用地となった土地の場合、過去に権利書を保有していた者は、補償を受けることは可能か。 • 影響を受ける村落の住民は、建設工事の雇用機会にアクセスできるか。 	<ul style="list-style-type: none"> • 基本的に政府用地となった土地については、補償対象とはならないが、収穫前の作物に対する補償および資金的な支援や生計回復支援は受けることが可能。ただし、今後、対象用地の確認を行うため、その際に権利書も含めて、再確認することになる。 • 建設工事への雇用機会は、対象村落の住民にも提供されることを想定している。

出典：JICA 調査団



ドゥブリ始点での 1st SHM



プルバリ終点での 1st SHM



ボートオペレーターとの会議



漁業従事者との会議



ドゥブリ始点での 2nd SHM



ボート乗り場での 2nd SHM



プルバリ終点での 2nd SHM



中州地域での 2nd SHM

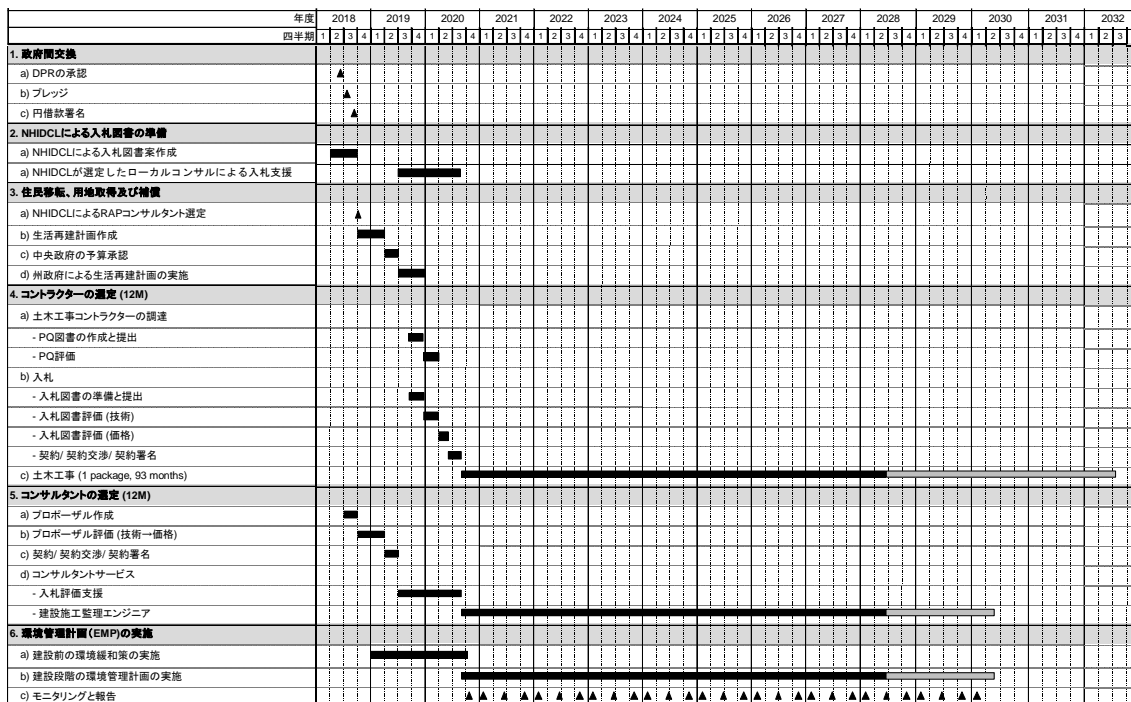
出典：JICA 調査団

図 7-32：ステークホルダー会議およびコミュニティ会議

第8章 事業実施計画

8.1 事業実施スケジュール

8.1.1 事業実施スケジュールの提案



出典：JICA 調査団

図 8-1：事業実施スケジュール

ドゥブリ橋建設の実施スケジュール案は、図 8-1 に示す通りであるが実施スケジュールの各プロセスにおける実施時期は以下を想定している。

(1) 円借款契約

円借款契約の調印は、インド政府と JICA の間で 2018 年 9 月までに実施される。

(2) 入札図書の準備

NHIDCL は入札図書の準備を 2018 年 6 月までに完了する。

(3) 住民移転、用地取得および補償

NHIDCL は、住民移転計画 (Resettlement Action Plan : RAP) のコンサルタントを 2018 年 12 月までに調達する。アッサム州政府は、2020 年 3 月末までに住民移転、用地取得および補償を完了する。用地取得について、入札公示時期に 80%、工事契約締結時までに 90% を完了していることを道路交通省が通達している。

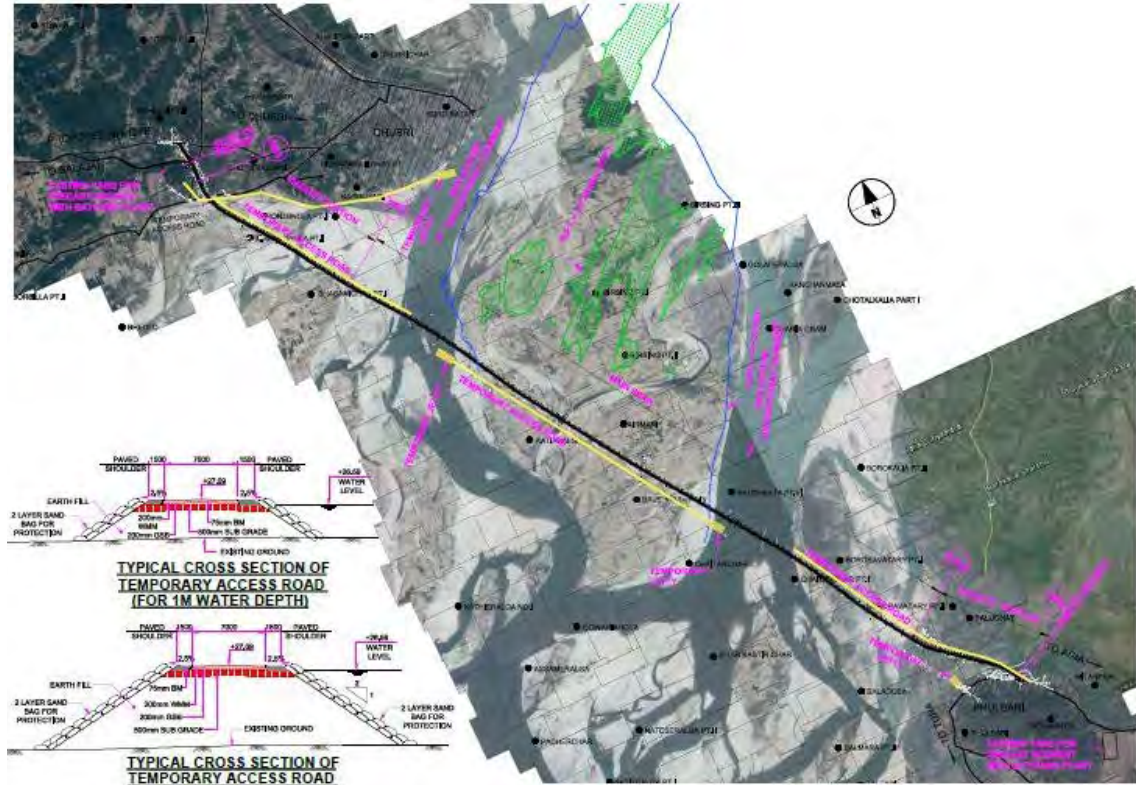
(4) コンサルタンの調達および工事入札

インド政府に対する JICA の円借款プレッジが 2018 年 9 月までに実施されると想定し、NHIDCL は、工事入札支援および工事施工監理のコンサルタントの調達を開始する。ドゥブリ橋はインド最大級の長大橋プロジェクトであることから、コンサルタントは EOI プロセスのもと国際入札を行い調達する。コンサルタントとのサービス契約を 2019 年 6 月までに完了する。

コンサルタントのサービスは、設計レビュー、施工監理及び瑕疵担保期間監理を支援する。入札プロセスを終えて、工事契約の締結を 2019 年 6 月に想定している。コンサルタントの施工監理業務は、工事期間は 7 年 9 か月を想定し、工事完了後の瑕疵担保期間の 2 年間も従事する。

8.1.2 建設計画

MSL よりも 1.5 m 高い位置で、かつ 7 m 幅・全長 15.25 km の仮設道路が建設期間中、各一年のうち 7 ヶ月間設置されることが計画されている。(但し、航路区間は除く)水深が 5 m 以上の浮遊式ケーソン法、杭基礎構築のための仮設を中州に設置する方法などが検討されている。年間 3 ヶ月は雨季により河川レベルが危険水位に到達する可能性が高いため、建設実施は不可能と考慮している。ドゥブリとプルバリの両サイドに設置予定の 2 台の仮設ジェティは建設期間中、資材やプレキャスト部材などの積み下ろし用に使用される予定である。2 箇所の浮遊式バッチプラントの建設が考慮されており、それらは仮設道路ではアクセスできない各セクションにコンクリートを輸送するために使用される。プレキャストヤードはドゥブリ、プルバリ両側に設置予定であり、これら仮設費も事業費として考慮されている。建設資材は鉄道、道路、水路、それぞれを利用してドゥブリまで輸送される。DPR における提案すべき仮設の建設計画は以下の通りである。

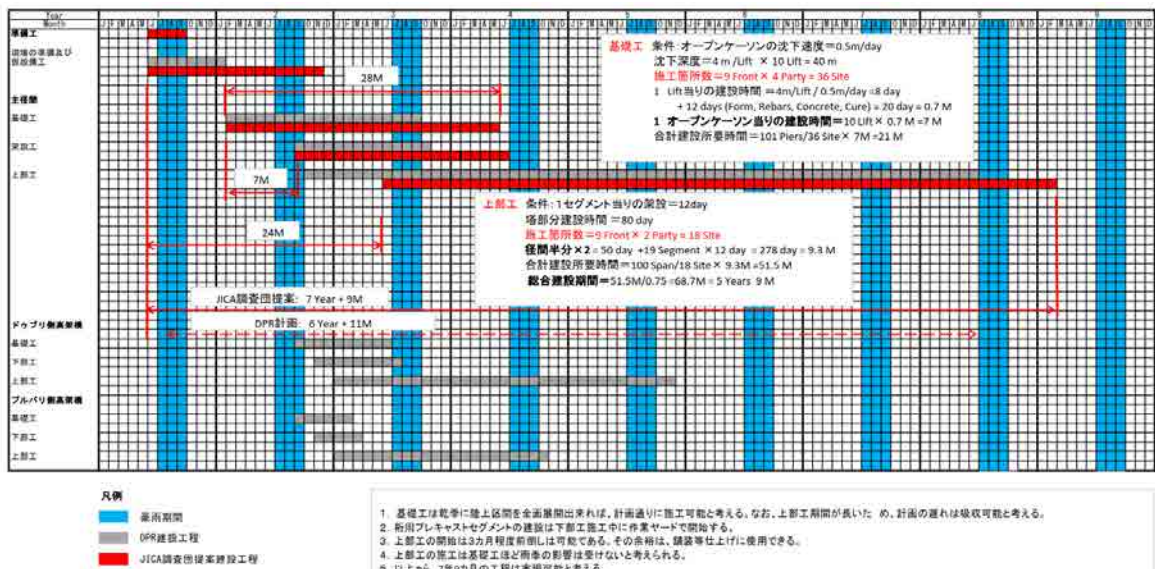


出典：DPR, AECOM, Jan 2018

図 8-2：建設期間中の仮設計画

8.1.3 建設期間

JICA 調査団より提案すべき建設スケジュールは以下の通りである。



出典：JICA 調査団

図 8-3：橋梁部の建設工程

プロジェクト道路の工期は、航路部 12.625 km を横断するエクストラード橋（スパン長 125 m の建設がクリティカルパスになる。この主橋梁の建設に要する工期の算定根拠は以下の通りである。

- 詳細設計

日本の経験による。

- 現場準備

日本の経験による。

- 基礎工

条件：オープンケーソンの沈下速度=0.5m/day

沈下深度=4 m /Lift × 10 Lift = 40 m

施工箇所数=9 Front × 4 Party = 36 Site

1 Lift 当りの建設時間 =4m/Lift / 0.5m/day =8 day

+ 12 days (Form, Rebars, Concrete, Cure) = 20 day = 0.7 M

1 オープンケーソン当りの建設時間=10 Lift × 0.7 M=7 M

合計建設所要時間=101 Piers/36 Site × 7M =21 M

総合建設期間=21M/0.75 =28M

- 下部工

インドのゼネコンへのヒアリングによる。

- ピロン

下部工完成後から 3 カ月に開始は、日本の経験による。ピロンの建設期間は桁の架設を含む。

- 桁架設

条件：1 セグメント当りの架設=12day

塔部分建設時間 =80 day

施工箇所数=9 Front × 2 Party = 18 Site

径間半分 × 2 = 50 day + 19 Segment × 12 day = 278 day = 9.3 M

合計建設所要時間=100 Span/18 Site × 9.3M =51.5 M

総合建設期間=51.5M/0.75 =68.7M = 5 Years 9 M

全体建設期間=24 M + 5 Years 9 M = 7 Years 9 M

- 舗装／撤去

日本の経験による。

尚、DPR に記載されている建設工期も JICA 調査団の提案と同様の 7 年 9 ヶ月である。

8.2 事業実施体制

8.2.1 NHIDCL の組織

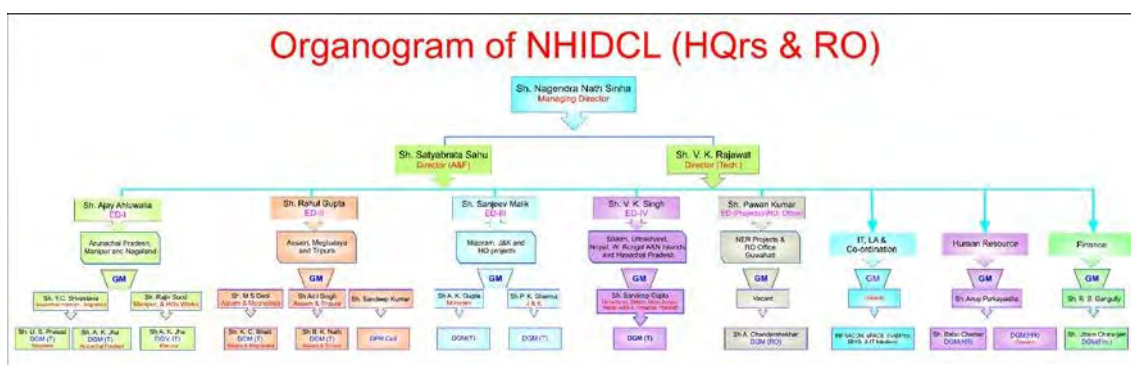
NHIDCL は、2015 年 1 月 1 日に MORTH から全額出資により設立された政府出資会社であり、国道や隣国との国境を跨ぐ重要路線の調査、計画、設計、建設、運営、維持管理

および道路改良等を担う機関である。組織が若く、現在成長中であるため、予定しているポジションを埋めつつ必要人員を確保しているところである。

本社はデリーに設置されており、その組織は、会長（Chairman）、理事長（Managing Director）、理事（Director）の理事会が組織運営を実施している。理事会の下に本部長（Executive Director）、部長（General Manager）、次長（Deputy General Manager）、課長（Manager）、課長代理（Deputy Manager）、担当職員（Office Assistant）が置かれている。

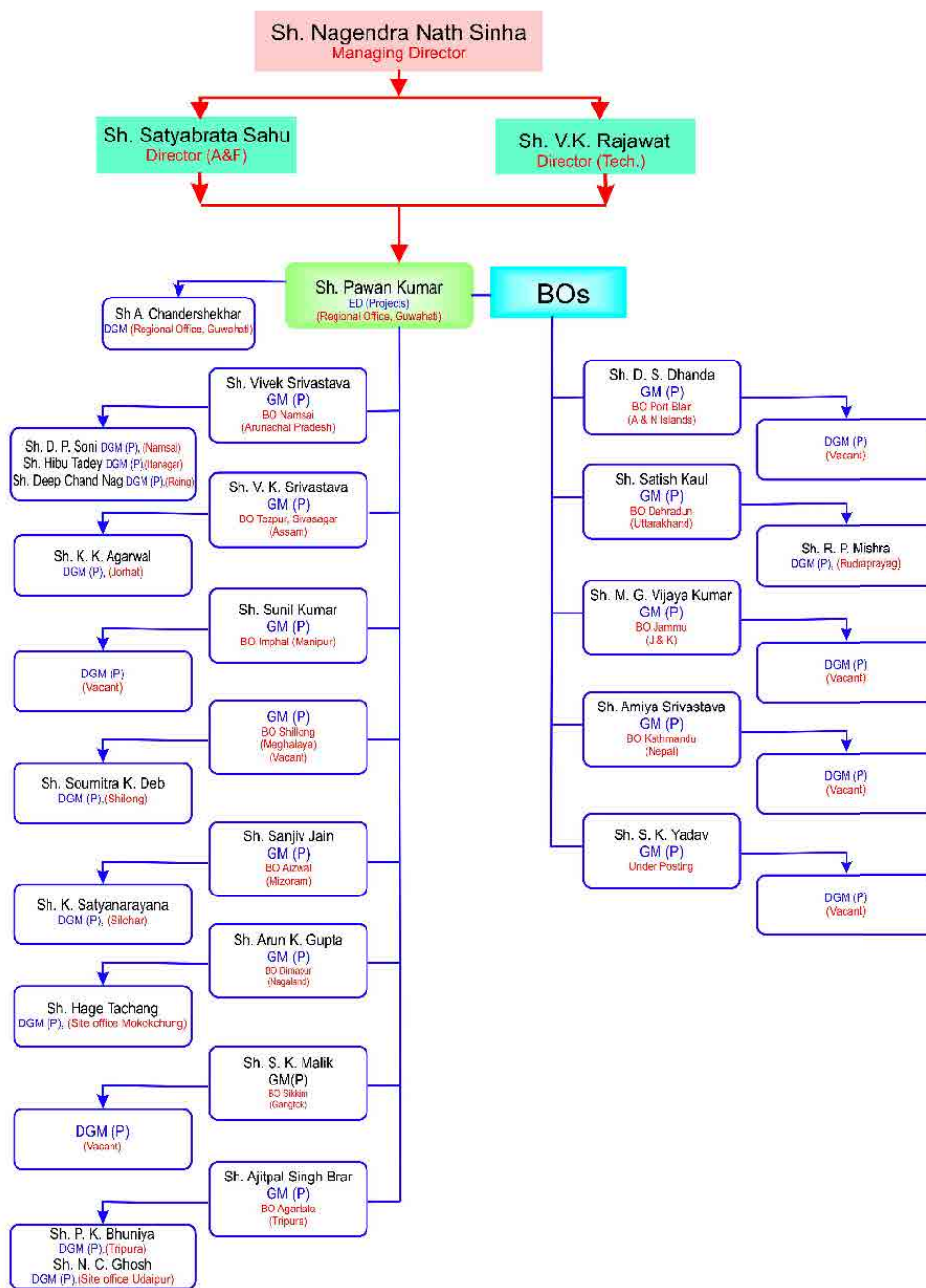
また、グワハティには地域オフィスがあり Executive Director と次長が、各州には担当部長と次長がそれぞれ配置されているが、未だに空きポストがある。

以下に、NHIDCL 本部および各州事務所の体制図を示す。



出典：NHIDCL

図 8-4 : NHIDCL 組織図



出典 : NHIDCL

図 8-5 : NHIDCL 地方事務所体制図

北東地域事務所は、現在グワハティ地方事務所内に設置され本部長クラスが北東地域全体を管轄している。ドゥブリ橋建設の現場担当は、グワハティ地方事務所が行い、その下に施工監理コンサルタントが雇用され、コントラクターを監督することになる。



出典：JICA 調査団

図 8-6：事業実施体制図

NHICDL の財務状況を下表に示す。中央政府からの補助、プロジェクト（DPR 作成、建設、維持管理）のエージェントフィーなどから収入を受けており、税引き後利益を年間 2 億円前後出している。

表 8-1：NHIDCL の財務状況

Particulars	FY17 in JPY. (1.4.2016-31.3.2017)	FY16 in JPY. (1.4.2015-31.3.2016)
Revenue from Operations	708,840,297	393,037,453
Other Income	119,431,572	152,380,871
Gross Receipts	828,271,869	545,418,324
Total expenses excluding depreciation	457,221,023	248,402,997
Profit before Depreciation and Tax	371,050,847	297,015,327
Depreciation	16,863,157	9,399,801
Profit after depreciation	354,187,690	287,615,526
Prior Period Expenditure	3,116,319	-
Profit before Tax and after Prior Period	351,071,371	287,615,526
Provision for Tax including deferred tax	124,116,985	102,342,714
Profit after tax	226,954,386	185,272,812
INR=1.65 JPY		

出典：NHIDCL 年次報告書を基に JICA 調査団作成

8.2.2 契約スキームの検討

(1) インドの EPC 契約方式

インド政府は、国道整備について 2005 年以降は官民パートナーシップ (PPP) で行うことを基本にして、その契約方式は建設・運営・移管 (BOT) 調達方式を用いてきた。しかし、近年において次に挙げるような問題に直面していた。

- 現実性のない入札価格とその結果による予算超過や工期遅延の多発
- 道路事業者の資金調達難
- 国内外の経済不況

これらの問題は、国道整備プロジェクトに深刻な影響を与え、国道整備の入札不調が頻発し、さらに入札後の契約不履行が多数発生したために、道路交通省は契約方式を見直すこととなった。基本的には、道路事業者が資金を調達する官民パートナーシップから、政府資金による工事発注へ移行することにした。

しかし、一般的に世界各国で用いられている設計・入札・施工 (DBB) 方式が、インドで実施されていたのは 1980 年代までであり、新たな契約方式を研究するに至った。その結果、FIDIC の EPC/Turnkey プロジェクト契約書 (1999 年 1 月) をベースにした技術・調達・建設 (EPC) 標準契約書が、2012 年に開発され適用されることになった。2012 年以降の国道整備契約は、徐々に EPC を用いる比率が高まっている。

(2) インドの EPC 契約方式の現状

2013 年度以降の国道整備契約方式は、EPC 契約が約 8 割を占めており、今後もこの傾向は継続するとみられている。州政府の発注方式も EPC 契約を採用するものが増えてきている。特に大型案件が、従来の PPP 方式で入札不調になり EPC へ変更してきている。

EPC/Turnkey 契約方式は、一括請負方式とも言われ、特にプラント等の建設に当たり、用地の整備、建設、設備の据え付け、試運転までの一連の業務を一括して受注側が引き受ける方式である。かぎを回すだけで操業できる状態で発注者がプラントの引き渡しを受けるところから、この名称が生まれている。この契約方式は、受注者にプロジェクトの設計と建設の全ての責任を課すものである。従って、この契約方式は、工費と工期が確実な場合に用いられる。発注者はプロジェクト事業費の把握が容易にできる一方で、受注者は工期と工費に大きなリスクを負うことになる。道路工事のように地下地盤の状況等、契約事前に把握できない要素が含まれる場合の適用に問題があるとされている。

アジア開発銀行、世界銀行、並びに JICA は、インド政府に対して国道プロジェクトの資金支援のために、インド EPC 標準契約書の部分変更を促しているところである。それに対応してインド政府は、2017 年 1 月 16 日にプロポーザル要請書改訂版及び 1 月 17 日に標準契約書改訂版を発行している。英語名は下記の通りである。

- Modified RFP Document- 16.01.2017, for single stage two-part bidding for Road & Bridge works on EPC mode
- Standard Agreement - 17.01.2017, for Road & Bridge works on EPC model

(3) インドの EPC 契約方式の課題

インドの EPC 方式は、アジア開発銀行、世界銀行、並びに JICA が修正を要請していることから、その内容について改善されつつあるものの次に挙げるような課題が残されている。

- 入札公示から入札日までの期間が 45 日と短く、十分な入札準備が困難である。最低 90 日程度は必要である。
- 入札は一段階二書類選考方式であり、第一段階で入札者が提出した入札書の適任性と能力の審査を行う。第二段階では、この適任性と能力の技術審査を通過した入札者のみについて、価格入札書が開かれる。そして、最低価格の入札者が選定される。基本的に価格のみによる競争である。過去に発生した攻撃的入札を除外するには、技術と価格の両審査点を加味する総合評価方式の導入が必要である。
- EPC 方式においては、建設工事の暫定完了書の発行日から、4 年間の維持管理業務が契約に含まれている。その支払いは、契約額に対して各年 0.5%、1%、1.5%、および 2% と決められている。また、橋梁等構造物の単独工事の場合には、その支払い率は 0.25%、0.5%、0.5%、および 0.5% と規定されている。現在の NHIDCL は、組織が若いこともあり維持管理体制が脆弱である。当面は、本規定が有効であるが中長期的には見直しが必要である。
- EPC 方式においては、建設工事の暫定完了書の発行日から、瑕疵担保責任を 4 年間に規定している。工期が延長された場合においても、瑕疵担保責任は完了書の発行日から 42 カ月を下回ってはならないと定められている。なお、瑕疵担保期間については、FIDIC や JICA の円借款事業用調達ガイドラインに沿って、今後検討していく必要がある。

実施機関から受領した入札図書案と JICA の標準入札図書（デザインビルド契約）について、GCC および PCC、片務性の有無等をレビュー・比較検討した結果は、添付-8 に示した。

8.2.3 施工監理業務

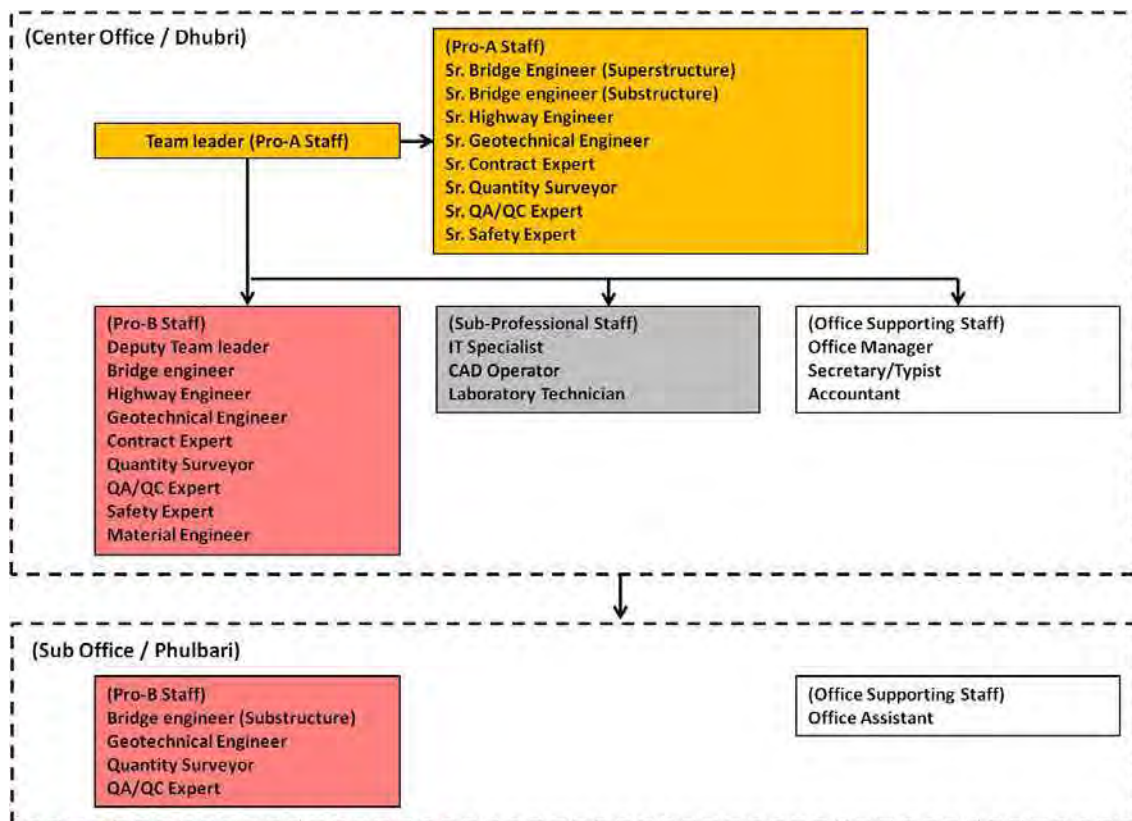
ドゥブリ橋建設事業は、インド最大級の長大橋プロジェクトであり、その架橋地域の自然条件は大変厳しい。従って、施工監理業務のコンサルタントは、EOI プロセスのもと国際入札を行い調達する。

橋梁が横断するブラマプトラ川は、川幅が約 20 km ある典型的な網状河川であり流路が不安定である。中州の地盤は大部分が砂である。また、雨季と乾季が一年を等分し、水深は 5 m 程度変化する。また、100 年確率の洪水が発生した場合には、プロジェクト道路が横断する周辺の中州は全て水没する。

長い雨季の中において、不安定な河川状況で建設する長大橋は、特に下部工の建設に高い技術が必要とされる。さらに上部工にあっても資機材や労働者のロジスティクスに高い

技術が必要とされる。以上の条件を加味して図 8-7 に挙げる施工監理コンサルタント体制を提案する。

施工監理業務の内容は、工事開始前にコントラクターから提出される工事図面の照査を行う。工事が開始されたら工事施工監理を行い、品質管理および部分払い検測等を実施する。コンサルタントの施工監理業務における主たるメンバーについても図に例示した。



出典：JICA 調査団

図 8-7：施工監理業務のコンサルタントの体制

8.3 維持管理計画

先方政府の本事業にかかる DPR では、道路の維持管理については、建設工事完成後の 4 年間においてコントラクターがその業務を担当することとなっている。コントラクターは、運営・維持管理が開始される月の 10 日前に、維持管理計画書 (Maintenance Programme) を NHIDCL のエンジニアと相談の上作成しなければならない。また、毎月エンジニアと合同で道路点検を実施しなければならない。維持管理の要求レベルについては、契約書の附則 - E 維持管理要求書 (Maintenance Requirement) に基づいて行わなければならない。コントラクターは、維持管理の期間において契約に基づいて次の責任を負う。

- プロジェクト道路を、連続的に安全でスムーズに利用できるようにする
- 日常維持管理を実施するが、以下の項目の速やかな補修を含む；ポットホール、クラック、裂け目、排水、盛土、構造物、舗装、路面表示、照明、道路標識、その交通管理付属物
- 構造物の補修の実施
- プロジェクト道路の不法使用を NHIDCL へ通報する
- プロジェクト道路への違法な占用を NHIDCL へ通報する
- 契約書に基づいてプロジェクト道路の効率的な維持管理を実施するために、情報通信、パトロール、並びに運営管理システム等全ての運営と維持管理

コントラクターに義務付けられた維持管理期間の終了後については、現在国道庁 (NHAI) が実施している有料・運営・移管 (TOT) モデルの活用がある。これは、国道庁の資金源の拡大にも貢献している。このモデルの導入について、2016 年 8 月に経済問題内閣委員会 (CCEA) が、政府予算で建設した国道プロジェクトを資金源にする権限を国道庁に与えた。

この制度が適用されるのは、現在までに少なくとも 2 年間は運営中であり、料金徴収を実施しているプロジェクトである。この TOT モデルに該当するものとして 75 本の運営道路が初期調査で確認された。この維持管理に関する新しいモデルは、建設完了後のプロジェクトについて国道庁の関与を縮小し、効率的な運営と維持管理 (O&M) を提供することを期待されている。また、O&M を専門とする新しい投資家グループに対して、ビジネス機会を創出することにもなる。

なお、NHIDCL は 2014 年に設立された組織であり、2016-17 の年次報告書によると、建設・改良が完成済みの道路は未だない。維持管理を含めて各州の担当部局が実施を管理しているが、維持管理についてはコントラクターに発注する方針であり、実際にそのような業務を複数発注、契約締結済みである。また、中央政府から、Special Repart Fund として 2017 年度で約 11 億円程度の支援を受けている。

第9章 経済分析

9.1 概要

本章では、前述の需要予測、事業スコープ、事業費、実施スケジュール等に基づき、本事業の経済評価を実施した。指標としては経済的内部収益率（EIRR）を用い、本事業を実施した場合（With Project シナリオ）と実施しなかった場合（Without Project シナリオ）を比較することにより本事業に係る費用と便益を推計し、EIRR を算出した。評価期間は2018年度～2042年度の25年間とし⁴¹、2028年の供用開始以降15年間の費用・便益を考慮した⁴²。また、費用・便益共に2017年価格で推計し、インフレは考慮していない。以下に方法論及び結果を記す。結論としては、本事業の経済効果は高く、その実施は国家経済的にみて妥当性十分との結果となった。

9.2 費用

下記の前提の下で、年度毎の投資費用及び維持管理費用を算出した。

- 投資費用の総額は、表 9-1 に示す事業費のうち、建設費、コンサルタント費（これらの物理的予備費は含むが、物価上昇は除く）、土地収用費、実施運営費の合計とする。税金は移転費用であり、経済費用からは除く。
- この合計を、2018年度～2028年度の各年につき算出する（表 9-2）。
- 残存価値は考慮しない。
- 本事業実施により追加的に生じる維持管理費は、インドの EPC 契約を参考に土木費の 2.0%（一定）と設定する⁴³。なお、4年目までは建設費に含まれるため、5年目以降を算出する⁴⁴。
- 財務費用から経済費用への変換係数は 0.90 と設定する⁴⁵。

⁴¹ 評価期間 25 年というのは、フェーズ 1 調査及び DPR と同様の設定。

⁴² 建設工事は 2028 年 5 月に終了予定のため、経済分析では 2028 年度（2028 年 4 月～2029 年 3 月）に発生が見込まれる便益の 5 分の 6 を計上。

⁴³ 土木費については、6.2.2 項の表 6-1 を参照。

⁴⁴ 開通時期を考慮し、5 年目（2032 年度）の道路維持管理費は 7 カ分を計上。

⁴⁵ 以下の世銀審査資料等に基づき設定：World Bank, *Project Appraisal Document for Assam State Roads Project*, February 2012.

表 9-1 : 総事業費とその内訳

	外貨	内貨	合計	
	ポーション (百万円)	ポーション (百万 Rs)	(百万円)	(百万 Rs)
1. 建設費	10,200	40,175	75,283	46,471
1.1 ドゥブリ橋	8,568	29,971	57,121	35,260
1.2 紛争裁定委員会	149	0	149	92
1.3 物価上昇	997	8,291	14,428	8,906
1.4 物理的予備費	486	1,913	3,585	2,213
2. コンサルタント費	881	1,787	3,775	2,330
2.1 ベースコスト	774	1,363	2,982	1,841
2.2 物価上昇	65	339	614	379
2.3 物理的予備費	42	85	180	111
3. 土地収用費	0	248	401	248
4. 実施運営費	0	1,514	2,453	1,514
5. 付加価値税	0	6,028	9,766	6,028
6. 輸入税	0	321	520	321
総事業費	11,081	50,073	92,199	56,913

注：交換レートは、Rs 1 = 1.62 円

出典：JICA 調査団

表 9-2 : 年度別必要資金

年度	外貨ポーション	内貨ポーション	合計	
	(百万円)	(百万 Rs)	(百万円)	(百万 Rs)
2018	0	63	103	63
2019	0	113	183	113
2020	1,390	4,757	9,097	5,615
2021	1,205	3,811	7,378	4,554
2022	1,173	3,856	7,420	4,580
2023	1,114	3,848	7,348	4,536
2024	1,061	3,825	7,257	4,480
2025	1,044	3,829	7,247	4,473
2026	1,045	3,828	7,246	4,473
2027	1,048	3,820	7,236	4,467
2028	680	2,455	4,656	2,874
2029	22	13	43	27
2030	237	864	1,638	1,011
2031	0	7	11	7
2032	0	5	8	5

注：交換レートは、Rs 1 = 1.62 円

出典：JICA 調査団

9.3 便益

便益については、道路事業の直接効果として一般的に用いられている、旅行時間 (TTC) の短縮、及び車両走行経費 (VOC) の節約の 2 種類について定量化を行った。これら便益の計算式を以下に記す。

$$(\text{旅行時間の短縮}) = TTC_o - TTC_w$$

$$TTC_i = \sum_j \sum_l (Q_{ijl} \times T_{ijl} \times \alpha_j) \times 365$$

$$(\text{車両走行経費の節約}) = VOC_o - VOC_w$$

$$VOC_i = \sum_j \sum_l (Q_{ijl} \times L_l \times \beta_{ij}) \times 365$$

ただし、

- TTC_i : シナリオ i における TTC (Rs/年)
- VOC_i : シナリオ i における VOC (Rs/年)
- Q_{ijl} : シナリオ i 、リンク l における車種 j の交通量 (台/日)
- T_{ijl} : シナリオ i 、リンク l における車種 j の旅行時間 (時間)
- L_l : リンク l の距離 (km)
- α_j : 車種 j の TTC 単価 (Rs/時間・台)
- β_{ij} : シナリオ i における車種 j の VOC 単価 (Rs/台・km)
- i : Without Project シナリオ (O) 及び With Project シナリオ (W)
- j : 車種
- l : リンク

9.3.1 旅行時間の短縮

旅行時間の短縮便益については、主に節約時間と車種別の時間価値から推計した。節約時間の推計に用いた仮定・関連パラメーターを表 9-3、時間価値の推計に用いた仮定・単価を表 9-4 に記す。なお、時間価値は主に所得レベル (一人当たり GDP で計測可能) に影響を受けることから、将来的な時間価値は一人当たり GDP 成長率で増加するとの仮定を行い、評価期間における各年の時間価値を設定した。

表 9-3 : 道路延長、走行速度、及び旅行時間

	Without Project (1)	With Project (2)	(1) - (2)
道路延長 (km)	205.3	19.3	186.0
走行速度 (km/hr) ¹⁾	25	50	-25
旅行時間 (hr)	8.21	0.39	7.83

注：1) Without Project シナリオの走行速度は調査団による現場踏査結果を参考に設定。With Project シナリオの走行速度はダブル橋の設計速度を参考に設定。

出典：JICA 調査団

表 9-4 : 主種別の TTC 単価、2017 年価格

	一人当たり TTC (Rs/時間・人) ¹⁾	一台当たり乗客数 (人/台) ²⁾	一台当たり TTC (Rs/時間・台)
乗用車	82.31	4	329.25
小型バス	55.21	15	828.10
バス	55.21	30	1,656.20
小型商用車	55.21	1	55.21
トラック ³⁾	55.21	1	55.21
二輪車	65.84	1	65.84
三輪車	65.84	3	197.52

注：1) 乗用車、小型バス、バス、二輪車、三輪車については、フェーズ 1 調査にある業務時間の単価（2015 年価格）の 90%を、一人当たり GDP 成長率により 2017 年価格に調整。小型商用車、トラックについては、参照可能な情報が不足しているため、安全側と考えられる設定として、小型バス、バスと同等と設定。2) フェーズ 1 調査等に基づき設定。3) 二軸トラック、三軸トラック、多軸トラックを含む（以下同様）。

出典：JICA 調査団

9.3.2 車両走行経費の節約

車両走行経費（VOC）の節約便益については、インドの道路セクター調査報告書（MMRDA 調査報告書）⁴⁶を参考に設定した VOC 単価（2008 年価格）を、消費者物価指数（CPI）により 2017 年価格に調整の上、事業対象区間の道路に適用することにより推計した。得られた単価・推計に用いた仮定を表 9-5 に記す。

表 9-5 : 車種別の VOC 単価、2017 年価格

	VOC 単価 (Rs/台・km) ²⁾	
	Without Project	With Project
乗用車	8.43	6.24
小型バス ¹⁾	33.80	18.55
バス	45.71	25.21
小型商用車	29.19	16.15
トラック	46.57	25.31
二輪車	3.10	2.62
三輪車	7.49	4.37

注：1) MMRDA 調査報告書には小型バスの単価がないため、バスの単価に、関連調査報告書（DMRC 調査報告書）⁴⁷から得られたバスの単価に対する小型バスの単価の比率を掛け合わせるにより算出した。2) With Project シナリオでは走行速度 25 km/hr での VOC 単価を、Without Project シナリオでは走行速度 50 km/hr での VOC 単価を使用。

出典：MMRDA 調査報告書、DMRC 調査報告書を基に JICA 調査団作成

⁴⁶ 出典：Mumbai Metropolitan Region Development Authority, *Comprehensive Transportation Study for Mumbai Metropolitan Region (Technical Assistance by the World Bank)*, Final Report, July 2008.

⁴⁷ 出典：DMRC, *Detailed Project Report for Delhi Metro Phase IV*, March 2014.

9.4 経済的内部収益率 (EIRR) の推計

以上の設定の下、費用及び便益を推計し、本事業のEIRRを算出した。表9-6に経済分析の計算過程と結果を示す。EIRRはインドにおいて資本の機会費用とされる水準(12%)を上回る16.5%となった。これより、ドゥブリ橋建設への投資は、高い経済効果をもたらし、国民経済的に見て事業実施は妥当性十分との推計結果となった。

表 9-6 : 費用便益フロー及び EIRR

(単位: 百万 Rs)

年度	費用		便益		費用便益フロー
	投資	維持管理	時間短縮	VOC 節約	
2018	57	0	0	0	-57
2019	102	0	0	0	-102
2020	5,139	0	0	0	-5,139
2021	4,173	0	0	0	-4,173
2022	4,195	0	0	0	-4,195
2023	4,151	0	0	0	-4,151
2024	4,097	0	0	0	-4,097
2025	4,090	0	0	0	-4,090
2026	4,090	0	0	0	-4,090
2027	4,085	0	0	0	-4,085
2028	2,629	0	914	5,254	3,539
2029	25	0	1,709	9,412	11,095
2030	925	0	1,863	9,836	10,775
2031	6	0	2,009	10,197	12,200
2032	4	370	2,167	10,571	12,364
2033	0	635	2,337	10,961	12,663
2034	0	635	2,521	11,365	13,252
2035	0	635	2,720	11,786	13,871
2036	0	635	2,934	12,223	14,523
2037	0	635	3,166	12,677	15,209
2038	0	635	3,417	13,150	15,932
2039	0	635	3,688	13,641	16,694
2040	0	635	3,981	14,152	17,498
2041	0	635	4,298	14,683	18,346
2042	0	635	4,641	15,235	19,241

出典: JICA 調査団

EIRR = 16.5%

表 9-7 : EIRR の感度

ケース	EIRR (%)
(a) ベースケース	16.5
(b) 投資費用: 15%上昇	14.9
(c) 交通量: 15%低下	14.6
(d) (b)と(c)の組み合わせ	13.1

出典: JICA 調査団

第10章 プロジェクトの評価

10.1 プロジェクトの概要

ドゥブリ橋は、国道 127B 号がブラマプトラ川を横断する区間の約 20 km に架かる。現在この区間は、小型船により人々と軽量貨物の輸送が行われている。国道 127B 号は、アッサム州スリランプールを始点とし、メガラヤ州ノングストインを終点とする総延長約 371 km であるが、ブラマプトラ川を横断するこの区間が国道 127B 号の道路欠如部分である。現在、ドゥブリからツラへ車両の移動や大型貨物を輸送する場合には、ブラマプトラ川に沿って約 60 km 上流のゴールパラ (Goalpara) にあるナラナラヤン橋を横断する必要があるために、約 150 km の余分な延長の迂回を余儀なくされている。

ドゥブリやプルバリが位置する北東地域西部は、開発が遅れている北東州の中でも特に交通の便が悪く陸の孤島として取り残されている地域である。ブラマプトラ川は、ドゥブリを過ぎた辺りから川幅が 20 km にも広がり、水の流路が何本にも分かれて数多くの中州を作る典型的な網状流路を形成している。ブラマプトラ川の中に形成された中州を含む砂丘地域は、チャール地域とも言われ、貧困地域として開発が待たれているところである。

国道 127B 号は、2012 年に新たに国道に指定されたのであるが、その沿道地域チャール地域も広く含まれている。また、この地域はバングラデシュとの国境に接し、過去には国境紛争も度々勃発し、治安も安定していなかった。この地域は、北東地域の中でも交通アクセスが特に限られているのみならず、基礎インフラ整備も遅れている後背地である。生計の手段も非常に限られている。

国道 127B 号に指定された路線は、以前は州道や地方道であり、多くの区間が未舗装で道路幅も狭小である。ドゥブリ橋の建設効果を発揮されるためには、ドゥブリ橋の建設と同時にこれら接続道路の整備が不可欠である。インド政府は、第 12 次 5 年計画の中でこの地域の全面的な開発に特に力を注いでおり、特にドゥブリ橋の建設は最優先プロジェクトとして位置づけられている。

10.2 プロジェクトの評価

10.2.1 設計内容の妥当性の確認

DPR については、DPR コンサルタントの作業がやや先行して行なわれたが、その内容を照査しつつほぼ並行して JICA 調査団も準備調査を行った。DPR の内容に課題が確認され、実施機関である NHIDCL、及びアッサム州内の道路を管轄している PWD と協議を行い、DPR コンサルタントと調整作業を進めた。以下、JICA 調査団が見出した主な課題、並びにその解決策を提案した項目である。

(1) 接続道路

ドゥブリ橋は、国道 127B 号がブラマプトラ川を横断する区間の約 20 km である。国道 127B 号は、東西回廊と北東地域西部を直結するもので、開発が遅れている北東地域西部が

東西回廊を介して北東地域の中心地や、さらにはインド全域への道路連結性が改善されることにより、物流が促進され経済発展に寄与すると予想される。ドゥブリ橋建設がその整備効果を発揮するには接続道路の状態が重要であり、鉄道網の状況も含めて接続道路の現状を調査した。

(2) 道路線形の選択

ドゥブリ橋を含めた道路線形の選択を検討するには、道路建設が及ぼす可能性のある様々な負の影響を考慮する必要がある。検討に必要な評価項目は、①橋梁計画に対する河川管理者の設計条件、②橋梁を含めた道路建設の社会的影響、③橋梁を含めた道路建設の環境的影響、そして④橋梁を含めた道路の経済性と走行安全性についての技術的検討が主要な項目として挙げられる。検討の結果、河川を斜めに横断してドゥブリとプルバリとを直線で結びドゥブリの住宅密集地と中州の居住地を最大限避ける案であるオプション 1 が「社会的影響」「環境的影響」「技術的検討」の全てで最も優れていることが示された。

(3) 浸食対策

河川内に構造物を設置することで、堤防や河床が浸食される。浸食分析の結果、次の結論を得た。①河川断面縮小浸食は発生しない、②局部浸食は、100 年確率の洪水時に最大で 11.08 m が橋脚基礎工に発生する。橋脚については適切に設計されているが、橋台部については、周囲の地形状況や洪水時の水の流れ等を勘案し、適切な盛土のり面の保護工を設計する必要がある。A2 橋台は、ブラマプトラ川の支流のひとつであるジンジラム川に面しており、この川の流れによる洗掘が発生する可能性があり、盛土のり面の防護工を提案した。

(4) 交差点設計

ドゥブリ橋は、アッサム州ドゥブリとメガラヤ州プルバリとを、ブラマプトラ川を横断して州境を超えて結ぶという特殊性がある。通常、州境においては、州税の徴収や過積載違反やその他車両検問等の交通取締が必要である。下記の条件を考慮して交差点設計を行う。

- ア) 交差点は、“交通抑制施設”として適用する。ラウンドアバウトは、走行速度を抑制して交通を循環させるために、譲るという習慣のないインドの道路交通の安全対策に効果的である。
- イ) ドゥブリ橋は二つの州に跨るために、道路交通警察チェックポイントや州境治安部隊チェックポイント（現在はドゥブリとプルバリ間の全てのボート交通を取り締まるチェックポイントがある）を橋梁の起終点に設置する必要がある。従って、“交通抑制”は交通安全を適切に確保するために非常に重要である。

(5) 橋梁区間長

橋梁計画位置でブラマプトラ川の川幅が 15 km を超えること、水路と中州の位置と規模が変化しやすい特徴があることを考慮して、橋梁区間を約 18.4 km としている。河道の不安定さを考慮して、支間長の大きな橋梁を必要とする航路区間を約 12.6 km とし、航路区間に接続する高架橋区間に短い支間長の橋梁を配置する計画は妥当である。ブラマプトラ川の左岸および右岸に明確な自然堤防 (natural levee) が形成されていないため、まれに発生する将来の洪水の影響を考慮して、現在の川幅よりも内陸の後背湿地 (backswamp) まで橋梁区間を延長していることは妥当な判断である。

(6) 橋梁計画

ブラマプトラ川は水運に利用されており、インド内陸水運局 (IWAI) は航行水路として水平方向に幅 100 m、鉛直方向に高さ 10 m のクリアランスを要求している。この要求に基づき、航路区間の橋脚間隔を 125 m に、航路区間につながる両側の高架橋区間の橋脚間隔は 60 m に設定している。IWAI との協議により、航路区間の長さは 12,625 m としている。上部工形式は、支間長に対して一般に経済的となる形式を選定しており、航路区間にエクストラードロード橋、それ以外の高架橋区間に PC 箱桁橋を選定している。

(7) 基礎工

浸食されやすい土が厚く堆積している地質条件に対応できること、特殊な建設機械を必要としないこと、支持地盤の確認が容易であること、ブラマプトラ川で施工した実績がありインドで成熟している技術であること、洗掘に対する安全性が高いことなどからオープンウェル基礎を採用していることは妥当である。上部工からの作用力が小さくなれば、ウェルの断面寸法を小さく設計できるが、ウェル内部の排土に使用するバケットの寸法から最小寸法に制限がある。

高架橋区間は航路区間の前後に位置しており、水深が浅い区間または乾季に陸地になる区間である。航路区間よりも支間長が短い上部工からの荷重が小さいことから、オープンウェルよりも経済性に優れた杭基礎を使用していることは妥当である。

(8) エクストラードロード橋

ケーブルが桁の中央に配置されている構造であり、ケーブル軸力を桁断面に分布させるための鋼フレームが桁の内部に配置されている。このフレームによって桁の内部空間の大部分が満たされてしまえば、将来の維持管理活動が制約される可能性がある。維持管理を想定した桁の断面を設計することが重要である。完成後に点検と補修のための機材を桁内部に持ち込めるようにしておく必要がある。また、桁に配置されているケーブルが 1 面であるため、橋軸直角方向に過大な変形が生じないように、桁の水平方向の剛性を十分に確保するように設計または補強する必要がある。

橋梁の伸縮装置は橋梁の中で最も損傷しやすい要素であり、十分に耐久的な構造と材質を選定するとともに、維持管理が容易な形式が望ましい。最も起点側と終点側の伸縮装置

だけは橋脚の上に位置しているが、残り全ての伸縮装置は支間中央にある。コンクリートのクリープ現象により、支間中央にある伸縮装置を共有する前後 2 つの桁が長期的に下方方向に変形して伸縮装置で段差が生じる可能性がある。

(9) 施工計画

ア) 資材の輸送

ドゥブリ橋建設に使用するセメント、鉄筋、ケーブルを含む多種多様な材料と機材は、北東州の外から架設現場に持ち込む必要がある。西ベンガル州のコルカタを輸送起点として想定すると、コルカタからドゥブリまでの輸送方法はトラックまたはトレーラー、台船、および鉄道による方法が可能である。輸送する材料の寸法、使用量、現地での保管可能量、季節的制約、輸送能力、コストを総合的に考慮して適切な輸送方法を決定することが重要である。経済的で季節的な制限がなく、大量輸送に適する鉄道が最も有効な輸送手段であると考えられる。最寄りの駅から現場までは、トレーラーまたはトラックによる輸送が必要である。

イ) エクストラドーズド橋の施工

施工計画における最大の課題は、ブラマプトラ川で 100 スパンにわたり連続するエクストラドーズド橋を建設する工法であり、現地の条件に基づいて経済性、技術的确实性に加えて工事期間を満足することが重要である。エクストラドーズド橋は、橋脚上のピロンから両側に桁を張り出しながら建設するもので、プレキャストセグメントあるいは現場でコンクリート打ち込みして桁を延長する。ドゥブリ側に比較してプルバリ側へ資材を輸送することが困難であることを考えれば、プルバリ側を期待しないでドゥブリ側に主要な作業ヤードを設置することを前提にしなければならない。ドゥブリ橋の桁幅は 28 m あり、重いプレキャストセグメントを製造場所から河川中の架設場所に輸送することになれば、台船への積み込み積み下ろしを行うための栈橋および輸送用通路など大掛かりな仮設備が必要になる。

(10) 事業費積算

DPR コンサルタントと JICA 調査団の両方で、その積算結果に差が出ないように、綿密な意見交換を行いつつ作業を進めた。特に橋梁形式は、事業費に大きな影響を与えるために DPR コンサルタントと綿密に打ち合わせを行った。

(11) 事業実施計画

インドにおけるプロジェクト調達の EPC 契約方式は、その改善について議論がされており、インド政府も随時改定を行っているところである。従って、JICA 調査団は、調達方式の最新情報を入手して、調達方式の提案を行った。また、工区割りについても、DPR コンサルタントと情報を共有し事業実施計画に違いが出ないようにした。

(12) 環境調査

JICA 調査団は EIA 及び RAP に係る調査を実施した。これらの調査は、DPR コンサルタントが実施した IEE レベルの環境調査を補足すると共に、JICA 環境ガイドラインを満たすためのものである。

10.2.2 プロジェクトの妥当性の確認

インド政府は第 12 次 5 カ年計画（2012 年 4 月～2017 年 3 月）において、北東地域特別道路整備促進計画（Special Accelerated Road Development Programme for North-East : SARDP-NE）による地域内主要都市間の国道整備を掲げた。また、2014 年 5 月に発足したモディ新政権も、北東州の開発、特に道路網の整備は重点政策の 1 つと捉えている。

SARDP-NE は、北東地域の地方中心部や遠隔地域を州都と接続する道路を整備するものである。7,530 km の国道の 2 車線化あるいは 4 車線化、並びに 2,611 km の州道の 2 車線化あるいは改良が含まれている。北東州にある 88 か所の地方中心部を、少なくとも 2 車線の道路で、最も近くを通る国道に接続することが目的である。

本プロジェクトは、これら上位計画に合致するものである。また、交通予測と事業費算定に基づいて経済分析を検討した結果、基本ケースとしての EIRR 値は 16.5%、最も下位ケースにおいても 13.1%と、それぞれ算出されたことから、本プロジェクトは妥当であると評価される。

10.2.3 有効性の確認

(1) 定量的効果

ドゥブリ橋建設事業の定量効果は、下表にしめす評価を行った。2 つの評価指標パラメーターの値は基準年（2017）及び目標年（2028）について設定した。

表 10-1：ドゥブリ橋検討の目標結果

評価指標	基準値（2017年）	目標値（2028年）
平均旅行速度（km/hr）	25	50
年平均日交通量（PCU/日）*	5,658	10,252

注*：距離加重平均により算出

出典：JICA 調査団

(2) 定性的成果

ア) ドゥブリ橋の建設は、現在ブラマプトラ川により分断されているドゥブリとプルバリを橋梁で接続する。この区間は、国道 127B 号のミッシング・リンクであり、橋梁建設により道路の接続性や利便性が改善される。

イ) ドゥブリ橋の線形ルート選定において、社会的影響、環境的影響、および技術的検討を総合的に比較検討し、環境社会への影響を最小化している。また、建設行為において環境社会に対する十分な配慮がなされるために、重大な影響は想定されない。

- ウ) 現在輸送に使われている小型船は、悪天候の影響を受けやすく、また船着き場の施設が貧弱なために利用する地域住民は、常に危険にさらされている。ドゥブリ橋の建設は、悪天候に左右されない輸送の定時性を改善し、さらに輸送の安全性を高め、それにより地域の経済活動や生活環境の質の向上に寄与する。
- エ) 現在輸送に使われている小型船は、自転車やバイクの運搬は可能であるが、車両等の重量物は運搬できない。ブラマプトラ川を横断する必要がある車両は、約 60 km 上流の橋梁へ迂回し、約 150 km の余分な延長を走行している。ドゥブリ橋の建設は、このような車両の走行距離を大きく短縮し、排気ガスや騒音を減少し、それにより、地域環境の向上に寄与する。

第11章 結論と提言

(1) 本プロジェクトは妥当であり有効である

前章で述べた通り、本プロジェクトは、その事業内容について JICA 調査団が国道インフラ開発公社 (NHIDCL) 作成の DPR のレビューを行い、確認された課題について改善案を提案し、それに基づいて DPR は適切に改善された。また、インド政府の上位計画とも合致することから、本プロジェクトは妥当である。さらに、定量的効果と定性的効果についても、その有効性が確認された。従って本プロジェクトは、妥当であり有効である。

(2) 効率的なエクストラードーズド橋の施工監理

施工計画における最大の課題は、ブラマプトラ川で 100 スパンにわたり連続するエクストラードーズド橋を建設する工法である。ドゥブリ橋の桁幅は 28 m あり、重いプレキャストセグメントを製造場所から河川中の架設場所に輸送することになれば、台船への積み込み積み下ろしを行うための栈橋および輸送用通路など大掛かりな仮設備が必要になる。日本の建設事例によれば、プレキャストセグメント工法で 1 セグメントを建設するのに 7 日を必要としている。仮にドゥブリ橋の工事期間を 6 年とする場合、日本の建設事例を参考に現場打ち込み工法による工事期間を推定すると、航路区間で 1 度に 30 か所程度の同時並行作業を行う必要がある。最大限の効率的なエクストラードーズド橋の施工監理が必要とされる。従って、入札図書の技術プロポーザルの方法論において、記述の必須項目とすることを提言する。

(3) 工事中の洪水監視警報システムの必要性

ブラマプトラ川は、降雨量が非常に大きいチベット南部を通過し、アッサム平原に達するまで広大な流域を有していることから、大洪水を頻繁に起こし、作物や人命等に大きな被害を出している。ドゥブリ橋の横断箇所における中州の地盤高は、わずか数メートルと低く 10 年確率の洪水で大部分が水没する。従って、工事期間中における洪水監視警報システムの構築は、工事現場で働く人々の安全を確保するため非常に重要である。洪水監視警報システムは、気象データ収集、データ分析、警報発令・伝達、避難マニュアル、避難訓練等が一体化して初めて機能する。従って、入札図書の技術プロポーザルの方法論において、記述の必須項目とすることを提言する。

(4) 運営と維持管理の技術移転の必要性

NHIDCL は、道路交通省の下に 2014 年 2 月に設置された若い組織である。維持管理の体制や技術については、これから構築していく計画である。ドゥブリ橋の維持管理については、コントラクターが建設完了後の 4 年間について担当し、NHIDCL に引き渡すことになっている。その後も NHIDCL 監督の下、維持管理が外部委託される予定であるが、ドゥブリ橋は約 20 km の長大橋であり、その維持管理は通常の国道とは異なった特殊なものにな

る。長大橋の点検手法や補修技術について、日本は豊富な経験を有しており、NHIDCL は日本から運営と維持管理の技術移転が必要としている。従って、コントラクターとの契約書の特記仕様書 (Employer's Requirement) において、維持管理について組織体制、機械設備、点検及び修繕手法、等について維持管理マニュアルを作成することを義務付け、さらに職員の教育を行うための研修計画を織り込むことを提言する。

【添付資料一覧】

- 添付資料-1 調査団員・氏名
- 添付資料-2 主要協議資料
- 添付資料-3 生態系モニタリング TOR
- 添付資料-4 RAP 支援 NGO 再委託 TOR
- 添付資料-5 外部モニタリング機関 TOR
- 添付資料-6 EIA (Environmental Impact Assessment, 環境影響評価)
- 添付資料-7 RAP (Resettlement Action Plan, 住民移転実施計画)
- 添付資料-8 入札図書案のレビュー結果

添付資料-1 調査団員・氏名

氏名	担当業務	所属
駄竹 清志	総括／道路計画①	株式会社パデコ
相馬 陽平	副総括／道路計画②	株式会社パデコ
高城 信彦	橋梁計画	大日本コンサルタント株式会社
徳永 博司	橋梁設計①上部工	大日本コンサルタント株式会社 (株式会社アジア共同設計コンサルタント)
平野 貴之	橋梁設計②下部工	大日本コンサルタント株式会社
横尾 文彦	土工／土砂災害対策	株式会社パデコ (OYO インターナショナル株式会社)
青木 博	道路設計①	株式会社パデコ
土屋 潤	道路設計②	大日本コンサルタント株式会社
角岡 正嗣	積算	株式会社パデコ
小林 一典 【前任】	調達計画	株式会社パデコ
池上 盛容 【後任】	調達計画	株式会社パデコ
福嶋 健次	自然条件調査	株式会社パデコ (OYO インターナショナル株式会社)
角田 直毅	経済・財務分析	株式会社パデコ
湊 周介	環境社会配慮①	株式会社パデコ (株式会社日本開発サービス)
中村 純	環境社会配慮②	大日本コンサルタント株式会社
豊島 淳子	環境社会配慮③	株式会社パデコ
服部 智子	環境社会配慮④	株式会社パデコ (株式会社オリエンタルコンサルタンツグローバル)
横澤 太郎 【前任】	業務調整／道路計画補助	株式会社パデコ
佐々木 直子 【後任】	業務調整／道路計画補助	株式会社パデコ

添付資料-2 主要協議資料

1. 初回現地調査の概要説明

(2016年10月13日 於 JICA 本部、2016年10月14日 於 国土交通省)

<p style="text-align: center;">  インド国 北東州道路網連結性改善事業(その2)準備調査 ドゥブリ橋現地調査結果報告について 2016年10月13日 JICA調査団 (株式会社バデコ) (大日本コンサルタント株式会社) </p>	<p style="text-align: center;">報告のポイント</p> <ol style="list-style-type: none"> I. 本調査契約時には「DPRの質に一定の期待は持てる」*(次頁参考)との想定であったが、以下の項目で想定以上の作業が発生する。 <ul style="list-style-type: none"> ● プロジェクトの起終点の取り付け道路設計が不適切 ● 橋台の浸食防止対策が不十分 ● 橋梁の型式比較選定が不十分(現流域部の施工難易度を考慮せず) II. 上記項目についてNHIDCL及びDPRコンサルタントと調整を行うには以下の追加作業が必要である。 <ul style="list-style-type: none"> ● 設計主要メンバー(道路3、橋梁3、地質1)による現地設計協議(11月中旬に約7日間) ● DPRの現地説明(道路2、橋梁2、地質1、環境2)(2017年4月上旬に約7日間) III. 環境社会配慮について以下の項目を確認した。 <ul style="list-style-type: none"> ● 対象となる先住民族(IP)は存在しない ● 自然保護区、保護林、原生な自然環境は存在しない ● 絶滅危惧種であるガンジスカワイルカが存在を確認した
<p> *(参考:特記仕様書) 第6条 実施方針及び留意事項 (5) 設計の精度 本業務では、実施機関にて作成中のF/S(以下、DPR(Detailed Project Report))とする結果をレビューし、概略設計(円借款事業としての妥当性を判断できるレベルの設計、積算)までを実施する。国道40号線については、DPRの質に期待できないため代替設計案の提示を、新橋についてはDPRの質に一定の期待は持てるため、DPRに修正を施すと言った作業を想定している。なお、DPRについては、現在作成中のステータスであり、DPRを作成しているコンサルタントと内容際りあわせの上で、設計作業を進めていくこととする。 </p>	<p style="text-align: center;">1. ドゥブリ橋の役割</p> <p>アッサム州スリランプールからドゥブリ、そしてメガラヤ州のブルバリへと接続し、ツラ、ロンジェン、終点となるノングストインまでの区間が、国道127B号線に指定された。この区間は、ツラ地域への貨物輸送や交通サービスを促進し、アッサム州のドゥブリ地域やその他近隣の後進地域への代替ルートとなるものである。プラマトラ川を横断するドゥブリ-ブルバリ橋は、最も高い優先度が与えられており、アッサム州のドゥブリ地域や西部地域の広大なチャール地方の後進性を解消するものである。(道路交通省)</p>  <p style="text-align: right; font-size: small;">出典:北東地域開発局「北東地域の主要道路橋梁計画」</p>
<p style="text-align: center;">2. 国道127B号線の連結性</p>  <p style="text-align: center;">国道127B号線</p>	<p style="text-align: center;">3. ドゥブリ側の連結性(道路の状態)</p>  <p> 既存道路は幅が狭く人家が密集している DPR提案ルート JICA調査団提案ルート </p>
<p>東西回廊に接続するスリランプールからドゥブリへ至る国道127B号線の現状は、道路幅が狭く(1車線、5m~7m)で舗装の状態は極めて悪い。特にドゥブリ側区間は未舗装であり車交通には全く適応できない。</p> 	<p>国道31号線は2車線道路として整備されており、舗装状況も良好である。しかし、国道31号線からドゥブリ橋への取り付け道路は、幅も狭く(1車線、4m~5m)人家が張り付いているために、橋梁取り付け位置としては不適切である。取り付けは国道31号線とすべきである(赤色破線)。</p>  <p> プロジェクトの取り付けは国道31号線まで延伸する必要がある 橋梁取り付け位置 ドゥブリ </p>

国道31号線への取り付けは、道路に並行して鉄道があるために、道路を北側にシフトして鉄道上部を橋梁で横断して取り付ける。



4. プルバリ側の連結性



プルバリからツラへ至るルートは東側及び西側の2本あるが、東側は道路幅が狭く(1車線、4m~5m)舗装の状態も悪い。西側は道路幅は広いが(2車線、6m~8m)舗装の状態は悪い。

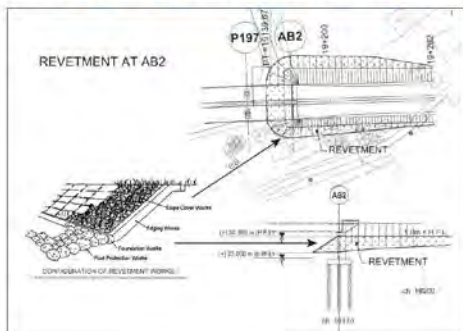


5. 河川流域及び中洲の現状

河川数及び中洲は、流水による浸食で常に形状が変化しており、放牧民は形成された新しい中洲へと移り住んでいる。プルバリ側の橋梁取り付けについては、橋台部分の浸食が懸念されるために浸食防止対策が必要である。



(プルバリ側橋台の浸食対策工案)



(参考:ドゥブリ橋から約64km上流ナラナラン橋)



(参考:ナラナラン橋の浸食防止堤)



6. 橋梁構造の選定について



(DPRとJICA調査団提案との比較表)

	DPR Proposal	JICA Study Team Proposal
(主要Specの違い)		
主構造形式	Extra-dozed	波型鋼板ウェブのExtra-dozed または 箱コンクリート橋合トラスのExtra-dozed
主構造延長	12,625 m	2,250 m × 2 = 4,500 m
中央支間長	125 m	250 m
ピロ形式	1本柱	2本柱
(懸念項目)		
Span Configuration (スパンの設定)	62.5+100@125+62.5	1ユニット 125+2@250+125
Aesthetic Consideration (景観の配慮)	先行事例があるため 印象が薄い	Innovationの観点から有利
Construction Methodology (建設手法)	張り出し工法	張り出し工法
Appreciation of Construction (建設評価)	現流域部を考慮せず	流域部の下部・基礎工の量を半減し建設に有利
Appreciation of Life Cycle Cost (ライフサイクルコスト評価)	大差なし	大差なし

(参考: DPRの建設コスト比較結果)

Bridge Option	Bridge Type	Descriptions	Superstructure Cost in Lacs (₹)	Substructure Cost in Lacs (₹)	Foundation Cost in Lacs (₹)	Wash Wall (₹)	Wash Pile (₹)	Total Cost in Lacs
A	Twin Bridge (all over road Bridge)	125m x 4 span = 500m	22,837	724	3,068	6,306	26,966	29,779
B	Segmental Reduced Cantilever Bridge	125m x 4 span = 500m	7,456	759	983	6,209	-9,238	14,814
C	Extra-dozed Bridge	125m x 4 span = 500m	4,479	759	983	6,306	9,221	13,617
D	Box Girder Arch Bridge	250m x 2 span = 500m	13,245	388	6,080	6,306	-19,281	66,912
E	Cable Trayed Bridge	500m x 1 span = 500m	42,057	-	21,180	4,327	83,247	68,384

Tentative cost of the main navigable section (125 m span, total length 13,000 m)
= Rs 8,221 Lacs × 26
= Rs 2,142 Crores
= 約 332 億円

(参考: インド国内での類似橋梁建設先行事例)

GANGES' LONGEST JOURNEY



● インド・ガンガー河では、世界最長のExtra-dozed橋の建設が決定している。
● 橋梁全長: 22.76 km
(出典: Bridge design & Engineering 2016 3rd)

● 同じブラマプトラ川上流では、アジアで最長の桁橋の建設が7ヶ月以内に完了する予定。
● 橋梁全長: 9.15 km
(出典: The Times of India, 26th September 2016)

Asia's longest bridge over Brahmaputra in 7 months



7. 環境社会配慮 (被影響世帯(PAH)の確認)

ドゥブリ橋、ブラマプトラ川の中州、ブルバリ川のPAHを視察(白色破線)。特に中州は、乾季と雨季(浸食)で土地の形状が大きく変化するため、住民の移動および土地利用状況を確認し、PAHを特定する必要がある。IPP対象となるガロ族地域は干渉しないため、再委託はIPPを除いて契約完了。



● 建設予定地周辺に**自然保護区、保護林等は存在しない**。
● 対象地の自然環境は主に農地や住宅地等であり、**原生な自然環境は存在しない**。
● しかしながら、ブラマプトラ川に**絶滅危惧種であるガンジスカワイルカの存在が確認**された。また、聴き取り調査によればガンジススッポンも存在する可能性がある。
● その他の希少種の存在の有無についても、再委託調査により確認する予定である。


(土地取得・住民移転計画作成のプロセス確認)

JICAガイドラインとのギャップ

- LARR2013: 対象地の法的権利(リース契約含む)を有する者のみ補償対象。
- JICAガイドライン: 対象地の法的権利がない占有者・利用者も補償対象。
- 中州におけるPAHの捉え方が異なる可能性あり。本調査で要確認。

土地取得計画の進捗

- AECOMが土地台帳上にアライメント・ROW図を作成済(下図)。現在、土地取得面積、PAH数を調査中(10月初旬に完成予定)。
- 各デストリクトの土地取得担当(DC)が現場を確認し、面積・PAH数を確認(10月末に完了予定)。
- 本調査では、インド側資料をベースに上記のギャップを踏まえRAP作成予定。



出典: AECOM作成「土地取得計画ROW図」(抜粋: ドゥブリ橋起点から1kmまでの図)

(自然環境の調査進捗状況)



● 建設予定地周辺に**自然保護区、保護林等は存在しない**。
● 対象地の自然環境は主に農地や住宅地等であり、**原生な自然環境は存在しない**。
● しかしながら、ブラマプトラ川に**絶滅危惧種であるガンジスカワイルカの存在が確認**された。また、聴き取り調査によればガンジススッポンも存在する可能性がある。
● その他の希少種の存在の有無についても、再委託調査により確認する予定である。

● ガンジスカワイルカ ● ガンジススッポン?

(参考: ガンジスカワイルカについて)

- IUCNレッドリストでEndangeredのカテゴリに分類、CITES付属書 I に記載されている。インド野生生物法(1972年)でも保護種(Schedule I)に指定されている。さらに、インドのNational Aquatic Animalである。
- 生息域はインド、バングラデシュ、ネパール、ブータンにまたがり、ガンジス川、ブラマプトラ川、及びその支流(Meghna川、Karnashukli川、Sangu川等)に生息するのみである。
- 全世界での生息数は2012年時点で1200個体程度と推定されている。1990年代には4000〜5000個体、1990年代には2000個体程度と推定されており、減少が著しい。
- 個体数減少の主な原因は、密漁、表層、過剰漁獲による個体の減少、水質汚染、ダム建設等による生息地の分断、土砂流入・採取等による河の地形改変等が挙げられる。
- 本事業のガンジスカワイルカに対する影響(特に工事中の水質汚染、地形の改変、工事中・運用中の騒音・振動等)を慎重に検討する必要がある。

<参考>
2016年2月にADBがBihar New Ganga Bridge ProjectのEIAを実施。このプロジェクトも同じガンジスカワイルカの生息域を対象としている。
(<https://www.adb.org/projects/documents/ind-bihar-new-ganga-bridge-project-feb-2016-eia>)



インド国北東州道路網連結性改善事業(その2)準備調査 変更作業工程表

Year	2016												2017					
	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6		
西道40号線																		
現地調査																		
地形・地質調査																		
道路断面の確定																		
概略設計																		
EIA/RAP/PPP調査																		
報告書等																		
ドゥブリ橋																		
現地調査																		
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道路断面の確定																		
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EIA/RAP/PPP調査																		
報告書等																		

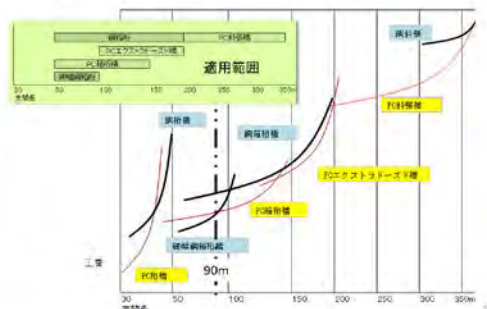
● 1ヶ月以内 ● 1ヶ月以上 ● 2ヶ月以上 ● 3ヶ月以上 ● 4ヶ月以上 ● 5ヶ月以上 ● 6ヶ月以上 ● 7ヶ月以上 ● 8ヶ月以上 ● 9ヶ月以上 ● 10ヶ月以上 ● 11ヶ月以上 ● 12ヶ月以上 ● 1年以上 ● 2年以上 ● 3年以上 ● 4年以上 ● 5年以上 ● 6年以上 ● 7年以上 ● 8年以上 ● 9年以上 ● 10年以上 ● 11年以上 ● 12年以上 ● 13年以上 ● 14年以上 ● 15年以上 ● 16年以上 ● 17年以上 ● 18年以上 ● 19年以上 ● 20年以上

2. 橋梁構造の検討に関する協議
(2016年11月10日 於 国土交通省)

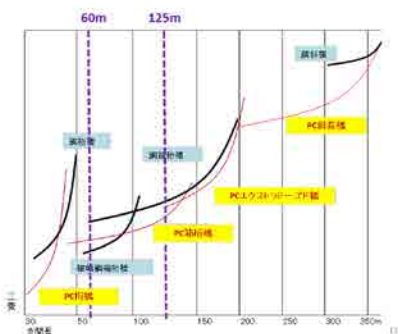
 <p>インド国 北東州道路網連結性改善事業(その2)準備調査</p> <p>ドゥブリ橋橋梁計画について 2016年11月10日</p> <p>JICA調査団 (株式会社パデコ) (大日本コンサルタント株式会社)</p>	<p>ドゥブリ橋位置</p> 																								
<p>1. 航路区間の上部工</p> <p>(1) スパン長と河積阻害率</p> <ul style="list-style-type: none"> ◆航路空間: 100m(H) × 10m(v) ◆不安定な河道の実情を考慮 <ul style="list-style-type: none"> ◆浸食されやすい土質、変動する水量・水位・流向、将来の開発の影響等 ◆「解説・河川管理施設等構造令 第62条橋脚」に準拠 <ul style="list-style-type: none"> 従来3%を努力目標としていたが、(略)原則として5%を目安とする。ただし、(略)高速自動車国道橋は7%以内を目安とする。 …橋の構造上式(v)を得ず(略)超える場合でも、一般の橋梁は6%にとどめるよう努力すべきである。ただし、(略)高速自動車国道橋は8%以内を目安とする。 	<ul style="list-style-type: none"> 河積阻害率=Σ橋脚厚さの合計/河川幅 × 100% 本件の川幅は非常に大きく、水路の位置が常に変動するので、以下で計算する。 <u>河積阻害率=ひとつの橋脚厚さ/スパン長 × 100%</u> 橋脚厚さは、インドの概略設計による(12m) <table border="1"> <thead> <tr> <th>スパン長(m)</th> <th>橋脚幅(m)</th> <th>河積阻害率(%)</th> </tr> </thead> <tbody> <tr> <td>125</td> <td>12</td> <td>9.6</td> </tr> <tr> <td>150</td> <td>12</td> <td>8.0</td> </tr> <tr> <td>175</td> <td>12</td> <td>6.9</td> </tr> <tr> <td>180</td> <td>12</td> <td>6.7</td> </tr> <tr> <td>200</td> <td>12</td> <td>6.0</td> </tr> </tbody> </table> <ul style="list-style-type: none"> 航路区間長に合わせるため、スパン長は180mとする。 	スパン長(m)	橋脚幅(m)	河積阻害率(%)	125	12	9.6	150	12	8.0	175	12	6.9	180	12	6.7	200	12	6.0						
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- 河積阻害率=Σ橋脚厚さの合計/河川幅×100%
 - 本件の川幅は非常に大きく、水路の位置が変動するので、航路区間と同じ計算による。
河積阻害率=ひとつの橋脚厚さ/スパン長×100%
 - 橋脚厚さは、インドの概略設計による(2×3m)
- | スパン長(m) | 橋脚幅(m) | 河積阻害率(%) |
|---------|--------|----------|
| 60 | 6 | 10.0 |
| 70 | 6 | 8.6 |
| 80 | 6 | 7.5 |
| 90 | 6 | 6.7 |
| 100 | 6 | 6.0 |
- スパン長90mを採用する。

(2) 橋梁形式の比較



(2) 橋梁形式の比較



(2) 橋梁形式の比較

上部工形式	細幅鋼箱桁	PC箱桁	PC複合トラス桁
イメージ図			
適用スパン長	60～90m	30～60m	50～110m
国内/海外事例	多い/少ない	多い/多い	少ない/少ない
提案スパン長	90m	60m	90m
施工方法	押し出し架設	スパン・バイ・スパン	張り出し架設
利点	軽量化、工期短縮でき、実績がある。橋脚が減らせる。	インド建設会社が施工可能	軽量化、施工省力化に利点がある。
欠点		適用スパン範囲が狭い。死荷重が重い。	高い設計・施工技術

上部工形式	細幅鋼箱桁	PC箱桁	PC複合トラス桁
橋脚数	65	97	65
デザインの印象	外観は単調	外観は単調	外観はトラスであり印象は薄い。トラスの塗色で印象が変わる。
工費差の理由	支間長60～90mでは最も安価。下部工費が減少。	支間長60mでは最も安価。	PC箱桁と同程度。
工費比率	1.24 上部工:0.98 基礎工:0.26	1.30 上部工:1.00 基礎工:0.30	1.38 上部工:1.10 基礎工:0.28
工期	短い	普通	短い
日本企業の関心	合成床版との組み合わせであれば、製作会社が参加可能。	参加の見込みは薄い(競争力がない)	参加の見込みは薄い。

3. 結論

(1) 現行案(インド案)と本提案の比較

	現行案	本提案
航路区間		
主構造形式	PCエクストラードード橋	PC複合トラス桁 エクストラードード橋
支間割	62.5+100@125+2.5	21@(120+180+180+120)
橋梁延長	12,625m	12,600m
アプローチ区間		
主構造形式	PC箱桁橋	細幅鋼箱桁橋
支間割	59@60 36@60+35	40@90 24@90
橋梁延長	3,540m 2,195m (合計 5,735m)	3,600m 2,160m (合計 5,760m)
全橋梁延長	18,360m	18,360m

(2) 日本企業の実績

〈実績〉

- PC複合トラス桁エクストラードード橋
 - 三井住友建設、川田建設(不動大橋)
 - PC複合トラス+PC斜張橋を同等にみなす
- PC複合トラス桁
 - 大林組
 - 鹿島建設
 - オリエンタル白石、富士ビー・エス
- 細幅鋼箱桁
 - IHIインフラシステム
 - JFE

(3) 選定橋梁形式

航路区間:PC複合トラス桁エクストラードード橋



3. 橋梁構造の検討に関する協議
(2016年11月21日 於 国土交通省)



インド国
北東州道路網連結性改善事業(その2)準備調査

ドゥブリ橋橋梁計画について(改訂)
2016年11月21日

JICA調査団
(株式会社パデコ)
(大日本コンサルタント株式会社)

変更

- 河積阻害率=Σ橋脚厚さの合計/河川幅×100%
- 本件の川幅は非常に大きく、水路の位置が常に変動するので、以下で計算する。
河積阻害率=ひとつの橋脚厚さ/スパン長×100%
- 橋脚厚さは、インドの概略設計による(12m)

上部工形式	スパン長(m)	橋脚幅(m)	河積阻害率(%)
エクストラードズド橋	125	8.5(推定)	6.8
	125	12	9.6
	150	12	8.0
	175	12	6.9
	180	12	6.7
200	12	6.0	

- 細幅箱桁の場合は120m、それ以外は180mとする。

変更

(2) 橋梁形式の比較



変更

(3) エクストラードズド橋の比較

上部工形式	PC箱桁 エクストラードズド橋	PC複合トラス桁 エクストラードズド橋
イメージ図		
適用スパン長	100~200m	150~200m
国内/海外事例	多い/多い	希少/希少
提案スパン長	125m	180m
施工方法	張り出し架設	張り出し架設
利点	インド建設会社が施工可能	軽量化、工期短縮、工費に利点。橋脚が減らせる。インド初の形式になる。
欠点	隣接州に先行事例	高い設計・施工技術

変更

上部工形式	PC箱桁 エクストラードズド橋	PC複合トラス桁 エクストラードズド橋
橋脚数	100	83
デザインの印象	印象的である。塔が中央分離帯にある。	印象的で、外観は斬新である。トラスの塗色で印象が変わる。
工費差の理由		2本塔による桁幅縮小と桁の軽量化でケーブルが減少、および橋脚数の減少。
工費比率	1.25 上部工:1.00 基礎工:0.25	1.27 上部工:1.05 基礎工:0.22
工期	普通	少し短い
日本企業の関心	参加の見込みは薄い(競争力が低い)	建設会社が参加可能

追加

(4) 細幅鋼箱桁の比較

上部工形式	PC箱桁 エクストラードズド橋	細幅鋼箱桁橋 (改良型)
イメージ図		
適用スパン長	100~200m	60~100m(125m)
国内/海外事例	多い/多い	希少/希少
提案スパン長	125m	125m
施工方法	張り出し架設	押し出し架設
利点	インド建設会社が施工可能	軽量化、工期短縮でき、橋脚が減らせる。日本の鋼橋技術(軽量コンクリート、BHS鋼材)が必要である。
欠点	隣接州に先行事例	高い設計・鋼材品質、施工技術

追加

(5) 合理化トラス橋の比較

上部工形式	PC箱桁 エクストラードズド橋	合理化トラス橋
イメージ図		
適用スパン長	100~200m	150~200m
国内/海外事例	多い/多い	希少/希少
提案スパン長	125m	180m
施工方法	張り出し架設	押し出し架設
利点	インド建設会社が施工可能	在来の技術で対応できる。合成床版を使用する。軽量化、工期短縮でき、橋脚が減らせる。
欠点	隣接州に先行事例	印象が悪る。

追加

上部工形式	PC箱桁 エクストラードスト橋	合理化トラス橋
橋脚数	100	83
デザインの印象	印象的である。 塔が中央分離帯にある。	従来のトラス橋より軽快感はあるが、印象は劣る。
工費差の理由		軽量化による下部工工費の減少。
工費比率	1.25 上部工:1.00 基礎工:0.25	1.25 上部工:1.05 基礎工:0.20
工期	普通	短い
日本企業の関心	参加の見込みは薄い(競争力がない)	鋼橋施工会社が参加可能(要確認)

追加

(6) 橋梁形式の比較

上部工形式	細幅箱桁橋(改良型)	合理化トラス橋
イメージ図		
提案スパン長	125m	180m
利点	軽量化、工期短縮でき、橋脚が減らせる。日本の鋼橋技術(軽量コンクリート、BHS鋼材)が必要である。耐候性鋼材を使用する。	従来の技術で対応できる。合成床版を使用する。軽量化、工期短縮でき、橋脚が減らせる。
欠点	従来の細幅箱桁橋の規模を超える。高い技術力が必要である。水上輸送が必要である。	従来の合理化トラス橋の規模を超える。

追加

3. 橋梁形式の選定

(1) 現行案(インド案)と本提案の比較

	現行案	提案(1)	本提案(2)
航路区間			
主構造形式	PCエクストラードスト橋	細幅箱桁橋(改良型)	合理化トラス橋
支間割	62.5+100@125+62.5	101@125	21@[120+180+180+120]
橋梁延長	12,625m	12,625m	12,600m
アプローチ区間			
主構造形式	PC箱桁橋	細幅箱桁橋	細幅箱桁橋
支間割	59@60 36@60+35	40@90 24@90	40@90 24@90
橋梁延長	3,540m 2,195m (合計 5,735m)	3,600m 2,160m (合計 5,760m)	3,600m 2,160m (合計 5,760m)
全橋梁延長	18,360m	18,360m	18,360m

追加

提案(1)の技術的課題

- 軽量コンクリートを使用した合成床版
- 単位重量 2.3→1.85 t/m³
- 高性能鋼材BHS
- 降伏点強度 450→500 N/mm²
- 現場溶接継手
- 高力ボルト→溶接継手
- 輸送方法

追加

桁断面の試算結果(鋼板厚さ)

材質:SM570

	桁高さ	側径間	中央径間	変異性
2主箱桁	3.6 m	> 100 mm	72 mm	×
	4.0 m	88 mm	59 mm	○
3主箱桁	3.6 m	76 mm	52 mm	○

材質をBHS 500に変更すれば、約10%減少する。
側径間の断面が最大になっている。

追加

4. 対応案

- ◆アプローチに細幅箱桁を適用する。
 - ◆現計画の5,735mに適用する。
 - ◆アプローチを延長して適用する。(4,000m+3,000m=7,000m)
 - ◆N/Aの了解を得る必要がある。
- ◆航路区間に細幅箱桁(改良型)を適用する。
 - ◆全区間12,600mに適用する。
 - ◆中央中洲の約4,000mに適用する。
- ◆航路区間に合理化トラス橋を適用する。
 - ◆全区間12,600mに適用する。
 - ◆中央中洲の約4,000mに適用する。

4. 鋼トラス橋検討結果に関するご報告
(2017年3月7日 於 JICA 本部)



インド国
北東州道路網連結性改善事業(その2)準備調査

ドゥブリ橋橋梁型式調査検討報告
2017年3月

JICA調査団
(株式会社パデコ)
(大日本コンサルタント株式会社)

ドゥブリ橋の位置



ドゥブリ橋の特徴

- ドゥブリ橋は、国道1278号線がブラマプトラ川を横断する区間約20 km
- 国道1278号線は、スリランプール～ノングストイン延長約371km
- ブラマプトラ川を横断する区間がミッシング・リンク
- 現在小型船を使って人と軽量貨物の輸送のみ
- 車道は、約60 km上流のナラナラヤン橋を使い約150 kmの長距離迂回



インド側との協議経緯

年月日	相手	協議内容
2016/9/14-28		第1回現地調査(現地状況) 現地を確認しNHIDCLと意見交換し、情報収集。
2016/9/15	NHIDCL, AECOM	インド側調査状況を確認、JICA調査団の調査計画(河川状況、水運状況、橋梁形式、支間長)を説明。
2016/9/30	AECOM	桁下条件、橋形式の比較と選定、桁内部の維持管理、洗掘、250mスパンの事前検討結果等を入手。
2016/10/3	AECOM	インセプションレポートを入手。
2016/11/11	NHIDCL	DFRを入手。
2016/12/4-10		第2回現地調査(検討状況の説明)
2016/12/7	NHIDCL, AECOM	各種鋼桁桁、複合トラス桁エクストラード・ストローク等のオプションを紹介、NHIDCLは更なる調査を要望。
2017/1/29-2/11	Nusen Logistics, K-LINE, WCC, AFCONS	第3回現地調査(施工計画) 運送状況の確認、運送会社、ゼネコンにヒアリング。
2017/4月(予定)	NHIDCL, AECOM	第3回現地調査の結果を報告。

ドゥブリ橋の構造

キロポスト	延長(m)	区間	インド側作成DFRにおける構造形式
00+000-00+810	810	アプローチ道路(北側)	盛土
00+810-04+850	3,540	高架橋(北側)	60m@PCセグメント箱桁橋、円柱型橋脚、杭基礎
04+850-10+975	12,625	既設鋼桁梁	123m@PCエクストラード・ストローク PC箱桁橋、空型橋脚、単柱基礎
10+975-19+170	2,195	高架橋(南側)	60m@PCセグメント箱桁橋、円柱型橋脚、杭基礎
19+170-19+282	112	アプローチ道路(南側)	盛土
計	19,282		



橋梁型式の選択

河川管理者(内陸水運局: IWAI)からの条件

- 航路部建築限界
垂直高: 高洪水レベルから10 m
水平幅: 橋脚間100 m
- 航路部はドゥブリ側河川湾部からブルバリ側の着岸地点までの約13 km
- 橋脚の設置間隔
航路部: 125 m
高架部: 60 m



出典: FHWA 出典: JICA調査団作成

航路部橋梁型式比較(1)

上層工形式	PC箱桁エクストラード・ストローク橋	鋼橋桁橋	PC複合トラス桁エクストラード・ストローク橋
イメージ図			
適用スパン長	100~200 m	60~100 m	150~200 m
国内/海外事例	多い/多い	希少/希少	希少/希少
標準スパン長	125 m	125 m	180 m
施工方法	張り出し工法	押し出し工法	張り出し工法
橋脚数	100	100	85
デザイン印象	印象的、塔が中央にある	単純	印象的
工費比較(日本価格)	1.25 (上層工:1.00 下層工:0.25)	1.25 (上層工:1.05 下層工:0.20)	1.34 (上層工:1.10 下層工:0.24)
工期	普通	短い	少し短い
利点	インド建設会社が施工可能	工期短縮できる	工期短縮できる
欠点	隣接州に先行事例	特殊な鋼材、技術が必要	高い設計・技術力が必要
日本企業の関心	関心は強い/競争力が弱い	関心は強い	関心はない

航路部橋梁型式比較(2)

上層工形式	PC箱桁エクストラード・ストローク橋	トラス橋
イメージ図		
適用スパン長	100~200 m	60~150 m
国内/海外事例	多い/多い	多い/多い
標準スパン長	125 m	125 m
施工方法	張り出し工法	押し出し工法
橋脚数	100	100
デザイン印象	印象的、塔が中央にある	シンプル
工費比較(日本価格)	1.25 (上層工:1.00 下層工:0.25)	1.35 (上層工:1.15 下層工:0.20)
工期	普通	短い
利点	インド建設会社が施工可能	工期短縮できる
欠点	隣接州に先行事例	土質に同形式事例
日本企業の関心	関心は強い/競争力が弱い	関心は強い

高架橋橋梁型式比較(2016年12月時想定)

上部工形式	PC箱桁橋	細幅鋼箱桁橋	PC複合トラス橋
イメージ図			
適用スパン長	30~60 m	60~90 m	50~110 m
国内/海外事例	多い/多い	多い/少ない	少ない/少ない
標準スパン長	50 m	60 mまたは90 m	50 m
施工方法	スパン・バイ・スパン工法	押し出し工法	張り出し工法
橋脚数	97	97または65	65
デザイン印象	単純	単純	印象的
工費比較	1.30 (上工工:1.00 下工工:0.30)	1.24 (上工工:0.98 下工工:0.26)	1.38 (上工工:1.10 下工工:0.28)
工期	普通	短い	短い
利点	インド建設会社が施工可能	工期短縮できる	軽量化できる
欠点	死荷重が重い	現地に仮工場が必要	高い設計・施工技術が必要
日本企業の関心	少し関心がある	少し関心がある	関心はない

高架橋部への細幅鋼箱桁橋の実現性調査

実現性の調査項目

- A) 鋼材輸送方法
(在印日系運輸企業及びインド橋梁建設企業へのヒアリングによる)
- B) インドアッサム州における鋼橋とPC橋の工事費比較
- C) 同工期の比較

検討対象区間(下図黄色部分)

区間	延長(m)	上部工形式	支間割
高架橋部(ドゥブリ側)	3,540	PC箱桁	細幅鋼箱桁
航路部	12,625	エクストラード橋	62.5m+100@125+62.5
高架橋部(プルバリ側)	2,195	PC箱桁	細幅鋼箱桁
高架橋部合計	5,735		36@60m

A) 鋼材の輸送実用調査結果

輸送方法	トレー輸送	台船輸送	鉄道輸送
実現性	可能	可能	可能
1回当たりの輸送量	20トン/台程度	300トン	200トン程度か
寸法の制限	10m(長)×2.5m(高)		12m(長)×2.9m(幅)
季節的制限	通年可能	9~12月のみ可能	通年可能
費用	高い	高い	安い
評価	× 必要な台数の確保が 懸念材料。	× 大型ブロックの輸送 には使用できる。	○ コルカタからシンプリ まで輸送可能。

インドでの一般的な鋼橋建設方法

- 現地に仮製作工場を建設(鋼重が20,000トン以上に限る)
- 鋼板を仮工場に輸送して製作・塗装(加工したものは輸送に課税される)
- 架設現場に輸送
- 架設
- 仮工場を撤去

B) 高架橋部の工費の比較(インド価格)

内訳	PC箱桁(百万円)	細幅鋼箱桁(百万円)	比率
上部工	15,137	18,646	1.232
下部工	6,055	5,449	0.900
合計	21,192	24,095	1.137

(注)上記は輸送費を除いた比較である。なお、輸送費は仮設の仮製作工場に付随する費用。

PC箱桁橋の床版面積当たり (円/m²)

内訳	インド価格(円)	日本実績(円)	比率
上部工	114,754	150,000-300,000	1.307-2.614
下部工	45,902	200,000	4.357
合計	160,656	350,000-500,000	2.179-3.112

細幅鋼箱桁橋の床版面積当たり (円/m²)

内訳	インド価格(円)	日本実績(円)	比率
上部工	141,360	330,000	2.334
下部工	41,310	180,000	4.357
合計	182,670	510,000	2.792

C) 高架部PC箱桁橋と細幅鋼箱桁橋との工期比較

(高架部PC箱桁橋+航路部エクストラード橋作業箇所30ユニット)

作業箇所	作業内容	作業期間	作業開始	作業終了
1	PC箱桁橋	3年4か月		
2	細幅鋼箱桁橋	1年3か月		

(高架部細幅鋼箱桁橋+航路部エクストラード橋作業箇所30ユニット)

作業箇所	作業内容	作業期間	作業開始	作業終了
1	細幅鋼箱桁橋	1年3か月		
2	PC箱桁橋	3年4か月		

工期に関する考察

- 高架橋部の工期を比較
PC箱桁橋 : 3年4か月
細幅鋼箱桁橋 : 1年3か月
- 全体工程のクリティカルパスは航路部エクストラード橋にあるために、高架部の工期短縮は効果がない。

本邦企業の関心分野

企業名	参入可能な分野	条件その他
JFEエンジニアリング	高架橋部の細幅鋼箱桁(合成床版) 航路部エクストラード橋	インドのゼネコンに協力
IHIインフラシステム	高架橋部の細幅鋼箱桁(合成床版)	インドのゼネコンに協力
新日鉄住金	高架橋部の細幅鋼箱桁(新設性鋼材)	
川田工業	高架橋部の細幅鋼箱桁(合成床版)	JFE、IHIインフラシステムに協力。
(以下参考)		
三井住友建設	高架橋部のPC箱桁橋	インドのゼネコンに協力、治安の問題から消極的。

上記企業の一般的な態度は、

- ・現時点の関心は、それほど強くない。
- ・現地へのアクセス、治安の問題、現在繁忙な市場状況等を懸念。

ドゥブリ橋橋梁型式調査検討結論

結論

航路部エクストラード橋及び高架部PC箱桁橋の橋梁型式選定は妥当

(理由1)

- 航路部(12,625 m)のスパン長125 mについて、エクストラード橋が最安値であり、インドにおける施工実績がある。

(理由2)

- 高架部(ドゥブリ側 3,540 m)及び高架部(プルバリ側 2,195 m)について、細幅鋼箱桁橋を採用すると、PC箱桁橋に対して工期を3年4か月から1年3か月に短縮可能である。しかし、工期のクリティカルパスは航路部エクストラード橋にあり、高架部の工期短縮が全体工期に及ぼす影響は小さい。

(理由3)


- 鋼材の輸送費を含めた細幅鋼箱桁橋のインド工費は、PC箱桁橋より2割高い。

上記橋梁形式で参入の可能性が有る企業は、三井住友建設のみであるが、治安への懸念から参入意欲は高くはない。

その他参考情報

- 現在、DPRの工期は6年になっているが、そのためには航路部エクストラード橋の施工に作業箇所30ユニットの同時施工が必要である。現実的には、15ユニットの同時施工が行われると考えられるが、尚約10年の工期が必要である。
- ドゥブリ側と比較してプルバリ側は、資材の輸送・作業ヤードの設置に困難があるため、ドゥブリ側に重点を置いた施工計画の検討が必要である。
- 短い工期(6年)を重要視する場合には、全延長に鋼トラス橋(片押し工法)を選択することも可能である。特にプルバリ側へ材料輸送を考慮した施工に有利である。しかし、工費は2割程度高くなることからインド側は難色を示すと考えられる。
- ドゥブリ橋を鉄道併設橋にする案が報道されているが、道路交通者及びNHDCは鉄道省との協議において道路併設橋にするとの確認を取っている。また、在インド日本大使館の情報では、一人の国会議員が主張しているだけで、政治的背景は無いとのことである。仮に鉄道併設橋にする場合は、工費は3割程度高くなる。
- なお、航路部PC複合トラス桁エクストラード橋(スパン180m)も比較検討したが、工費工期とも大きな優位性がなかった。

5. 橋梁型式に関する四者(NHIDCL, AECOM, JICA, JST)協議
(2017年6月8日 於 NHIDCL)




Preparatory Study for North East Road Network Connectivity Improvement Project (Phase 2)

Summary of Study on Structural Type of Dhubri Bridge
June 8, 2017


JICA Study Team
PADECO Co., Ltd.
Nippon Engineering Consultants Co., Ltd.

1. Project Location



2. Features of Dhubri Bridge

- Missing link of NH-127B to cross Brahmaputra River is about 20 km length
- NH-127B connects Srirampur and Nongstoin (about 371 km)
- Presently, small boats are used to transport people and light goods
- Vehicles must detour 150 km using Nara Narayan Bridge (about 60 km upstream)




3. Record of Meetings

Date	Institution	Agenda
2016/9/14-28		First site visit (survey of site conditions). Information collection from NHIDCL and discussion
2016/9/15	NHIDCL, AECOM	Confirmation of progress of study by Indian side, explanation of study plan of JICA team (river condition, waterway transport, bridge type and span arrangement)
2016/9/30	AECOM	Collection of study results (clearance requirement, comparison of bridge types, maintenance of inside of girder, scour, span of 250 m)
2016/10/3	AECOM	Collection of inception report
2016/11/11	NHIDCL	Collection of DFR
2016/12/4-10		Second site visit (explanation of interim results)
2016/12/7	NHIDCL, AECOM	Introduction of alternative structural types (steel narrow box girder, extradosed with composite truss girder, etc.) NHIDCL requested further study.
2017/1/29-2/11	Yusen Logistics, K-LINE, HCC, AFCONS	Third site visit (construction plan), condition survey of road, hearing from logistics companies and general contractors
2017/4/3, 6	NHIDCL, AECOM	Fourth site visit (explanation of review results of DPR)

4. Structures of Dhubri Bridge

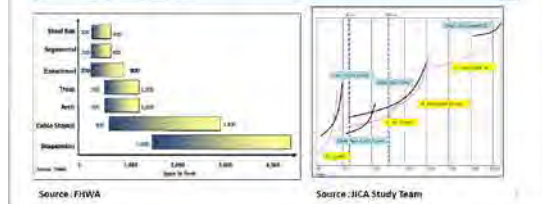
Section	Length (m)	Section	Structural Type by IACOM DPR
00+000-00+810	810	Approach road (North)	Embankment
00+810-04+250	3,540	Viaduct (North)	PC box girder (60m span), column pier, pile foundation
04+250-16+975	12,625	Navigation section	Extradosed or box girder (125m span), wall type pier, wall foundation
16+975-19+170	2,195	Viaduct (South)	PC box girder (60m span), column pier, pile foundation
19+170-19+282	112	Approach road (South)	Embankment
Total	19,282		



5. Selection of Bridge Type




Requirements by River Management Authority (IWA)

- Clearance space for navigation section
Height: 10 m above HFL
Width: 100 m between piers
- Navigation section is about 13 km from Dhubri to Phulbari
- Interval of piers
Navigation section: 125 m
Viaduct: 60 m



Source: IWA / Source: JICA Study Team

6. Comparison of Viaduct Type

Type	PC Box Girder	Steel Narrow Box Girder	PC Composite Truss
Photo			
Applicable span	30~60 m	60~90 m	90~110 m
Japan/Foreign	Many/Many	Many/Few	Few/Few
Proposed Span	60 m	60 m or 90 m	90 m
Erection Method	Span-by-Span	Launching	Launching
No. of Piers	97	97 or 65	65
Aesthetic Impression	Simple	Simple	Impressive
Construction Cost	1.30 (Super: 1.00 Sub: 0.30)	1.24 (Super: 0.98 Sub: 0.26)	1.38 (Super: 1.10 Sub: 0.28)
Construction Period	Standard	Shorter	Shorter
Advantage	Common construction	Shorter construction	Lighter structure
Disadvantage	Heavy weight	Site shop fabrication	High technology

Comparison of PC Box Girder with Steel Narrow Box Girder

Issues

- Transportation of Steel (Hearing from Japanese logistics companies and Indian contractors)
- Cost comparison of Steel and PC Bridges in Assam
- Comparison of Construction Period

Target Section (Yellow)

Section	Length(m)	Type	Span Arrangement
Viaduct (Dhubri side)	3,540	PC Box Girder	Steel Narrow Box Girder 59@60m
Navigation Section	12,625	Extradosed Bridge	62.5m+100@125+62.5
Viaduct (Phulbari side)	2,195	PC Box Girder	Steel Narrow Box Girder 35@60m
Total of Viaduct	5,735		

A) Transportation of Steel

Mode	Trailer	Barge	Railway
Availability	Possible	Possible	Possible
Capacity	20 ton/vehicle	800 ton/ barge	200 ton or more
Size Restriction	10m(L) × 2.5m(H)		12m(L) × 2.4m(W)
Seasonal Restriction	No	Sep.~Dec. only	No
Cost	Expensive	Expensive	Economical
Evaluation	△ Many trailers are necessary	△ Appropriate for huge size and heavy good	○ Possible from Kolkata to Shilliguri

Common Construction Method of Steel Bridge in India

- Construct site-shop (min. steel volume is 20,000 ton)
- Transport steel plates to site-shop and fabricate/paint (taxation to fabrication)
- Transport to erection site
- Erect
- Demolish site-shop

B) Cost of Viaduct (India Cost)

	PC Box Girder (Crore INR)	Steel Narrow Box G.(Crore INR)	Ratio
Superstructure	796.7	981.4	1.232
Substructure	318.7	286.8	0.900
Total	1,115.4	12,682	1.137

Unit price of PC Box Girder (UP/m²)

	India (INR)	Japan(JPY)	Ratio
Superstructure	80,997	79,800	1.027-1.034
Substructure	24,739	105,000	4.337
Total	84,556	184,000-243,000	2.179-4.112

Unit price of Steel Narrow Box Girder (UP/m²)

	India (INR)	Japan(JPY)	Ratio
Superstructure	74,407	173,884	2.334
Substructure	21,742	94,717	4.337
Total	96,149	768,421	7.992

C) Comparison of Construction Period

PC Box Girder (year)	Steel Narrow Box G.(Crore INR)	Ratio
3.3	1.25	0.388

7. Comparison of Bridge Type

Comparison of Extradosed with Steel Truss

Issues

- Outline of Steel Truss Road Bridge (Result of Preliminary design)
- Cost comparison of Steel Truss and Extradosed Bridge
- Comparison of Construction Period

Target Section (Yellow)

Section	Length(m)	Type	Span Arrangement
Viaduct (Dhubri side)	3,540	PC Box Girder	59@60m
Navigation Section	12,625	Extradosed Bridge / Steel Truss	62.5m+100@125+62.5 or 101@125
Viaduct (Fhulbari side)	2,195	PC Box Girder	36@60m

A) Outline of Steel Truss Road Bridge

Steel Weight (per 125m)

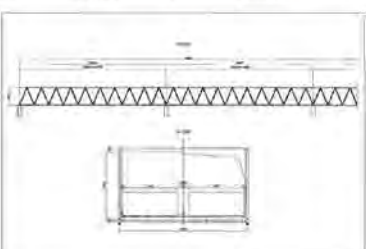
Item	Designed Weight
Main Structure	
Upper Chord	179.53 ton
Lower Chord	165.66
Diagonal	330.48
Lateral Bracing	73.69
Stringer	290.14
Portal	14.77
Others	Expansion Joint, Guard Rail, Drainage
	13.52
Total	1,067.79 ton

Common Construction Method of Steel Bridge in India


- Construct site-shop (min. steel volume is 20,000 ton)
- Transport steel plates to site-shop and fabricate/paint (taxation to fabrication)
- Transport to erection site
- Erect
- Demolish site-shop

B) Cost of Navigation Section (India Cost)

	Extradosed (Crore INR)	Steel Truss (Crore INR)	Ratio
Superstructure	1,689.7	2,078.6	1.230
Substructure	887.2	727.5	0.820
Total	2,576.9	2,806.0	1.089



C) Comparison of Construction Period



Section	Superstructure	Parallel Construction	Period
Navigation	Extradosed Bridge	15 sites*	9.5 years
	Steel Truss	None	6 years

* 15 work sites are assumed maximum from Japanese experience

8. Recommendations

Steel Truss Bridge should be adopted for the entire section

Reason 1: The critical path of the construction period is the extradosed section.
Reason 2: Although the extradosed is theoretically the most economical, the severe natural condition of the project site makes the construction very difficult with high risks of delays of the project completion.

Supporting Facts

- Applying the steel narrow box girder to the viaducts will shorten the work time, but it does not contribute to shortening the overall construction period, because the critical path is that of the extradosed.
- An estimated construction period with the extradosed under normal condition (15 work sites) is about 9.5 years, which is much longer than the proposed 6 years.
- It may be possible to increase the number of the work sites more than 15. However, only one contractor (I&T) has the experience of constructing large-scale extradosed bridges over river in India. Mobilizing many contractors with no experience of extradosed in India will increase the risk of site problems such as delay of work, conflicts with neighboring sites, countermeasures against emergency, etc.
- The original cost comparison between extradosed and truss uses the cost of a rail cum road bridge for truss. ICA Study Team conducted a preliminary design of a continuous steel truss road bridge, which is much economical than the rail cum road bridge.
- Replacement of extradosed with steel truss will increase the cost by about 8%. Applying the entire section will increase it by about 15%. However, applying steel truss for the entire section will enable the use of launching erection method only from the Dhubri side. The launching method reduces the work over river drastically.
- The Japanese design of the steel truss road bridge is very slender and beautiful to be a symbol of the region. Introduction of such design technology will contribute to the development of Indian road technologies.

9. Response to JST's Recommendations

SI	Item	NO	ACCOM Observations (01/05/2017)	ICA Study Team Observations
1	P12 of P12 PDF	1	Steel quantity for deck reinforcement has not been included in the calculations.	The steel weight in the table on P12 does not include the deck reinforcement. The cost on P11 includes the deck.
		2	The Grade of steel is not mentioned. It is important from the design as well as availability and procurement point of view with respect to Indian market.	IMRSL, mild steel is used for the preliminary design. If the Indian steel market allows, the usage of a higher grade steel will make it more economical. The Indian steel industry is growing rapidly and the Project will sustain its 'critical' growth.
		3	ACCOM has performed parallel steel design with Grade (e-48) steel as shown below and approximate coverage for 161 spans is 232,000 tons excluding steel for deck in comparison to 1,07,846.78 tons (1,067.79 x 101) of steel mentioned by ICA. This is requested by ICA to review.	The discrepancies between JST and ACCOM are assumed that (1) the JST design is a continuous bridge, while the ACCOM one is a simple (about 25% economical in steel quantity); (2) the JST design has 2 sets of vertical posts, while the ACCOM one has 3 sets; (3) the JST uses the launching erection method, while the ACCOM one uses the conventional erection method.
		4	ACCOM proposed a hybrid concept with a balanced combination of steel and concrete. Steel minimum for a single 125m Extradosed span is recommended below.	The total steel weight on P12 is just an average among many existing bridges in Japan. No objection.

Sl.	Item	NO	AECOM Observations 05/05/2017	JICA Study Team Observations
2	Point 5, P15 of JST PPT	i	Launching scheme details for truss has not been mentioned.	The launching erection method for a truss bridge is commonly used, and in Anam, the Bagber Truss Bridge was successfully erected by the method.
		ii	Elaborate erection scheme is required considering the number of continuity spans as this will again involve the provision of proportional expansion joints and special arrangements. Further, loading at midpoints and rolling over bottom chord shall result in 8% - 10% more steel requirement.	The design of JST is a continuous truss bridge, which does not require an arrangement of special connection members, and which uses much smaller number of expansion joints. The design employs 4 continuous spanning (4@125+500m) as 1 unit to be launched.
		iii	From our past project experience the 4.84 km steel bridge at Pitra over river Ganga required 6 years for the superstructure completion only by cantilever method of construction. Thus fabrication of such huge quantity of steel need to be relooked.	Generally the cantilever erection method, which was used for the Pitra Ganga bridge, needs more working days than the launching erection method. With regard to the actual construction period of extradosed bridges are 3 years for the Second Veknanda Bridge (880m) and 2.5 years for the New Kormda River Bridge (1,800m). Challenges in India are the adoption of efficient construction methods.
		iv	Thus, it is requested to review the quantity from construction perspective.	As stated above, JST is quite confident of the preliminary design results in quantity. It has been double checked with other existing road truss bridges in Japan.

Sl.	Item	NO	AECOM 05/05/2017	JICA Study Team 10/05/2017
3	P14 of JST PPT	i	The construction period for foundation and substructure should be identical for both type of construction. However, it is mentioned 6 years (considering 15 work fronts) for the construction of extradosed bridge and 4.5 years for truss bridge option (considering 20 work fronts).	The construction schedule of the substructure is formulated considering the timing of that of superstructure and the entire schedule of the construction. It shall be changed accordingly. When the entire construction period is 6 years, the work schedule for the substructure fits well within it with 20 work fronts.
		ii	Detail program is requested including deck casting schedule which is not presently shown. Please note that the deck casting can only be done after the launching operation is complete.	The critical path of the construction schedule at issue is the required erection period of superstructure. The schedule of the deck construction fits easily inside the entire schedule.
		iii	A Construction Schedule for extradosed bridge (Complete Construction) showing a construction period of 6.5 years is enclosed for review along with indicative layout plan. Please note that the main span has been grouped in 3 packages, each having 3 work fronts with 4 simultaneous construction site.	JST sees no necessity of dividing the Project into several packages. There is no problem with a 1-package contract to arrange 9 work fronts at all. The 1-package contract with 1 experienced prime contractor can ensure smooth communication with a client and clarification of responsibility.

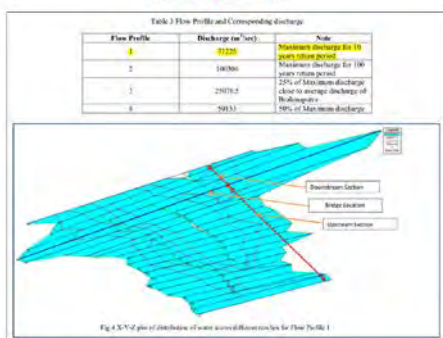
Summary of Discussion

Item	Approved Option	JICA Study Team Option
Bridge Type	PC box girder (60m span, 3,540m) Extradosed PC box girder (125m span, 12,302m) PC box girder (60m span, 2,193m)	Continuous truss bridge (60m span, 4@125m, 3,540m) Continuous truss bridge (60m span, 4@125m, 11,425m) Continuous truss bridge (60m span, 4@125m, 2,193m)
Cost	Most economical	About 1.16 times expensive
Remarks	<ul style="list-style-type: none"> AECOM contends that the steel tonnage of the truss should be double (2,000,000 tons) instead of 1,07,848.73 tons. The tonnage is an average among other road truss bridges in Japan. JICA Study Team can provide a further detailed design if required. 	
Construction Period	66/2017: 04/2025 (7 years and 9 months)	16 years (1997) contract
Remarks	<ul style="list-style-type: none"> AECOM contends that the construction of Ganga Rail cum Road Bridge (11.95km) took 6 years. This bridge used the cantilever erection method, which takes more time than the launching erection method. JICA Study Team is proposing the launching erection method, which completes the erection in about 3 years. The launching method for a truss bridge is safer compared and was successfully used for the Buzbeel Bridge in Siam. 	
Package	3 packages (3 packages for viaducts, 3 packages for main bridges)	1 package
Remarks	<ul style="list-style-type: none"> AECOM plans that 3 packages for the extradosed section, each having 3 work fronts (9 work fronts for extradosed in total). if a study team sees no necessity of dividing the project into packages. A single package can also have 9 work fronts. Dividing packages will require 3 prime contractors, whereas a single package requires only 1 prime contractor. 1 package with 1 prime contractor makes an iron clad communication with it as client. 1 prime contractor with rich experience can manage the overall construction rather than many prime contractors with poor experience. 	

Remaining Issues of JST's Recommendations (P-22)

Item	Contents	AECOM's Observations	Remaining Issues
Background	Although the contractor is the best economic of the work, natural condition of the project site makes the construction very difficult with high risks of delay of the project completion.	Price treatments and bidding plans are prepositions and should be improved to improve the logistics for materials, equipment, laborers, etc.	According to ITR (see table below), if all above all items of the similar will be submitted by a block of 10 year contract , resulting a high risk of danger to the plan.
Supporting Fact 2	An estimate of construction period with the submitted tender (current condition) is about 9.5 years, which is much longer than the proposed 6 years.	Hybrid concept of extradosed, 3 packages with 3 work fronts each (1) simultaneous construction period, and 7 year 9 months construction period are proposed (the last 3 sections have 3 packages, 3 packages in total).	Dividing the Project into packages may reduce different prime contractors, when 4 packages can employ 9 work fronts.
Supporting Fact 3	It may be possible to decrease the number of the work sites from 18 to 15. However, only one contractor (JST) has the experience of constructing large-scale extradosed bridges over river in India. Mobilizing many contractors with no experience of extradosed in India will increase the risk of site problems such as delay of work, conflicts with neighboring sites, coordinated actions against environmental, etc.	Examine issues as above.	<ul style="list-style-type: none"> (i) One prime contractor, 1 prime contractor (can use same approach to communicate with the client). (ii) Employing many experienced contractors as prime contractors. High risks of delay of work, conflicts with neighboring packages, coordinated actions against environmental, etc.

(Reference-1)



(Reference-2)



Summary of Comparison

Item	Approved Option	JICA Study Team Option
Bridge Type	PC box girder (60m span, 3,540m) Extradosed PC box girder (125m span, 12,302m) PC box girder (60m span, 2,193m)	Continuous truss bridge (60m span, 4@125m, 3,540m) Continuous truss bridge (60m span, 4@125m, 11,425m) Continuous truss bridge (60m span, 4@125m, 2,193m)
Erection Method	Span by span erection (ballast) balanced cantilever erection (extradosed)	Launching erection
Remarks	Erection from each pier	Incrementally launch from the Dhuri side toward the entire bridge section
Cost	1.0	1.15
Remarks	The weight of truss designed by AECOM is double of that of JICA Study Team	Based on the Japanese design methodology of steel continuous truss road bridges.
Construction Period	6.5 years (sub- and super structures), 7.5 years (entire work)	4.5 years (superstructures), 6.0 years (entire work)
Remarks	6.5 years using hybrid Extradosed 9 work fronts	Truss fabrication 2.5 years, launched 1 year, 3.5 years in total Incrementally launch from a fabrication yard in Dhuri
Merits	The design is conceived	<ul style="list-style-type: none"> Shorter construction period Reduction of the work over the river for the superstructure Japanese design methodology of steel continuous road bridges is introduced to India
Demerits	<ul style="list-style-type: none"> Longer construction period Delivery of materials, equipment, PC equipment, etc. is made more difficult Higher risk of delay due to more work over the river for superstructure Difficulty of building a construction yard in Dhuri due to long transportation of materials and laborers Higher risk of the site failure due to only 1 Indian contractor with experience of large-scale extradosed bridges 	<ul style="list-style-type: none"> About 15% higher direct cost Redesign of the truss bridge is required (valuation fee, design period)

10. Preliminary Design of Truss by JICA Study Team

(1) Estimated Size of Site Fabrication Shop at Dhuri

Assuming that all steel plates are transported by rail, an assembly yard of 600m length to cover a 4-span truss in parallel to the beginning section of the viaduct is designed. A site fabrication shop and a steel plate stock yard are designed next to the assembly yard as shown in the following Photo.

Facility	Area
(1) Assembly yard	600m (L) × 100m (W)
(2) Site fabrication shop	600m (L) × 100m (W)
(3) Steel plate stock yard	300m (L) × 100m (W)



(2) Impact to Steel Production in India

Production of crude steel by major Indian steel manufacturers is shown in the table.

Steel Manufacturer	Crude Steel Production (mill. ton)
Tata Steel	24.49
JSW Steel	14.91
Steel Authority of India	14.38
Essar Steel	7.45
Vizag Steel	3.82
Total	65.05

Assuming 2% of crude steel production is allocated to structural steel of Dhubri Bridge for 2 years, its impact to the entire production will be less than 10%.

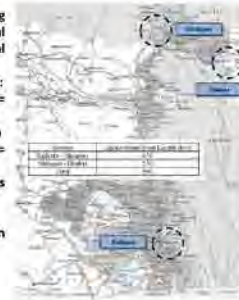
Steel plates for Dhubri Bridge = 250,000 ton
 Yearly ration = $(250,000 \times 0.5) / (65,000,000 \times 0.02) = 0.10$

(3) Transportation of steel plates by rail

Assuming that 15 railroad cars each carrying 25ton of steel for 7 days in a week, the total volume for 2.5 years will be larger than the total volume of Dhubri Bridge.

The total volume transported by rail for 2.5 years:
 $25\text{ton} \times 15 \text{ railroad cars} \times 7 \text{ days} = 2,625\text{ton/week}$
 $2,625\text{tons/week} \times 4 \text{ weeks} = 10,500\text{ton/month}$
 $10,500\text{tons/month} \times 12\text{month} = 126,000\text{ton/year}$
 $126,000 \times 2.5\text{years} = 315,000\text{ton} > 250,000\text{tons}$
 (Total volume of steel plates for Dhubri)

River barges are also available for transportation of steel plates if necessary.



(4) Capacity of Site Fabrication Shop

Considering that the truss members are small in size and there are many members of the same size, the fabrication capacity is assumed 7,000ton/month. The site fabrication shop can fabricate, 7,000ton/month \times 12 month = 84,000ton/year

It is required to increase the capacity with larger working hours by 20%.
 $84,000 \times 2.5\text{years} \times 1.20$ (20% increase of working hours) = 252,000ton

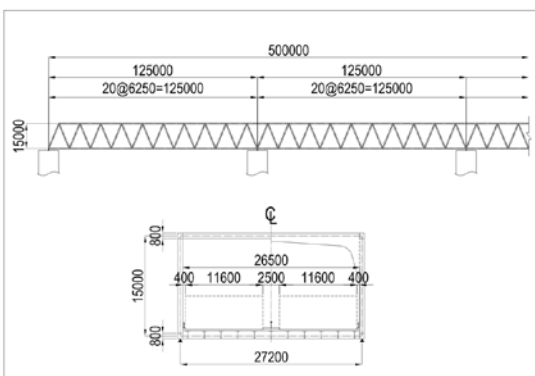
(5) Preliminary Truss Design by JICA Study Team

Preliminary design was made to obtain the general idea of steel volume of truss option based on the Japanese Standards. The steel volume was then double-checked by existing truss bridges in Japan. The Indian Design Standards may possibly increase the steel volume by 30%. The following items are assumed as major reasons of difference in steel volume between AECOM and JICA Study Team.

- a. Single span truss and 4-span continuous truss
- b. Cantilever erection and incremental launching erection method
- c. Difference of live loads
- d. Difference of steel design practice
- e. Grade of steel
- f. Reinforcement bars of RC deck

The above-mentioned reasons may explain the larger steel volume of AECOM except for item-f. If item-a and -b are proved to be correct, there will be 20% reduction of the steel volume. However, a detailed design is required to know the exact steel volume.

Preliminary design by JICA Study Team uses steel grad, SM400 (Tensile Strength=400 N/mm², Yield Strength=245 N/mm²), which may be lower grade than Fe 540. Fe540 is said equivalent to SM520 (Tensile Strength=520 N/mm², Yield Strength=365 N/mm²) of Japanese Standard. Detail design can use SM520 to reduce the weight.



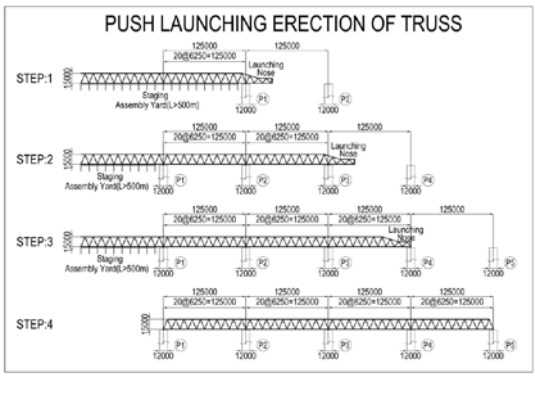
(6) Erection of Truss

A continuous truss does not need any temporary members to connect simple span trusses each other, and has advantage in efficient erection. The launching speed is assumed 0.10m/min.

The daily travel distance is:
 $12\text{hours} \times 60\text{min} / (0.10\text{m/min}) = 72\text{m/day}$
 (If 9 hours is available, $9\text{hours} \times 60\text{min} / (0.10\text{m/min}) = 54\text{m/day}$)

To travel the entire bridge length from Dhubri,
 $18,365\text{m} / 72\text{m} = 255 \text{ days}$
 (If 9 hours is available, $18,365\text{m} / 54\text{m} = 340\text{days}$)



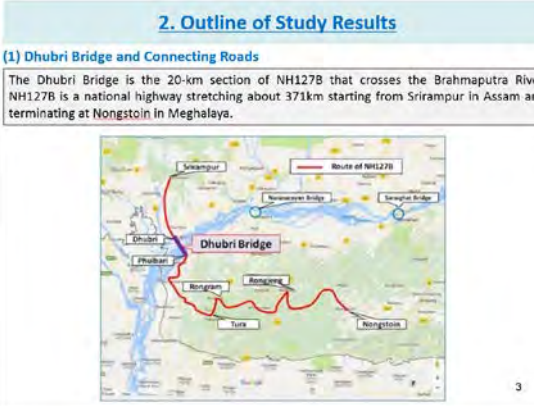
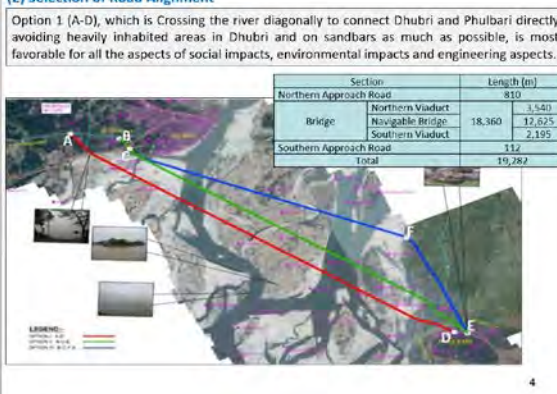
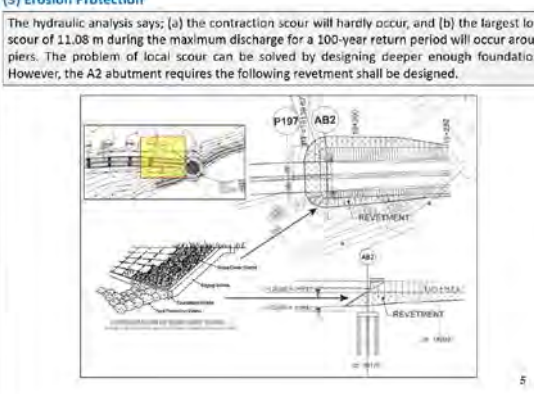
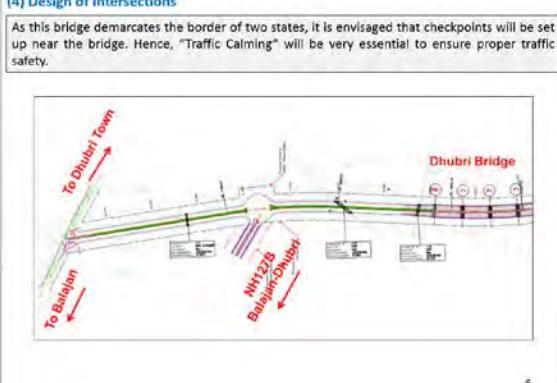

1.5 years will be available for erection of truss by overlapping partially with substructure works because the erection of truss can be started before completion of all the substructures.



(7) Advantages of Truss

The truss option can remove (1) higher risks of delay due to difficulties of transportation of materials for superstructure to 100 piers; (2) higher risks of delay due to relying on the casting yard with the batching plant on the Phulbari side; (3) higher risks of flood disasters due to the usage of sandbars for temporary labor hutments and batching plants; and (4) the longer construction period (7.75 years vs. 6.0 years).

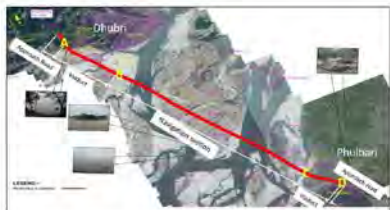
6. DFR 内容の説明
(2017年10月25日 於 NHIDCL)

	<p style="text-align: center;">Outstanding Issues (Page 17)</p> <table border="1"> <thead> <tr> <th>No.</th> <th>Issue</th> <th>Suggested Solution</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Materials Procurement and Delivery</td> <td>Additional cost for materials transportation to Phulbari should be included. The additional cost estimated by the JICA Study Team is 8.9 Crore INR.</td> </tr> <tr> <td>2</td> <td>Construction Schedule</td> <td>An inoperative period of 3 months during rainy season should be applied. Initial site preparation (60 days) should also be included. The additional construction period estimated by the JICA Study Team is 10 months totaling 7 years and 9 months.</td> </tr> <tr> <td>3</td> <td>Temporary Facilities</td> <td>Additional cost for temporary facilities should be included because the transport of precast blocks and other materials involves far larger scale than a standard. The additional cost estimated by the JICA Study Team is 64.26 Crore INR.</td> </tr> <tr> <td>4</td> <td>Workers and Inspectors</td> <td>Additional cost for strengthening the function of construction management should be included. The additional cost estimated by the JICA Study Team is 89.56 Crore INR.</td> </tr> <tr> <td>5</td> <td>Measures Against Flooding</td> <td>The flood alarm monitoring system should be prepared. The system should be equipped with functions of meteorological data collection, data analysis, warning and communication, evacuation manual, evacuation drill, etc.</td> </tr> </tbody> </table>	No.	Issue	Suggested Solution	1	Materials Procurement and Delivery	Additional cost for materials transportation to Phulbari should be included. The additional cost estimated by the JICA Study Team is 8.9 Crore INR.	2	Construction Schedule	An inoperative period of 3 months during rainy season should be applied. Initial site preparation (60 days) should also be included. The additional construction period estimated by the JICA Study Team is 10 months totaling 7 years and 9 months.	3	Temporary Facilities	Additional cost for temporary facilities should be included because the transport of precast blocks and other materials involves far larger scale than a standard. The additional cost estimated by the JICA Study Team is 64.26 Crore INR.	4	Workers and Inspectors	Additional cost for strengthening the function of construction management should be included. The additional cost estimated by the JICA Study Team is 89.56 Crore INR.	5	Measures Against Flooding	The flood alarm monitoring system should be prepared. The system should be equipped with functions of meteorological data collection, data analysis, warning and communication, evacuation manual, evacuation drill, etc.
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<p style="text-align: center;">1. Project Location</p> 	<p style="text-align: center;">2. Outline of Study Results</p> <p>(1) Dhubri Bridge and Connecting Roads</p> <p>The Dhubri Bridge is the 20-km section of NH127B that crosses the Brahmaputra River. NH127B is a national highway stretching about 371km starting from Srirampur in Assam and terminating at Nongstoin in Meghalaya.</p> 																		
<p>(2) Selection of Road Alignment</p> <p>Option 1 (A-D), which is Crossing the river diagonally to connect Dhubri and Phulbari directly avoiding heavily inhabited areas in Dhubri and on sandbars as much as possible, is most favorable for all the aspects of social impacts, environmental impacts and engineering aspects.</p> <table border="1"> <thead> <tr> <th>Section</th> <th>Length (m)</th> </tr> </thead> <tbody> <tr> <td>Northern Approach Road</td> <td>810</td> </tr> <tr> <td>Bridge</td> <td></td> </tr> <tr> <td> Northern Viaduct</td> <td>1,540</td> </tr> <tr> <td> Navigable Bridge</td> <td>12,625</td> </tr> <tr> <td> Southern Viaduct</td> <td>2,195</td> </tr> <tr> <td>Southern Approach Road</td> <td>112</td> </tr> <tr> <td>Total</td> <td>19,282</td> </tr> </tbody> </table> 	Section	Length (m)	Northern Approach Road	810	Bridge		Northern Viaduct	1,540	Navigable Bridge	12,625	Southern Viaduct	2,195	Southern Approach Road	112	Total	19,282	<p>(3) Erosion Protection</p> <p>The hydraulic analysis says; (a) the contraction scour will hardly occur, and (b) the largest local scour of 11.08 m during the maximum discharge for a 100-year return period will occur around piers. The problem of local scour can be solved by designing deeper enough foundations. However, the A2 abutment requires the following revetment shall be designed.</p> 		
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<p>(4) Design of Intersections</p> <p>As this bridge demarcates the border of two states, it is envisaged that checkpoints will be set up near the bridge. Hence, "Traffic Calming" will be very essential to ensure proper traffic safety.</p> 	<p>(5) Length of Bridge Section</p> <p>Considering the instability of the river and channels, constructing a long span bridge of 12.5km for the navigational portion and connecting it with short span viaducts is deemed appropriate. There are no clear natural levees on either side of the shores along the river, and therefore, it is an appropriate judgment to locate the start and end points of the bridge section in the back-swamps behind the present river shores.</p> 																		

(6) Bridge Plan

Since the River is used for water transportation, the Inland Waterways Authority in India requests a clearance of 100m width by 10m height for navigation. To satisfy this requirement, a span of 125m for the navigational portion and 60m for viaduct portions are set.

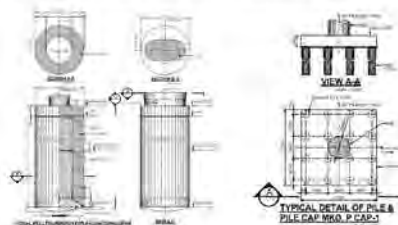
Portion	Superstructure	Span Arrangement
Viaduct (Dhubri)	PC Box Girder	59@60m=3,540m
Navigation	Extradosed PC Girder	62.5+100@125+62.5m=12,625m
Viaduct (Phulbari)	PC Box Girder	36@60=2,195m
Total		18,360m



8

(7) Foundation

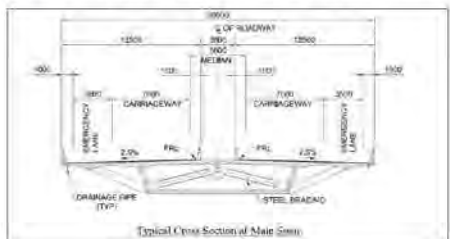
It is reasonable to select open well foundations for substructures since it can cope with thick deposits of erodible soils, requires no special construction machines, a technology already established in India and utilized on the Brahmaputra River, and is regarded as safe from scouring. The viaduct portions run in shallow water or on land in dry seasons. The magnitude of loads from superstructures is lighter than the navigational portion due to shorter spans, and it is reasonable to apply pile foundations which are more economical.



9

(8) Extradosed Bridge

DPR has selected an Extradosed PC Bridge type with deck supported by single-plane cable system in the center of the box girder. The steel frame system housed in the box girder distributes the concentrated force of cables to the section of box girder. If most of the space of the box girder is occupied by the frame, it may restrict maintenance abilities in future.



10

(9) Bridge Construction Plan

- The most important challenge in the construction planning is the selection of the construction method of a series of 100 spans of Extradosed Bridge (foundations, substructures, and superstructures) over the Brahmaputra River.
- It is important to consider economical, technical reliability, and planned period aspects based on the local conditions. Considering the difficulty of the transportation of the materials to Phulbari compared to Dhubri, major site yards should be situated at Dhubri.
- The full width of the girder for Dhubri Bridge is 28m. If the heavy precast segments are carried from the site casting yard to the exact location of erection in the river, a large temporary facility such as a jetty should be used for loading/unloading from barges and as a temporary passage to carry heavy goods.

11

3. Traffic Projections

Phase 1 study has conducted preliminary traffic analysis. DPR consultant has also conducted extensive traffic survey and analysis. In this study, these existing analyses have been reviewed and updated. The DPR consultant's traffic survey and analysis as well as their method complies with the IRC requirements. The result of traffic projection in the "most likely case" is presented below. Operation year of the new bridge is set for 2025.

	2011	2015	2020	2025	2030	2040	2046
2-Wheeler	775	396	741	286	399	1,176	1,336
Auto Rickshaw	110	179	144	863	177	151	713
Car	629	1,218	1,775	3,480	3,256	4,270	5,620
Mini-Bus	34	42	64	86	76	37	104
Truck	283	293	497	109	261	3094	3075
LCV	283	519	894	382	1,079	1,219	1,679
2-Axis Truck	254	370	461	369	949	237	336
3-Axis Truck	297	296	261	439	217	608	728
MV	162	181	324	280	304	388	412
Total	2,843	3,627	6,260	6,206	7,298	15,623	15,419
PCU	2811	3624	6251	2079	2921	2940	3386
2-Wheeler	140	181	272	368	485	581	772
Auto Rickshaw	110	125	144	163	177	152	213
Car	629	1,218	1,775	3,480	3,256	4,270	5,620
Mini-Bus	102	127	181	197	227	285	311
Truck	348	1,162	1,497	1,674	2,108	2,477	2913
LCV	283	779	1,021	1,222	1,518	1,518	2,112
2-Axis Truck	822	1,109	1,402	1,706	2,027	2,281	2,629
3-Axis Truck	622	1,285	1,378	1,378	2,274	2,124	3,327
MV	864	881	1,608	1,181	1,287	1,520	1,553
Total	3,212	6,848	8,616	11,227	12,446	16,258	20,714

12

4. Preliminary Design

(1) Highway Drainage

For embankments with heights of more than 6m and approaches to bridges, special arrangement for protection of embankment slopes shall be essential in order to ensure that embankment slopes maintain their shape during the monsoon season. In this respect, directions contained in Clause 7 of IRC: SP- 42-2014 may be followed.



13

(2) Pavement Design

The approach road pavement design has already been designed in DPR. This study is planned based on design criteria IRC: 37-2012 and IRC: 58-2015. This approach section is shorter than the bridge section, but it is not factoring bridge pavement, so the pavement plan for the bridge is shown below.

	Case 1	Case 2	Case 3
Surface Layer	Improved Asphalt-III	Improved Asphalt	Improved Asphalt
Tack Coat	0.4l/m ²	0.4l/m ²	0.4l/m ²
Binder Layer	Improved Asphalt-III	Improved Asphalt	Improved Asphalt
Waterproofing Layer	Liquid System	Sheet System	Liquid System
Sealing and Bonding Layer	Asphalt Solvent System	Asphalt Solvent System	Asphalt Solvent System
Thickness	80mm	80mm	80mm
Waterproofness	Excellent	Excellent	Excellent
Adhesiveness	Excellent. But no case in Asia	Excellent	Excellent
Workability	Good Workability	Requires High Skill	Good Workability
Evaluation			Recommended

14

(3) Viaduct Design

Bridge Type	PC Box Girder	Steel Slender Box Girder	PC Composite Truss
Images			
Japan/India	many / many	few / none	few / none
Applicable Span	30 ~ 60m	60 ~ 90m	50 ~ 110m
Proposed Span	60m	60 or 90m	90m
Erection Method	Span-by-span	Push Launching	Balance Cantilever
Pier Quantity	97	97 or 65	65
Architect. Design	Simple	Simple	Impressive
Construction Cost	Most Economical	Higher	Higher
Advantage	Indian companies are capable	Shorter construction period	Weight can be reduced
Disadvantage	Heavy dead load	Higher construction cost	Advance technology required and higher construction cost
Evaluation	Most advantageous	Reason to adopt is low	Reason to adopt is low

15

(4) Navigable Bridge Design

Bridge Type	PC Box Girder Extradosed	Steel Slender Box Girder	Composite PC Truss Girder Extradosed	Steel Truss
Image				
Japan / India	Many / few	Few / none	Few / none	Many / many
Applicable Span	100 ~ 200m	60 ~ 90m	150 ~ 200m	60 ~ 150m
Proposed Span	125m	125m	180m	125m
Erection Method	Balanced Cantilever	Push Launching	Balanced Cantilever	Push Launching
Pier Quantity	100	100	83	100
Architect. Design	Impressive	Simple	Impressive	Massive
Construction Cost	Most economical	Higher	Higher	Higher
Advantage	Indian companies are capable	Shorter construction period	Shorter construction period	Indian companies are capable and shorter construction period
Disadvantage	Not innovative enough	Special steel materials required	Advanced technology required	Not innovative enough
Evaluation	Most economical but longer construction period	Reason to adopt is low	No reason to adopt	Shorter construction period but higher construction cost

16

(5) Construction Issues and Solutions

Issue	Description
#1 Materials Procurement and Delivery	A large amount of materials is needed, that is why the stable production, transportation, and on-site storage should be confirmed. Likewise, the capacity of production and delivery of the manufactures should be confirmed.
#2 Construction Schedule	The construction time frame should include necessary time for detail design and procurement of materials. Sufficient study of construction method should be conducted to manage multiple sites simultaneously that are subject to significant seasonal changes of the Brahmaputra River.
#3 Temporary Facilities	A jetty, temporary roads, concrete mixing plant and such facilities are expected to be large. Proper preparation and maintenance is necessary. Since the cost of large temporary facilities is greater than that for common works, expenses should be properly estimated.
#4 Workers and Inspectors	Many workers and inspectors are needed along with the development of works. It is important to secure and manage many experienced workers and inspectors.
#5 Measures Against Flooding	A flood of 10-year return period may occur during the construction period, and therefore, the countermeasures for flood disaster should be considered.
#6 Corrosion Prevention	Repainting of steel is expected to be difficult and durable rust-proofing methods should be applied.
#7 Railway Station	When railway is utilized for transporting materials, access roads and loading/unloading facilities should be studied.

17

Issue #1: Materials Procurement and Delivery

Analysis: Regarding the cement and aggregate, the mainland of Northeastern Region is India's leading producer, therefore manufacture is possible and there is no problem in the supply. For rebars and PC cables there is sufficient supply and manufacturing capacity in India. Furthermore, transportation via road, railway or river is possible, and storage facility and concrete manufacturing plants can be secured on site. **However, there is no railway connection to Phulbari and the road condition to reach Phulbari is very poor making the delivery of materials to the Phulbari site troublesome.**

Suggested Solution:
Additional cost for materials transportation to Phulbari should be included. The additional cost estimated by the JICA Study Team is 8.9 Crore INR.

Materials	Amounts (ton)
Cement	97,273
Steel	34,698
Total	131,971
Necessary # of trailers	131,971ton/16ton = 8,248
Additional cost	8,248 x 10,799INR = 8.9 Crore INR

18

Issue #2: Construction Schedule

Analysis: The construction schedule is initially set as 6 years but by reconsidering construction details and dividing the bridge in 4 sections with simultaneous constructions, it allows placement of concrete manufacturing plant and precast block driving yard in each section. By the transportation of precast block via barges and use of wharfs for transportation the whole construction schedule can be completed in 6 years and 11 months. **However, an operational rate during rainy season especially for foundations and substructures should be carefully reexamined.**

Suggested Solution:
An inoperative period of 3 months during rainy season should be applied. Initial site preparation (60 days) should also be included. The additional construction period estimated by the JICA Study Team is 10 months totaling 7 years and 9 months.

Item	Duration (day)
Foundation (173) + Substructure (20) + Pier & Pylon (35)	228
Operational Rate = 3/12 = 0.75	228/0.75 = 304
# of cycles for each Workfront	3
Additional Days by Operational Rate	(304 - 228) x 3 = 228
Initial Site Preparation	60
Additional Construction Period	(228 + 60)/30 = 10 months

19

Issue #3: Temporary Facilities

Analysis: Wharfs, construction road, batching plant and others can be installed on site. Crane, vehicles for precast block transport such as large trailer and trolley can be provided with the existing equipment in India. Regarding the cost of temporary equipment, an appropriate cost estimate is done by standard integration method, a method that is being used in India. **However, the cost of large temporary facilities is greater than that for common works, and additional expenses should be properly estimated.**

Suggested Solution:
Additional cost for temporary facilities should be included because the transport of precast blocks and other materials involves far larger scale than a standard. The additional cost estimated by the JICA Study Team is 64.26 Crore INR.

Item	No.	Size (m2)
Temporary Jetty	3	15 x 40 x 3 = 1,800
Unloading Platform	2	10 x 30 x 2 = 600
Temporary Access Road (1)	1	6 x 7,000 x 1 = 42,000
Temporary Access Road (2)	1	6 x 4,500 x 1 = 27,000
Total		71,400
Installation/Removal Cost		71,400 x 0.15 x 60,000 = 64.26 Crore INR

20

Issue #4: Workers and Inspectors

Analysis: There is no problem in the quality and quantity of inspectors since Indian companies have built the same type of bridges in India. The control and insurance of manpower can also be dealt with even though it is the responsibility of the contractor. **However, there are extra-large number of parties (4 parties in each of 9 work-fronts) working simultaneously, and the function of construction management should properly be strengthened.**

Suggested Solution:
Additional cost for strengthening the function of construction management should be included. The additional cost estimated by the JICA Study Team is 89.56 Crore INR.

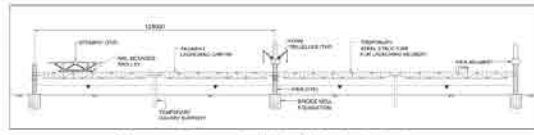
Item	Duration
Navigational Section	2,168 days
Additional Days by Operational Rate	228 days
Total	2,396 days (78.9 months)
2 bridge engineers for each of 9 work-fronts	78.9 x 2 x 9 x 630,600INR = 895,578,120INR

21

Issue #5: Measures Against Flooding

Assuming the occurrence of a flood with a 10-year recurrence probability during construction, the flood can be dealt with by utilizing the finished substructure and setting up a pier- and transportation road. The main body of the bridge is designed to correspond to a 100-year recurrence probability flood. **However, it is very important to establish a flood alarm monitoring system during construction for disaster preparedness to ensure the safety of construction workers.**

Suggested Solution:
The flood alarm monitoring system should be prepared. The system should be equipped with functions of meteorological data collection, data analysis, warning and communication, evacuation manual, evacuation drill, etc.



Transportation road utilizing finished substructures

22

Issue #6: Measures Against Flooding

The location of Dhubri Bridge is inland and the effect of salt is considered to be insignificant, therefore, the expensive weathering steel is not considered. Furthermore, the steel materials exposed to weather are limited that painting can be used as anti corrosion measure.

Issue #7: Railway Station

Railway is a common transportation in India. Also, if it is difficult to use the existing roads, an access road to the station will be constructed. There is no problem in the maintenance of the access road from the site condition.

23

(4) Conclusion and Recommendations

- a. **The Project is relevant and effective:** As described in the previous chapter, the project has been appropriately modified based on the proposals made by the JICA Study Team, who reviewed the Detailed Project Report (DPR) prepared by the National Highways and Infrastructure Development Corporation (NHIDCL), and identified areas for improvement. The project also aligns with the upper level plans of the Government of India and complies with overarching goals. Furthermore, the quantitative and qualitative effectiveness has been adequately demonstrated. Thus, the project is relevant and effective.
- b. **Efficient Construction Management of Extradosed Bridge:** The most important challenge in the construction planning is the selection of the construction method of a series of 100 spans of Extradosed Bridge in the Brahmaputra River. The full width of girder of Dhubri Bridge is 28 m. If the heavy precast segments are carried from the site casting yard to the exact location of erection in the river, a large temporary facility such as jetties should be used for loading and unloading from barges and as a temporary passage to carry heavy goods. According to the experiences of precast segment construction in Japan, 7 days were needed to complete each segment while 10 to 15 days were needed for in-situ concrete placement method. Suppose the construction period of Dhubri Bridge is 6 years, with reference to Japan's experiences, it is necessary to conduct 30 sites in parallel for the navigational portion. Thereby, the most efficient construction management of extradosed bridge is required. Therefore, it is recommended to be described in the technical proposal methodology of the bidding documents.

32

- c. **Necessity of a Flood Alarm Monitoring System during Construction:** The Brahmaputra River flows across southern Tibet, which is characterized by high levels of rainfall that reach the Assam Valley where it collects rainwater from the huge basin area. Whereby frequently bringing about heavy floods spelling disasters for agricultural products and human lives. The ground height of the sandbars at the project site is only a few meters, not taking much to get submerged by a flood of a 10-year return period. Therefore, it is very important to establish a flood alarm monitoring system during construction to ensure the safety of construction workers. The flood alarm monitoring system must be equipped with functions of meteorological data collection, data analysis, warning and communication, evacuation manual, evacuation drill, etc. Therefore, it is recommended to be described in the technical proposal methodology of the bidding documents.
- d. **Necessity of Technical Transfer in Operation and Maintenance:** NHIDCL was established as a new entity under the Ministry of Road Transport and Highways in February 2014. It has still been building up the structure and engineering for operation and maintenance (O&M). The O&M of the Dhubri Bridge will be undertaken by the contractor for the first 4 years after construction, then, the duties will be transferred to NHIDCL. The Dhubri Bridge, which is a long-span bridge of about 20 km, requires special techniques for O&M different from those of ordinary national highways. Japan, which holds rich technical experience in inspection and repairs for long-span bridges, is required to transfer O&M technologies to NHIDCL. Therefore, regarding maintenance and management, it is recommended that the maintenance management manual be prepared for the organizational structure, machinery equipment, inspection and repair methods, etc., and that training plans for educating staff should be included in the Contractor's Employer's Requirement.

添付資料-3 生態系モニタリング TOR

TERMS OF REFERENCE

Ecosystem Monitoring for North East Road Network Connectivity Improvement Project (Dhubri – Phulbari Bridge)

1. Project Description

National Highways and Infrastructure Development Corporation (NHIDCL) plans to construct a 20-km bridge including approaches over River Brahmaputra between Dhubri and Phulbari on South Bank in the state of Assam/Meghalaya on NH-127B under loan from the Japan International Cooperation Agency (JICA).

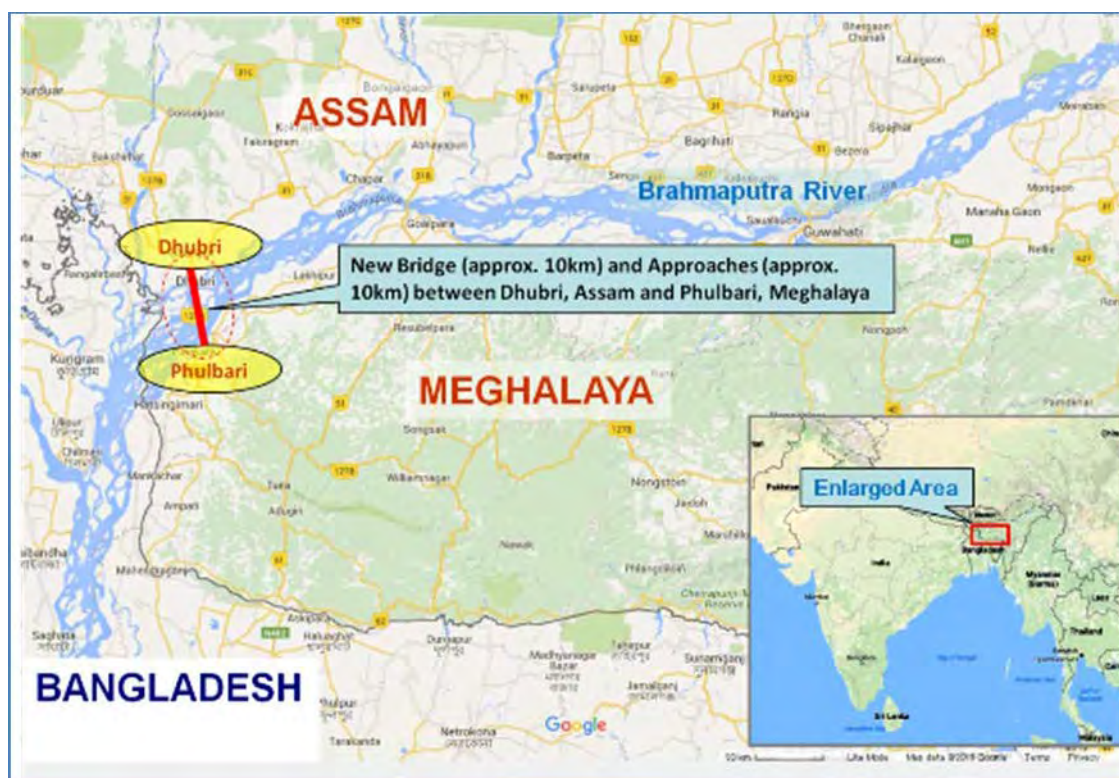


Figure1: Project Location

3.3 Monitoring of the impact of the project during the construction and operation

- a) Repeat the dolphin census survey three times per year during the construction period. Constant survey methods must be used for each survey.
- b) In case the data indicates negative impact of the project on the dolphin population, propose additional mitigation measures and assist NHIDCL to implement them.
- c) The survey shall be continued three times per year for two years after the completion of the construction.

4. Deliverables

The following deliverables shall be submitted.

- a) Inception report within 1 month of contract of signing, stating the result of review of the EMP, EMoP, and construction work plan, the survey methodology and schedule.
- b) Initial assessment report, stating the result of initial ecosystem assessment
- c) Survey reports to be submitted at the end of each monitoring survey
- d) Annual monitoring reports including the monitoring results, evaluation of impacts and recommendation of mitigation measures if necessary.
- e) Final report within 1 month of the completion of all works

5. Eligibility

The applying organization must have the following qualifications.

- a) More than 3 years of experience in the ecological monitoring of Ganges river dolphins in the State of Assam
- b) One team leader who has a doctorate degree in the field of wildlife ecology
- c) Demonstrated knowledge and working experience in the local ecosystem (Brahmaputra River)
- d) Ability to organize a survey team

添付資料-4 RAP 支援 NGO 再委託 TOR

TOR for RAP Implementation Agency

1. Project Background

Ministry of Road Transport and Highways (MORT&H) plans to construct Two / Four lane bridge including approaches over River Brahmaputra between Dhubri on North Bank via newly formed South Salmara-Mankachar district villages, and Phulbari on South Bank in the state of Assam/Meghalaya on NH-127B under JICA loan. The bridge will be constructed approximately 20 km to provide better connection in a long continuous stretch.

NHIDCL has prepared Resettlement Action Plan (RAP) in compliance with State Government, Government of India and JICA Guideline for Environmental and Social Consideration which is in line with World Bank's OP 4.12.

The NGO shall be responsible for assisting NHIDCL in facilitating land acquisition and Resettlement Plan (RP) implementation in an efficient and transparent manner.

The proposed bridge traverses along 18 villages in Dhubri, South Salmara-Mankachar, West Garo Hills Districts. According to census survey in RAP report, the details of impacted land and displacement have been provided below.

Table 1: Summary of Impacts

Sl. No.	Impacts	Number
1	Total Area of Land required (in Hectares)	94.3
2	Area of private land to be acquired (in Hectares)	56.2
3	Total number of PAHs	761
4	Total number of PAPs	3,043
5	Total number of private structures affected	273
6	Total number of physically displaced households	127
7	Total number of physically displaced persons	500

2. Scope of Work

2.0 Coordination with Appropriate Government Agencies

Land acquisition and resettlement shall be implemented in close coordination and cooperation with respective government agencies as listed below. Current status of land acquisition process shall be confirmed prior to the Work.

- Dhubri District Collector and Land Acquisition Officer
- South Salmara-Mankachar District Collector and Land Acquisition Officer
- West Garo Hills District Collector (for Phulbari)

2.1 Update the Census Survey

- Confirm the validity of the information on affected and eligible families including loss of assets and loss of livelihoods (agricultural labours, boat operators, etc.) from the Project. Special attention shall be paid to land ownership in the project area as it is often divided into several families who do not appear on the government records and families who live on the government land without legal documents. Those who are not covered in the census survey shall also be surveyed.
- Based on the above, prepare the list of eligible PAPs and their entitlement and benefits as per the entitlement framework (as described in the RAP).

2.2 Assistance on Land Acquisition

- Inform PIU about the shifting dates agreed with the PAPs in consultation with the PAPs.
- Assist the PAPs in opening bank accounts explaining the implications, the rules, and the obligations of a bank account and how they can access the resources they are entitled to.
- Assistance in Payment of Resettlement Benefits to PAPs in coordination with district administrators.
- Prepare Public Information Booklet¹ and circulate among PAPs and affected communities and provide information to PAPs about the respective entitlements as proposed under the RAP, and distribute entitlement cum ID Cards to the eligible PAPs.

2.3 Facilitate the Grievance Redress Mechanism

- Nominate a suitable person from the staff of the NGO¹ to be a member of the Grievance Redress Committees (GRCs) at both local as well as district level.
- Inform PAPs about the function of GRMs/GRCs and how they can utilize the mechanism.
- Record the grievance and bring it to the notice of the GRCs in a timely manner. Assist PAPs to express their grievance in GRC and inform decisions taken by the GRC.
- In addition to receiving grievance, carry out periodic consultation with PAPs.

2.4 Assist PAPs for the Rehabilitation

- Survey alternative method of livelihood using local resources and opportunities² available in the project area as well as outside. Consult with the PAPs in finding suitable economic rehabilitation options.
- Carry out exercise of skill mapping³ and training needs assessment before finalization of training schemes and coordinate with the project, training institutions and non-government training agencies.
- Develop good rapport with the local financial institutions and facilitate access to credit at acceptable terms and conditions.
- Liaise with PIU / Contractor for construction related activities and design training program
- Establish linkage with the district administration for ensuring that the PAPs get access to government poverty reduction programs.
- Disseminate information to the PAPs on the possible economic opportunities available with the project.

2.5 Social Responsibility

- Conduct awareness program for HIV/AIDs, health and hygiene, and human trafficking in affected villages.
- Assist PIU to ensure that the contractors are abiding by the applicable laws, concerning issues such as: child labour, discrimination in employment and occupation, minimum wages equal to male and female worker, health and safety measures as per contract.

2.5 Monitoring and Evaluation

- Collect data required on monitoring of RAP implementation and selected impact indicators on monthly basis.

2.6 Reporting

- Monthly progress reports to be submitted to at the end of each month. Shall include weekly progress and work charts as against the scheduled timeframe of RAP implementation.
- Completion Report at the end of the contract period summarizing the actions taken during the project, the methods, and personnel used to carry out the assignment, and a summary of support/assistance given to the PAPs.

3. Staffing requirement

¹ Local trusted NGO who can represent the opinions of the local people.

² It may include agriculture/fishery products marketing, transportation services, trading goods, starting shops, etc.

³ The process of identifying and understanding the specific knowledge and abilities which may differ according to the region, sex and vulnerability

The table below details the required staffing structure and qualification of experts for the assignment.

Table 2: Qualification of Staffs (RAP Implementation NGO)

Staff	Qualification
Team Leader	Minimum: Post graduate degree in social science, Sociology, Economics, Master in Social Work, Masters in Rural Development, Bachelors of law shall be added qualification 10 years of minimum professional experience 10 years of minimum relevant experience in implementing R&R activities. Previous experience in project funded by external donors. Good understanding of land acquisition process and LARR 2013
Social Development Expert	Minimum: Bachelor's degree in social science, Post graduate degree in social science is preferred 10 years of minimum professional experience 10 years of minimum relevant experience in community development and community awareness projects.
Field Coordinator	Minimum: Bachelor's degree in any discipline, Post graduate degree in social science is preferred 10 years of minimum professional experience 5 years of minimum relevant experience in R&R activities. Previous experience in project funded by external donors strongly preferred. Good understanding of land acquisition process and LARR, 2013. Proficient in local language is preferred.
Field Support Staff	Minimum: Bachelor's degree in any discipline. Post graduate degree in social science is added qualification 3 years of minimum professional experience Previous experience in working rural communities required. Proficiency in local language is required. Previous experience in land acquisition activities and working in the region is strongly preferred.

Sample monitoring form is as shown below.

Table 3: Monitoring Form (RAP Implementation NGO)

Major items of action	Specific action steps (sub-items)	Progress in quantity	Progress in %	Expected Date of Completion
Recruitment, training and deployment	Deployment of consultants and resettlement workers (MM)			
	Training and mobilization (No. of trained personnel)			
Review of Resettlement Action Plan	Review of RAP (%)			
	Finalization of PAPs (%)			
	Approval of RP with corrections (%)			
Socio-economic Survey	Field Survey, data collection, data analysis (%)			
	Valuation of affected property and collection of data (%)			
	Produce data for comparison/evaluation (%)			
Information campaign	Distribute information brochure (No. distributed)			
	Public consultation meetings/FGD (Times)			
Identification of PAPs	Assigning ID numbers (No. of Person)			
Payment	Opening bank account (No. of Person)			
	Assist PAPs to collect cash compensation (No. of Person)			
	Confirm payment transfers (No. of Person)			
Resettlement	Coordinate resettlement site with DC (No. of HH)			
	Assist relocation and resettlement (No. of HH)			
Income restoration program	Training program, Assistant activities (No. of case)			
	Field Survey, data collection, data comparison (%)			

Major items of action	Specific action steps (sub-items)	Progress in quantity	Progress in %	Expected Date of Completion
Grievance Redress	Formation of GRC (%)			
	Receiving complaints / claims from PAPs (No. of case)			
	Resolved complaints / claims from PAPs (No. of case)			
Supervision and Management	Supply of manpower (MM)			
	Number of meetings with relevant agencies (No. of meetings)			
Reporting	Inception / Monthly progress / Draft final report			

添付資料-5 外部モニタリング機関 TOR

TOR for External Monitoring Agency

1. Project Background

Ministry of Road Transport and Highways (MORT&H) plans to construct Two / Four lane bridge including approaches over River Brahmaputra between Dhubri on North Bank via newly formed South Salmara-Mankachar district villages, and Phulbari on South Bank in the state of Assam/Meghalaya on NH-127B under JICA loan. The bridge will be constructed approximately 20 km to provide better connection in a long continuous stretch.

NHIDCL has prepared Resettlement Action Plan (RAP) in compliance with State Government, Government of India and JICA Guideline for Environmental and Social Consideration which is in line with World Bank's OP 4.12.

The NGO shall be responsible for monitoring the process and evaluate the result of land acquisition and Resettlement Plan (RP) implementation in an efficient and transparent manner.

The proposed bridge traverses along 18 villages in Dhubri, South Salmara-Mankachar, West Garo Hills Districts. According to census survey in RAP report, the details of impacted land and displacement have been provided below.

Table 4: Summary of Impacts

Sl. No.	Impacts	Number
1	Total Area of Land required (in Hectares)	94.3
2	Area of private land to be acquired (in Hectares)	56.2
3	Total number of PAHs	761
4	Total number of PAPs	3,043
5	Total number of private structures affected	273
6	Total number of physically displaced households	127
7	Total number of physically displaced persons	500

2. Scope of Work

2.1 Review RAP

- d) Review the content of RAP to confirm that the entitlements are sufficient.
- e) Review the time frame and verify the adequacy of budget to meet the objectives of the RAP.
- f) Based on the above, provide recommendation for policy changes if required.

2.2 Monitoring of the Processes and Procedures

- g) Monitor the procedure and progress of the census and asset verification/quantification.
- h) Monitor the timing and duration of the hearing objections procedures.
- i) Monitor the effectiveness of the coordination between NGO, NHIDCL, and other line agencies in addressing the issues identified.
- j) Identify, quantify and qualify the types of conflicts and grievances reported and resolved and describe any outstanding actions that are required.
- k) Describe further mitigation measures needed to meet the needs of any PAPs if required.
- l) Review results of internal monitoring and verify claims through sampling check at the field level to assess whether land acquisition/resettlement objectives have been generally met.

2.2 Monitoring of Land Acquisition and Delivery of Entitlements

- m) Monitor that the agreement and consent were received before the acquisition and change of official registration after the acquisition.
- n) Monitor the quality, sufficiency of funds and on-time delivery of entitlements according to RAP.
- o) Monitor the payment of compensation and assistance including its levels and timing.
- p) Monitor the provision of employment, job trainings, other assistance programmes and their adequacy.
- q) Monitor that the equal opportunities are provided to women for the employment and no children are employed in construction work. Monitor the preparation and adequacy of resettlement sites, if it is required.
- r) Monitor the payment of compensation for temporary impact and restoration of site after the construction

2.3 Participation of PAPs in Monitoring and Evaluation

- s) During monitoring and evaluation activities, participation of all stakeholders shall be ensured, including the method described as follows;
- t) Community public meetings and Focused Group Discussions (FGD)
- u) Key informant interviews with select local leaders, village workers or persons with special knowledge or experience about resettlement activities and implementation.
- v) Informal surveys/interviews: informal surveys of PAPs, workers, resettlement staff, and implementing agency personnel using non-sampled methods.

2.5 Evaluation of Impacts after the Land Acquisition and Resettlement

- w) Establish by appropriate investigative and analytical techniques, the pre- and post- project socio-economic conditions of the PAPs.
- x) Approximately 20% census survey of persons who were severely affected by the project and have relocated either to group resettlement sites or preferred to self-relocate.
- y) Approximately 10% sample survey of persons who had property, assets, incomes and activities marginally affected by Project works and did not relocate.
- z) Approximately 10% sample survey of those affected by off-site project activities by contractors and subcontractors, including employment, use of land for contractor's camps, pollution, public health etc.

aa) Monitoring items shall include the followings.

- Level of satisfaction from the livelihood restoration programme.
- Change in economic activities (employment, occupation, income, skills, etc.)
- Change in access to infrastructures (transport, markets, schools, hospitals, other social facilities, etc.)
- Conflict within and among PAPs and non-PAPs due to unequal distribution of benefits and losses.

2.6 Reporting

- bb) Biannual progress reports to be submitted including recommendation of actions if identified.
- cc) Mid-term and final evaluation will be carried out to find out if the R&R objectives have been achieved as against the performance impact indicators.

3. Staffing requirement

The table below details the required staffing structure and qualification of experts for the assignment.

Table 5: Qualification of Staffs (External Monitoring Agency)

Staff	Qualification
Team Leader	Minimum: Post graduate degree in social science, Sociology, Economics, Master in Social Work, Masters in Rural Development shall be added qualification 10 years of minimum professional experience 10 years of minimum relevant experience in planning, implementation and monitoring of involuntary resettlement for infrastructure projects.

Staff	Qualification
Livelihood Restoration Specialist	Minimum: Bachelor's degree in social science 10 years of minimum professional experience in social impact assessment including census and socioeconomic surveys, restoration of livelihood in compliance with safeguard policies of the international development agencies and national legislations. Experience of preparing/monitoring livelihood restoration program is essential.
Gender Specialist	Minimum: Bachelor's degree in social science 10 years of minimum professional experience 5 years of minimum relevant experience in social impact assessment including census and socioeconomic surveys, gender in compliance with safeguard policies of the international development agencies and national legislations. Experience of preparing/monitoring a gender program is essential.
Data Analyst	Minimum: Bachelor's degree in any discipline. 3 years of minimum professional experience. Working experience and knowledge of software, preferably relational, and data analysis are required.

Sample monitoring form is as shown below.

Table 5: Monitoring Form (External Monitoring Agency)

Major Items in Actions	Details (Sub-items)	Answer	Remark
Review RAP	• Is the content of the RAP efficient and entitlements sufficient?	Yes/No	
	• Is the time frame and budget sufficient to meet objectives	Yes/No	
Monitor operational process	• Has the census and asset verification/quantification procedures been implemented?	Yes/No	
	• Is the timing and duration during the hearing objections procedures adequate?	Yes/No	
	• Is the coordination between NGO, NHIDCL, and other line agencies effective in addressing the issues identified?	Yes/No	
Stakeholder consultation and participation	• Implementation of information dissemination and its adequacy	No. of cases	
	• Consultations and meetings with community, PAPs, vulnerable people, women, etc. are implemented.	No. of cases	
	• Number of GRC conducted, and participation of appropriate stakeholders including government officials, NHIDCL, PAPs.	No. of cases	
	• Types of complaints/grievances raised and resolved and time taken for the resolution of complaints/grievances	Describe	
Land and asset acquisition	• Agreement and consent received before the acquisition and change of official registration after the acquisition.	Progress	
	• Land acquired (private and government owned land, land use by agricultural, residential, commercial etc.);	Progress	
	• Structures acquired (private buildings, government buildings and infrastructure etc.);	Progress	
	• Trees and crops acquired	Progress	
Delivery of entitlements	• Payment of compensation and assistance including the timing.	Progress	
	• Has the resettlement sites adequately prepared, when required?	Yes/No	
	• Has the compensation paid for temporary impact and has the site restored after construction?	Yes/No	
	• Level of satisfaction	Positive %	

Major Items in Actions	Details (Sub-items)	Answer	Remark
Restoration of livelihoods	• Provision of employment to compensate loss of earnings	Yes/No	
	• Provision of job trainings and other assistance programs to restore livelihoods and their adequacy.	Yes/No	
	• Monetary and technical assistances sufficient for livelihood restoration	Positive %	
	• Level of satisfaction	Positive %	
Economic activities of PAPs	• Employment status	Positive %	
	• Change in occupation and stability of income source	Positive %	
	• Change in income of households	Positive %	
	• Change in skill levels	Positive %	
Access to Infrastructure and networks	• Change in access to transport and mode of transportation	Positive %	
	• Change in access to markets	Positive %	
	• Change in access to health care, education facilities and other community facilities etc.	Positive %	

添付資料-6

EIA (Environmental Impact Assessment, 環境影響評価)

MINISTRY OF ROAD TRANSPORT AND HIGHWAYS
NATIONAL HIGHWAY AND INFRASTRUCTURE DEVELOPMENT CORPORATION

**THE PREPARATORY STUDY FOR NORTH EAST
NETWORK CONNECTIVITY IMPROVEMENT
PROJECT (PHASE-3) IN INDIA**

**PRELIMINARY DESIGN WORK FOR
DHUBRI-PHULBARI BRIDGE IN THE STATE OF
ASSAM / MEGHALAYA ON NH-127B
(LENGTH OF 20KM)**

ENVIRONMENT IMPACT ASSESSMENT

VOLUME - I
MAY2018

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

PADECO CO. LTD.

NIPPON ENGINEERING CONSULTANTS CO., LTD.

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TABLE OF CONTENTS

CHAPTER 1 Introduction	1
1.1 Background of the project.....	1
1.2 Outline of the project.....	1
1.3 Purpose and Purpose of the Study.....	3
1.4 Scope of the Study.....	4
1.4.1 Geographical Extent.....	4
1.5 Principles of the Study	5
CHAPTER 2 Baseline Condition of the Natural and Social Environment.....	6
2.1 Natural Environment.....	6
2.1.1 Climate	6
2.1.2 Land Use	8
2.1.3 Geology and Geography.....	10
2.1.4 Geohydrology.....	12
2.1.5 Ecology	15
2.2 Living Environment	15
2.2.1 Water Quality	15
2.2.2 Air Quality.....	16
2.2.3 Noise and Vibration.....	18
2.2.4 Soil Quality	18
2.3 Socio-economic Environment.....	19
2.3.1 Assam State.....	19
2.3.2 Meghalaya State	24
CHAPTER 3 Legal Framework	27
3.1 Major Laws and Regulations Relevant to the Project	27
3.1.1 The Environment (Protection) Act, 1986	27
3.1.2 Notification of the Environmental Impact Assessment of Development Projects.....	27
3.1.3 Wildlife Protection Act, 1972.....	28
3.1.4 The Biological Diversity Act, 2002.....	29
3.1.5 The Forest (Conservation) Act, 1980 (amended in 1988).....	29
3.1.6 The Water (Prevention and Control of Pollution) Act, 1974.....	29
3.1.7 The Air (Prevention and Control of Pollution) Act, 1981	29
3.1.8 The Motor Vehicles Act, 1988.....	30
3.1.9 The Land Acquisition Act, Rehabilitation and Resettlement Act, 2013.....	30
3.2 JICA/WB/ADB's Guidelines for Environment and Social Considerations	30
3.2.1 JICA Environmental and Social Guidelines.....	30
3.2.2 World Bank's Environment Safeguard Policy	31
3.2.3 Safeguard Policy of Asian Development Bank	33
3.3 Comparison of JICA/WB/ADB Guidelines and EIA Regulations of India	34
3.4 Central Level Institutions.....	36
3.5 State Level Institutions.....	37
3.6 Requirements of Environmental Clearance.....	38
3.7 Environmental Standards of India.....	39

CHAPTER 4 Analysis of Alternatives	46
4.1 Alternatives Subject to Analysis	46
4.2 Criteria for Analysis of the Alternatives.....	47
4.3 Results of the Analysis of Alternatives.....	48
4.3.2 Comparison of bridge alignment options	50
CHAPTER 5 Scoping Analysis	54
5.1 Procedures of Scoping Analysis.....	54
5.2 Scoping Matrix: Preliminary Analysis of the Environmental Impacts.....	54
5.3 TOR of Natural and Socio-economic Environment Survey	58
CHAPTER 6 Anticipated Environmental Impacts.....	62
6.1 Impacts on the living environment.....	62
6.1.1 Survey Results.....	62
6.1.2 Anticipated Impacts and Mitigation Measures.....	70
6.2 Natural Environment	77
6.2.1 Survey Results.....	77
6.2.2 Anticipated Impacts and Mitigation Measures.....	86
6.3 Major Impacts on Social Environment.....	90
6.4 Impact Analysis.....	94
CHAPTER 7 Environmental Management Plan and Monitoring Plan	99
7.1 Environmental Management Plan	99
7.2 Environment Monitoring Program.....	113
7.3 Institutional Arrangement.....	118
7.4 Grievance Redress Mechanism	118
7.5 Monitoring Forms	119
7.6 Environmental Management Budget.....	124
CHAPTER 8 Stakeholder Consultation	126
8.1 1 st Round Consultation	126
8.2 2 nd Round Consultation	131
CHAPTER 9 Conclusion and Recommendations.....	135
9.1 Key issues / Concerns Identified.....	135
9.2 Summary of Key Benefits from the project	135
9.3 Recommendations/conclusion.....	136
9.3.1 Recommendations	136
9.3.2 Conclusion.....	136
REFERENCES.....	137

LIST OF FIGURES

Figure 1-1 Project Location.....	2
Figure 1-2 Project Site	3
Figure 1-3: Geographical Extent of the Environmental Study.....	4
Figure 2-1: Wind Rose Diagram	7
Figure 2-2: Land Use of Assam and Meghalaya State	8
Figure 2-3: Land Use Pattern in 10km radius of the Project Area	9
Figure 2-4: Geological map of Meghalaya.....	10
Figure 2-5: Geological map of Assam.....	11
Figure 2-6: River Brahmaputra and Geohydrological Map of Dhubri District in Assam	13
Figure 2-7: Geohydrological & River Map of West Garo Hills, Meghalaya	14
Figure 2-8: Map of Assam State.....	20
Figure 2-9: Map of West Garo Hills District.....	24
Figure 3-1: Environmental Clearance Process for Category A Projects.....	28
Figure 4-1: The Alternative Route connects Dhubri and Phulbari by widening of existing NH-31 B and SH-46 through existing bridge near Goalpara	46
Figure 4-2: Alignment of Two / Four lane bridge between Dhubri and Phulbari.....	47
Figure 6-1: Sampling locations for ambient air quality and noise level.....	62
Figure 6-2: Concentration of PM _{2.5} at locations along proposed Dhubri – Phulbari bridge on NH-127B	63
Figure 6-3: Concentration of PM ₁₀ at locations along proposed Dhubri – Phulbari bridge on NH-127B	63
Figure 6-4: Concentration of SO ₂ at locations along proposed Dhubri – Phulbari bridge on NH-127B	63
Figure 6-5: Concentration of NO _x at locations along proposed Dhubri – Phulbari bridge on NH-127B	64
Figure 6-6: Concentration of CO at locations along proposed Dhubri – Phulbari bridge on NH-127B	64
Figure 6-7: Sampling locations for water and soil quality	65
Figure 6-8: Ambient Noise Quality Results at locations along proposed Dhubri – Phulbari bridge on NH-127B.....	70
Figure 6-9: Riverbed Topography around the Dhubri Bridge	85
Figure 7-1: Riverbed Topography around the Dhubri Bridge	118
Figure 8-1: Starting location mentioned in the meeting.....	129
Figure 8-2: Ending location mentioned in the meeting.....	129
Figure 8-3: Stakeholders/Community Meetings	134

LIST OF TABLES

Table 2-1: Meteorological Data Parameters at Dhubri district (January – December 2016)	7
Table 2-2: Precipitation of West Garo Hills District in (mm)	8
Table 2-3: Breakdown of the Land Use Pattern in 10km radius of the Project Area	9
Table 2-4: Results of Water Quality Analysis	16
Table 2-5: Results of Air Quality Analysis.....	16
Table 2-6: Ambient Noise Level in the Study Area.....	18
Table 2-7: Results of Soil Quality Analysis	19
Table 2-8: Demographics of Assam State and Districts in the Project Site.....	21
Table 2-9: Scheduled Caste and Scheduled Tribe in Assam State.....	21
Table 2-10: Economic Trend in Assam State	22
Table 2-11: Workers Ratio in Assam State	22
Table 2-12: Demographics of Char Area in Dhubri / South Salmara-Mankachar district.....	23
Table 2-13: Demographic Situation of Meghalaya State	24
Table 2-14: Population Ratio of Scheduled Caste and Scheduled Tribes	25
Table 2-15: Economic Trend of Meghalaya State	25
Table 2-16: Workers Composition in Meghalaya State.....	26
Table 3-1: Comparison between JICA Guideline and Laws in India regarding EIA	35
Table 3-2: Applicable Environmental Clearance.....	39
Table 3-3: Standards for Ambient Air Quality	40
Table 3-4 Ambient Air Quality Standard by WHO	41
Table 3-5: Vehicle Emission Standards (1991 to Date).....	41
Table 3-6: Water Quality	42
Table 3-7: Water quality standard for international EHS Guideline.....	42
Table 3-8: Fuel Quality	43
Table 3-9: Noise Standard for Diesel Generator	43
Table 3-10: Vehicle Emission Standards (1991 to Date).....	44
Table 3-11: Noise Emission Standards.....	44
Table 3-12: Ambient Noise Standards.....	45
Table 4-1: Criteria for the Evaluation of the Alternatives	47
Table 4-2: Analysis of alternatives	49
Table 4-3: Location of Nodes for the Bridge Alignment Alternatives	51
Table 4-4 Evaluation Criteria	51
Table 4-5 Evaluation and Comparison of the Alternatives.....	52
Table 5-1: Scoping Matrix for the Proposed Bridge Option	55
Table 5-2: TOR of Natural and Socio-economic Environment Survey.....	59
Table 6-1: Ambient Air Quality along proposed Dhubri – Phulbari bridge	62
Table 6-2: Water quality (Surface and Ground water) along proposed Dhubri – Phulbari Bridge on NH-127B	66
Table 6-3: Soil quality (Surface and Ground water) along proposed Dhubri – Phulbari Bridge on NH-127B	68
Table 6-4: Noise Levels along proposed Dhubri – Phulbari Bridge on NH-127B.....	70
Table 6-5: Typical Noise Levels of Construction Equipment	74
Table 6-6: Domesticated agro-biodiversity in the Study Area	77
Table 6-7: Plant Biodiversity in the Study Area.....	78
Table 6-8: Invasive Alien Plants in the Study Area.....	80
Table 6-9: Animal biodiversity in the Study Area.....	80
Table 6-10: Hydraulic Parameters.....	85
Table 6-11: Distribution of vulnerable and other important species in the project area.....	88
Table 6-12: Summary of Households Affected	90
Table 6-13: Health and Safety Measures.....	93
Table 6-14: Scoping and Survey Result	94

Table 7-1: Environmental Management Plan for Pre-Construction Stage	100
Table 7-2: Environmental Management Plan for Construction Stage.....	101
Table 7-3 Environmental Management Plan for Operation Stage.....	111
Table 7-4: Environmental Monitoring Plan.....	114
Table 7-5: Environmental Clearance.....	119
Table 7-6: Air Quality	119
Table 7-7: Water Quality	120
Table 7-8: Solid Waste.....	120
Table 7-9: Noise and Vibration	120
Table 7-10: Topography and Geology.....	121
Table 7-11: Soil Contamination.....	121
Table 7-12: Biodiversity.....	122
Table 7-13: Land Use	123
Table 7-14: Utilization of Local Resources.....	123
Table 7-15: Unequal Distribution of Benefit and Damage.....	123
Table 7-16: Gender.....	123
Table 7-17: Public Health.....	123
Table 7-18: Occupational Health and Safety.....	124
Table 7-19: Accident	124
Table 7-20: Budget for EMP Implementation	124
Table 8-1: Location and Dates of Stakeholder meetings.....	126
Table 8-2: Discussion in Stakeholder Meetings	127
Table 8-3: Location and Dates of Community meeting	127
Table 8-4: Discussion in Community meetings	128
Table 8-5: Location and Dates of Focus Group Discussions	130
Table 8-6: Topics in Focus Group Discussions	130
Table 8-7: Details of the Second Round Consultation Meetings	131
Table 8-8: Participation Details of the Second Round Consultations	132

ABBREVIATIONS

ADT	Average Daily Traffic
BRDB	Border Roads Development Board
BRO	Border Roads Organization
COD	Chemical Oxygen Demand
CPCB	Central Pollution Control Board
DOEF	Departments of Environment and Forests
DOF	Department of Forest
DPR	Detailed Project Report
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GHG	Green House Gas
GOI	Government of India
GSDP	Gross State Domestic Products
IRC	Indian Road Congress
MOEFCC	Ministry of Environment, Forests & Climate Change
MORTH	Ministry of Road Transport & Highways
NABL	National Accreditation Board for Laboratories
NHAI	National Highway Authority of India
NHIDCL	National Highways and Infrastructure Development Corporation
NOAA	National Oceanic and Atmospheric Administration
NOC	No-objection Certificates
PAPs	Project Affected Persons
PCU	Passenger Car Unit
PIU	Project Implementation Unit
PUC	Pollution under Control Certificate
PWD	Public Works Department
RAP	Resettlement Action Plan
RO	Regional Offices
ROB	Road over Bridge
ROW	Right of Way
SC	Supervision consultants
SPCBs	State Pollution Control Boards

CHAPTER 1 Introduction

1.1 Background of the project

In India, roads are one of most important modes of ground transportation as they constitute 85% of passenger transportation and 60% of freight transportation in India. However, the development of the road network in mountainous regions of the Northeastern Region of India has been much worse than the rest of the country. This is due to financial and technical reasons. Thus, the Northeastern Region has suffered greater economic disparity compared to other regions.

While 63.4% of the roads in India have been paved, only 28.5% of the roads in Northeastern Regions are paved, out of which only 53% of the national highways are more than 2 lanes. This is because the Northeastern Region is located far from the major areas of India. Furthermore, the roads leading to neighboring countries have been underdeveloped due to security concerns.

The severe natural conditions of the Northeastern Region featured by steep mountains and a prolonged monsoon season have also been obstacles for appropriately developing the road network. Economic growth in this part of the country has therefore been very delayed. The regional connectivity of the road network should promote cross-border trade and commerce and help safeguard India's international borders. This would lead to the formation of a more integrated and economically consolidated South and Southeast Asia. In addition, there would be overall economic benefits for the local population and would promote the integration of the peripheral areas.

The approximate aggregate length of 10,000km of road in the Northeastern Region has been identified for development. The development of the road network envisages creating customized and specialized skills addressing issues like the complexities of geographical terrains and the extensive coordination with the central and state governments.

The Government of India (GOI) thus launched in recent years the "Special Accelerated Road Development Program for Northeastern Region" for which improvement of the road network is of great importance. The GOI stated in their "Twelfth Five Year Plan (from April, 2012 to March, 2017)" that the improvement of national highways in the Northeastern Region should interconnect major cities within the region. It is within this context that the GOI requested that the Government of Japan provides assistance in the carrying out of the design work of two/four lane bridge including approaches over river Brahmaputra between Dhubri on the north bank and Phulbari on the south bank in the State of Assam / Meghalaya on NH-127B (length of 20km).

1.2 Outline of the project

The proposed Dhubri bridge will cross the Brahmaputra River and will be a 20-km long, four-lane bridge connecting Dhubri in the Assam State on the north bank and Phulbari in the Meghalaya State on the south bank. The construction site extends over two states, the Dhubri District on the north bank and the South Salmara-Mankachar District on the south bank belong to Assam State and the West Garo Hills District belongs to Meghalaya State. It extends from the starting point (89 ° 55 '45.68 "E & 26 ° 2' 10.49" N) towards the southeast, crossing over the Brahmaputra River and some of the sandbars reaches the south end point (90 ° 1 '59.11 "E & 25 ° 53' 25.98" N).

The locality is a flat lowland with an altitude of 35 m to 42 m. Approximately 500 km from the mouth of Brahmaputra river, annual flow rate $571 \times 10^9 \text{ m}^3$, flow rate $18,099 \text{ m}^3 / \text{s}$, flow rate varies greatly in the rainy season dry season and place, but on average $1 \text{ m}^3 / \text{s}$ in the vicinity of Dhubri, the water depth at the deepest part across the bridge is about 10 m in the rainy season about 4 meters in dry season. The banks are naturally sloped towards the river. The yearly sediment load of the Brahmaputra River is 800 million tons. The sandbars are made of sand

accumulated by the flooding of the river, and their locations and sizes are not constant due to hydrodynamic activity of the river. Some of the sandbars are inhabited by the local people conducting mainly agriculture, farming, fishing etc. Currently 20 to 30 small boats operate between Dhubri and Pulbari and to carry people and goods, but the time required to cross the river is about 2.5 hours.

A new bridge connecting Dhubri and Phulbari across the Brahmaputra river will improve the connectivity of the road and is the most important section. The construction of the new bridge will further connect the southwestern region of Meghalaya State and other parts of India at the shortest distance, and will greatly expand the transportation network of this region.

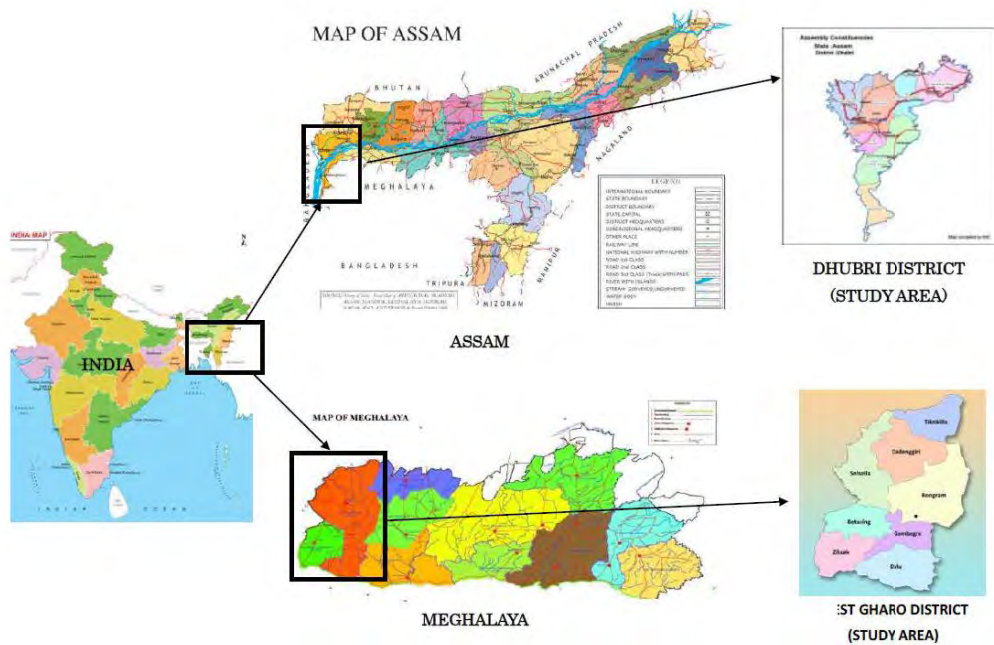


Figure 1-1 Project Location

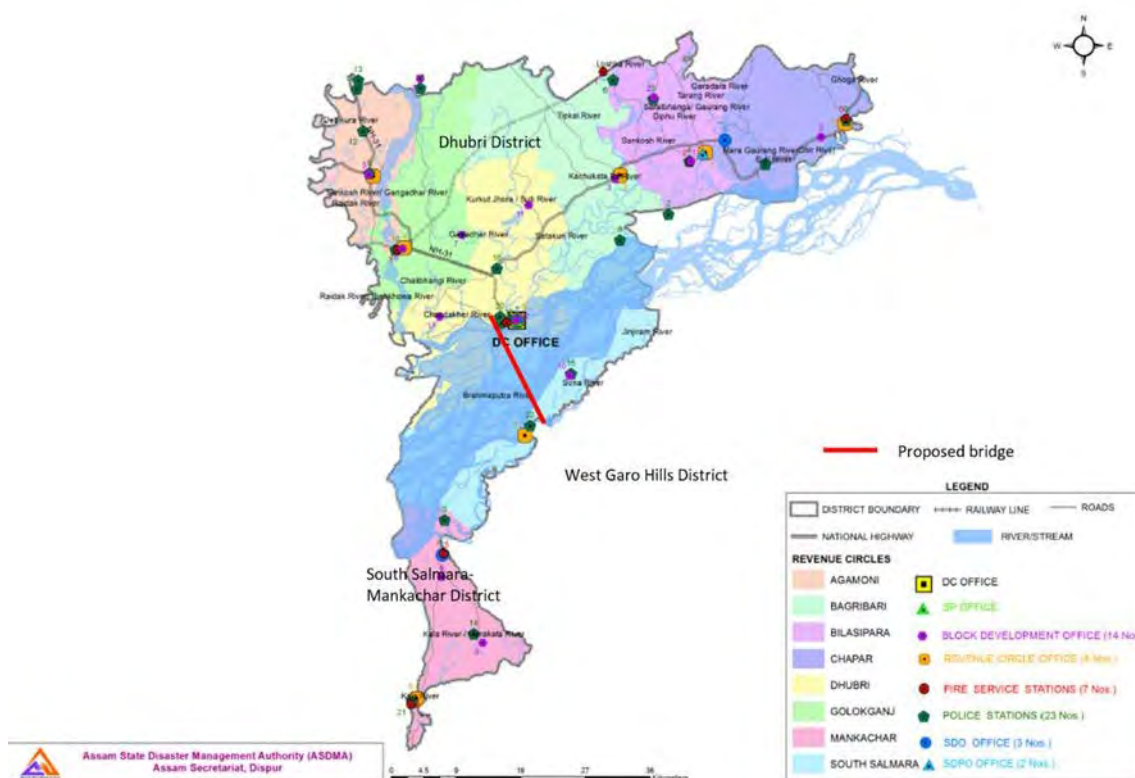


Figure 1-2 Project Site

1.3 Purpose of the Study

As per the MOEF & CC EIA Notification, dated 14.09.2006 (as amended in August 2013), any highway project falls under Category A if the project entails:

- 1) New National Highways; and
 - 2) Expansion of National Highways greater than 100km involving additional right of way or land acquisition greater than 40m on the existing alignments and 60m on re-alignments and bypasses.
- The proposed Dhubri-Phulbari Bridge project does not require additional land acquisition beyond 60m and has length of approximately 20km. and therefore, does not attract the provisions of the EIA Notification of 2013.

While a DPR consultant undertook a preliminary environmental assessment during the preparation of the DPR for Dhubri-Phulbari Bridge, the project does not require environmental clearance from MOEF & CC. On the other hand, the project has been classified as Category A per JICA's Guidelines for the Environmental and Social Considerations and the project requires a full EIA study including SIA and RAP surveys.

It is therefore the JICA Study Team's obligation to carry out EIA/SIA/RAP studies, which supplement the environmental studies carried out by DPR consultants. Thereby additional requirements short of JICA's guidelines are fulfilled.

The EIA/SIA/RAP studies carried out by JICA Study Team aimed to:

- Review the environmental assessment undertaken as part of the DPR study;
- Identify gaps between Indian laws and regulations relating to the EIA study and JICA Guidelines for Environmental and Social Considerations;

- Study the baseline of social and environmental conditions along the areas directly and indirectly affected during design, construction operation and maintenance of the NH40 widening project;
- Carry out environmental impact analysis with respect to the proposed project;
- Identify environmental issues that require further studies;
- Carry out an analysis of alternatives including a comparison with a “no project” scenario;
- Develop cost effective measures for mitigating adverse environmental and social impacts and enhancing positive aspects;
- Develop an Environmental Management Plan (EMP) for the mitigation of environmental impacts and the monitoring of the implementation of mitigation measures during the operation and maintenance period;
- Consult and inform the project affected persons (PAPs) and other stakeholders concerned with the project to encourage their active participation.

1.4 Scope of the Study

1.4.1 Geographical Extent

The geographical extent of this study is the area within a 10km radius of the proposed bridge alignment as shown in the Figure below.



Source: JICA Study Team

Figure 1-3: Geographical Extent of the Environmental Study

1.5 Principles of the Study

(1) Study Components of Natural Environment and Socio-economic Environment

This bridge construction project entails to some extent a negative impact on the natural environment as well as a social impact including a relatively large-scale resettlement. The survey covers not only direct and immediate impact but also secondary and cumulative impacts in accordance with JICA guidelines. The survey items include air, water, soil, waste, ecology, involuntary resettlement, the poor, livelihood, occupational safety, etc.

(2) Legal Framework Related to the Project

The legal framework and principles adopted for environment and social consideration of the project have been guided by the existing legislation and policies of the Government of India (GOI), the State Government of Assam and Meghalaya. Since the project is considering getting assistance from JICA, the regulatory/legal framework should be consistent with the national, state, local, as well as JICA Guidelines for Environmental and Social Considerations.

(3) Scope of Resettlement

This project extends to two states, the Assam and Meghalaya states, across the Brahmaputra River. The Char lands (sand bars) in the Brahmaputra River which belong to the Assam state will also be within the scope of land acquisition and resettlement. The Char lands are unique in that the shapes change according to the changes in water level. The area of the Char lands becomes smaller due to a rise in water level during the rainy season (May to October) and expands in dry season (November to April). In this survey, a census survey was carried out based on the list of villages and land plots prepared by the district governments from the land acquisition map produced by DPR consultant (prepared in June 2016). A Resettlement Action Plan (RAP) will be prepared in accordance with relevant Indian laws and regulations, World Bank's safeguard policy and JICA guidelines.

CHAPTER 2 Baseline Condition of the Natural and Social Environment

2.1 Natural Environment

2.1.1 Climate

The **Dhubri district** enjoys a subtropical humid climate with temperatures ranging between 10.5°C (minimum, in December/January) and 30°C (maximum, in July/August). A south west monsoon activates from May and continues up to September/October. The average annual rainfall of the district, as recorded in Dhubri, is 2,363mm with about 65% of rainfall occurring during the monsoon. The monthly evapotranspiration is about 40% of the rainfall, with the highest in August and lowest in January.

The **West Garo Hills** district has a mildly tropical climate. The climate of the district is largely controlled by the southwest monsoon and seasonal winds. The district being relatively lower in altitude compared to the rest of Meghalaya, experiences a fairly high temperature for most of the year. The average rainfall is 4203.8 mm, of which more than two-thirds occurs during the monsoon, with winter being practically dry. The district receives fairly high rainfall throughout the year. Most of the precipitation occurs during the rainy season, i.e. between April and October, due to the southwest monsoon. The average rainfall recorded at the Tura meteorological station is presented in the Table below.

Generally, light to moderate winds prevail throughout the year with speeds ranging from 1 to 26.5kmph. Winds were light and moderate particularly during the morning hours, while during the afternoon hours the winds were stronger. The wind rose diagram developed during October - November (2016) shown in Figure 2-1 reveals that the pre-dominant wind direction occurs from the north-east direction in the Dhubri district with an average wind speed of 7.2 kmph.

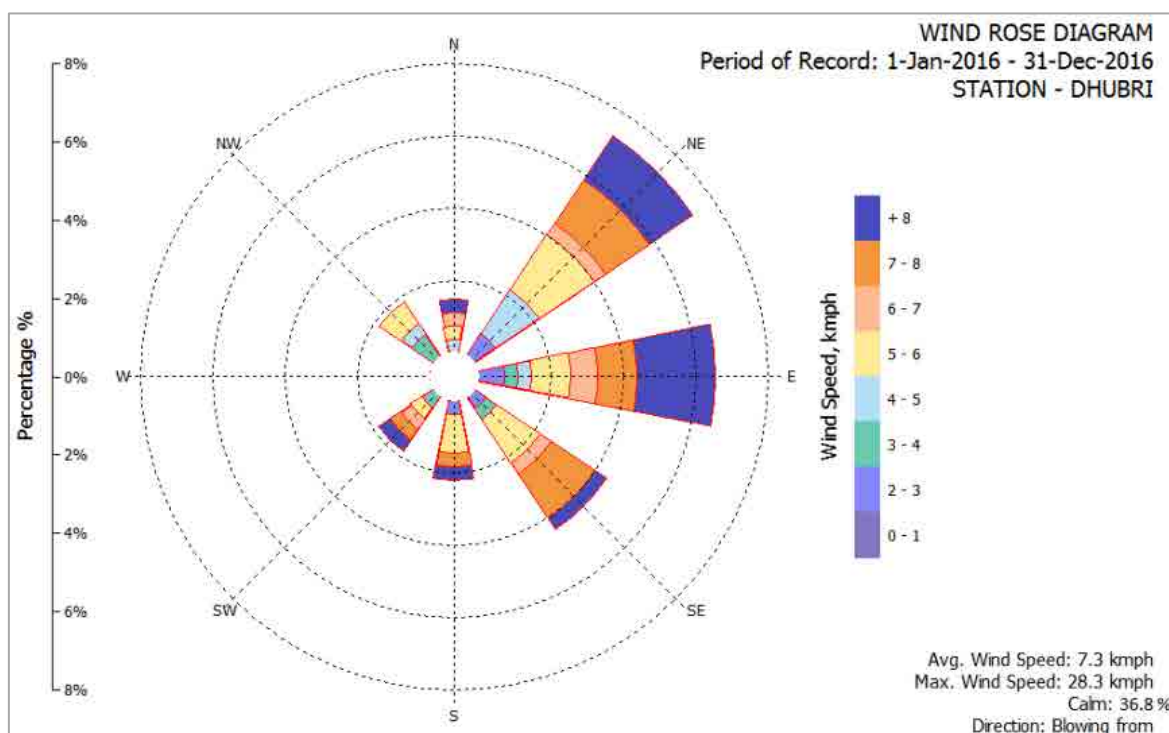
The following Table 2-1 shows the Meteorological Data Parameters in the Dhubri district (January – December 2016).

The wind speed and direction data have been collected for Guwahati from the Indian Metrological Department (IMD) during January - December 2016 and wind rose diagram has been prepared and shown in Figure 2-1.

Table 2-1: Meteorological Data Parameters at Dhubri district (January – December 2016)

Date	Temperature, deg C			Humidity, %			Pressure, hPa			Wind Speed, km/Hr	Predo-Minant Wind	Rainfall mm
	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Avg	Direction	
January	9.3	26.3	17.8	63	86	74.5	1009.7	1013.6	1011.65	4.8	NE	6.7
February	10.2	30.2	20.2	52	76	64	1007.1	1013.4	1010.25	5.6	N	6.6
March	13.4	35.8	24.6	48	68	58	1003.9	1011.2	1007.55	7.7	E	42.5
April	17.2	36.7	26.95	62	74	68	1000.9	1008.6	1004.75	11	NE	133.2
May	19.2	35.3	27.25	75	82	78.5	998.3	1005.7	1002	10.1	NE	340.4
June	21.7	35.2	28.45	83	89	86	995.2	1002.3	998.75	8.6	E	514.2
July	22.8	34.1	28.45	54	87	70.5	994.7	998.2	996.45	6.9	E	432.5
August	23.4	34.2	28.8	52	85	68.5	996.2	997.6	996.9	6.6	NE	368.2
September	22.3	24.5	23.4	86	83	84.5	999.5	1003.2	1001.35	6.4	NE	263.7
October	19.5	32.6	26.05	78	84	81	1004.5	1006.1	1005.3	6.9	NE	140.5
November	14.1	29.3	21.7	72	82	77	1007.5	1011.3	1009.4	7.4	NE	18.7
December	10.5	25.8	18.15	66	86	76	1008.6	1013.2	1010.9	5.7	NE	3.4

Source: IMD



Source: IMD

Figure 2-1: Wind Rose Diagram

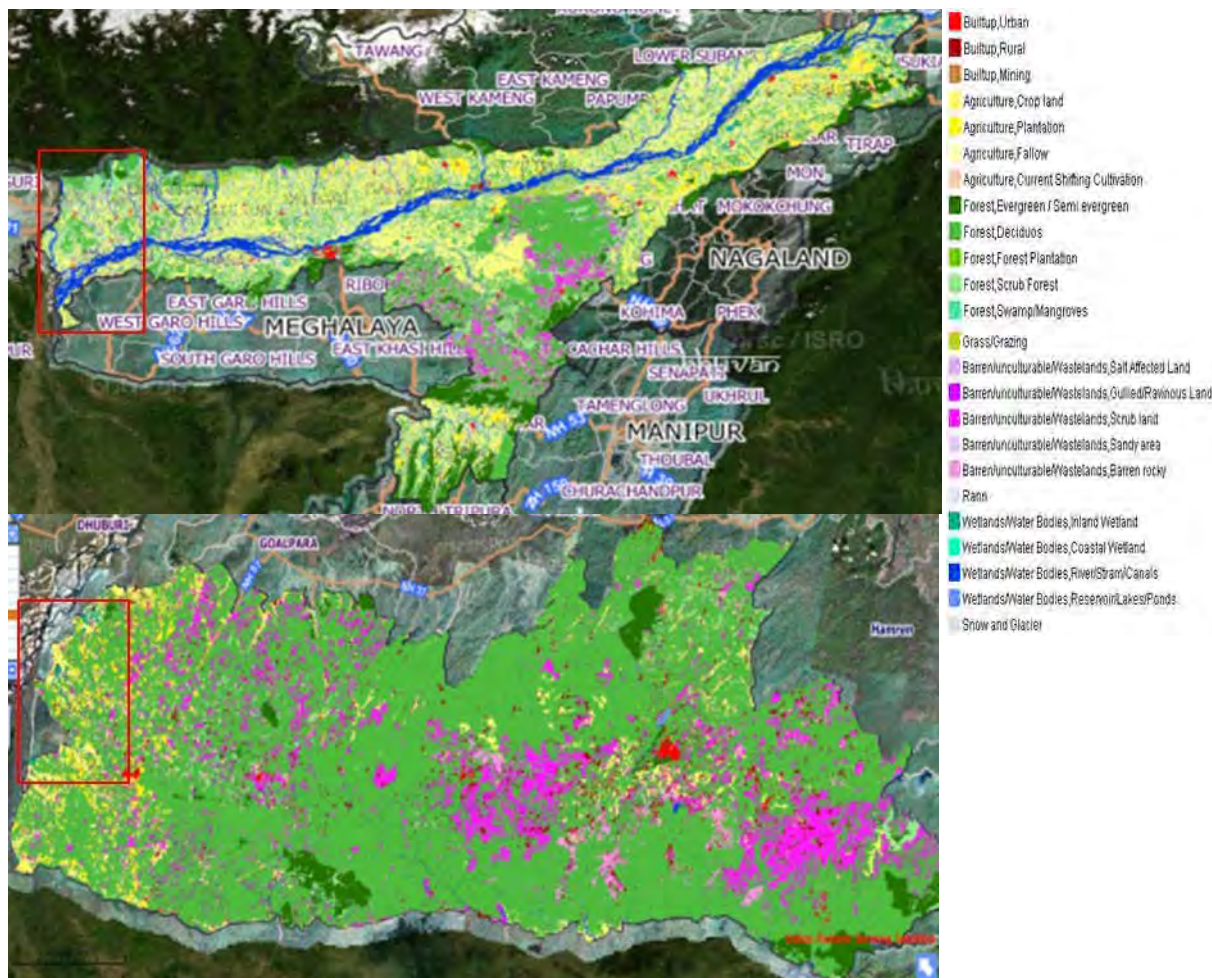
Table 2-2: Precipitation of West Garo Hills District in (mm)

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
22.1	14.7	105	269	514	889	910	643	502	298	13.3	24.2	4203.8

Source: <http://cgwb.gov.in/>

2.1.2 Land Use

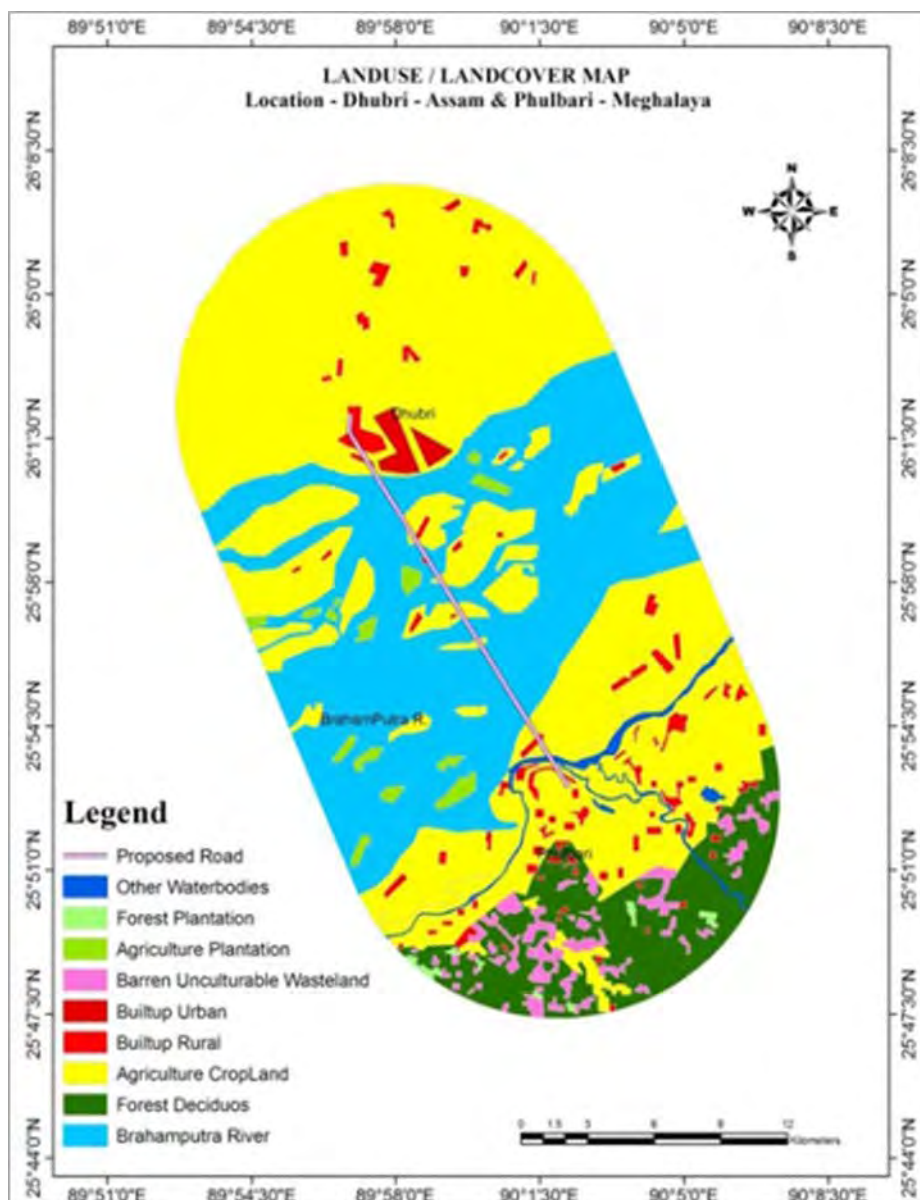
Current land use of the project's surrounding areas in Assam and Meghalaya State is shown in the following Figure. The majority of the areas in both Assam and Meghalaya State are agriculture land (yellow), forest deciduous (light green) and wastelands/shrublands (pink).



Source: bhuvan.nrsc.gov.in

Figure 2-2: Land Use of Assam and Meghalaya State

Figure 2-3 and Table 2-3 show the land use of a 5km radius of the project site. The area is composed of 45% agricultural land (yellow), 35% Brahmaputra River (light blue) and build up areas including residential structures (red) remains at 4%. The starting point of the approach road in the Dhubri District is planned to pass by the side of the residential area.



Source: Prepared by EIS based on Resourcesat I LISS-III

Figure 2-3: Land Use Pattern in 10km radius of the Project Area

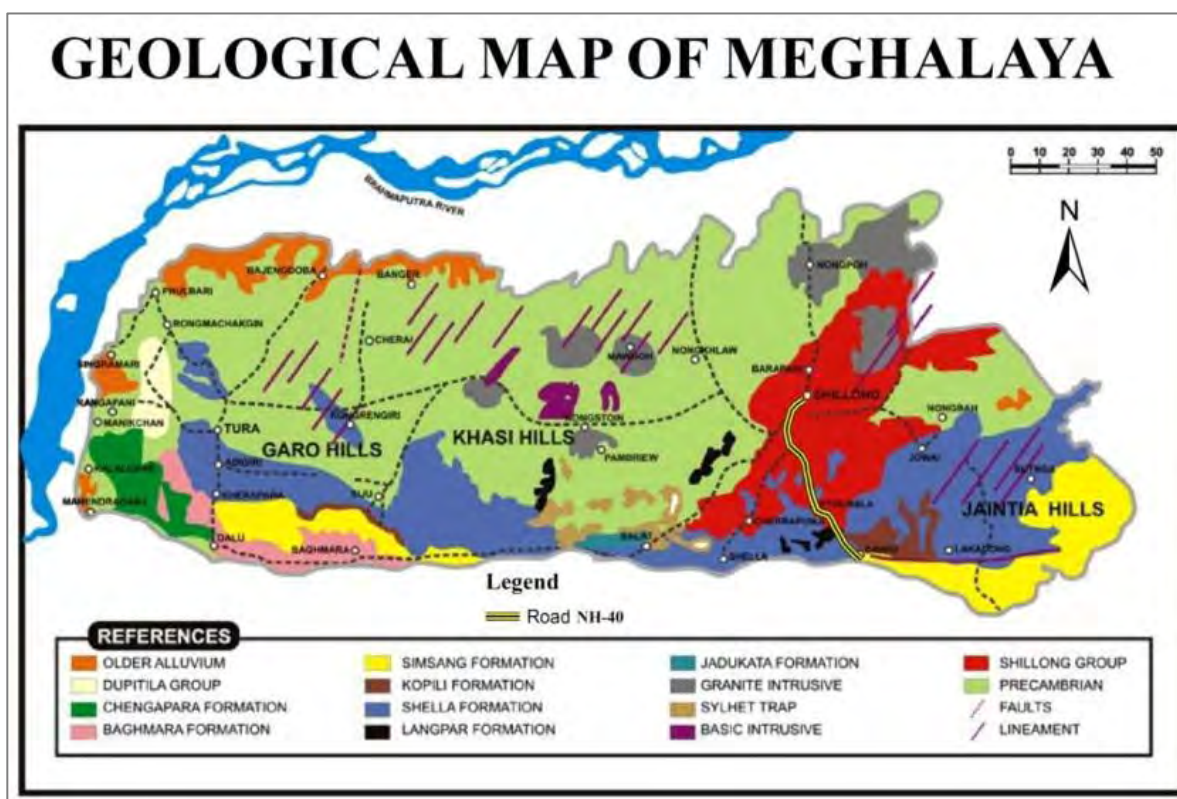
Table 2-3: Breakdown of the Land Use Pattern in 10km radius of the Project Area

Sl.No.	Land Use Class	% of Class
1	Proposed bridge	0.5%
2	Other Water bodies	1.5%
3	Forest Plantation	2.0%
4	Agriculture Plantation	2.0%
5	Barren Unculturable Wasteland	3.0%
6	Built up Urban	2.0%
7	Built up Rural	2.0%
8	Agriculture Crop Land	45.0%
9	Forest Deciduous	7.0%
10	Brahmaputra River	35.0%

Source: Prepared by EIS based on Resourcesat I LISS-III

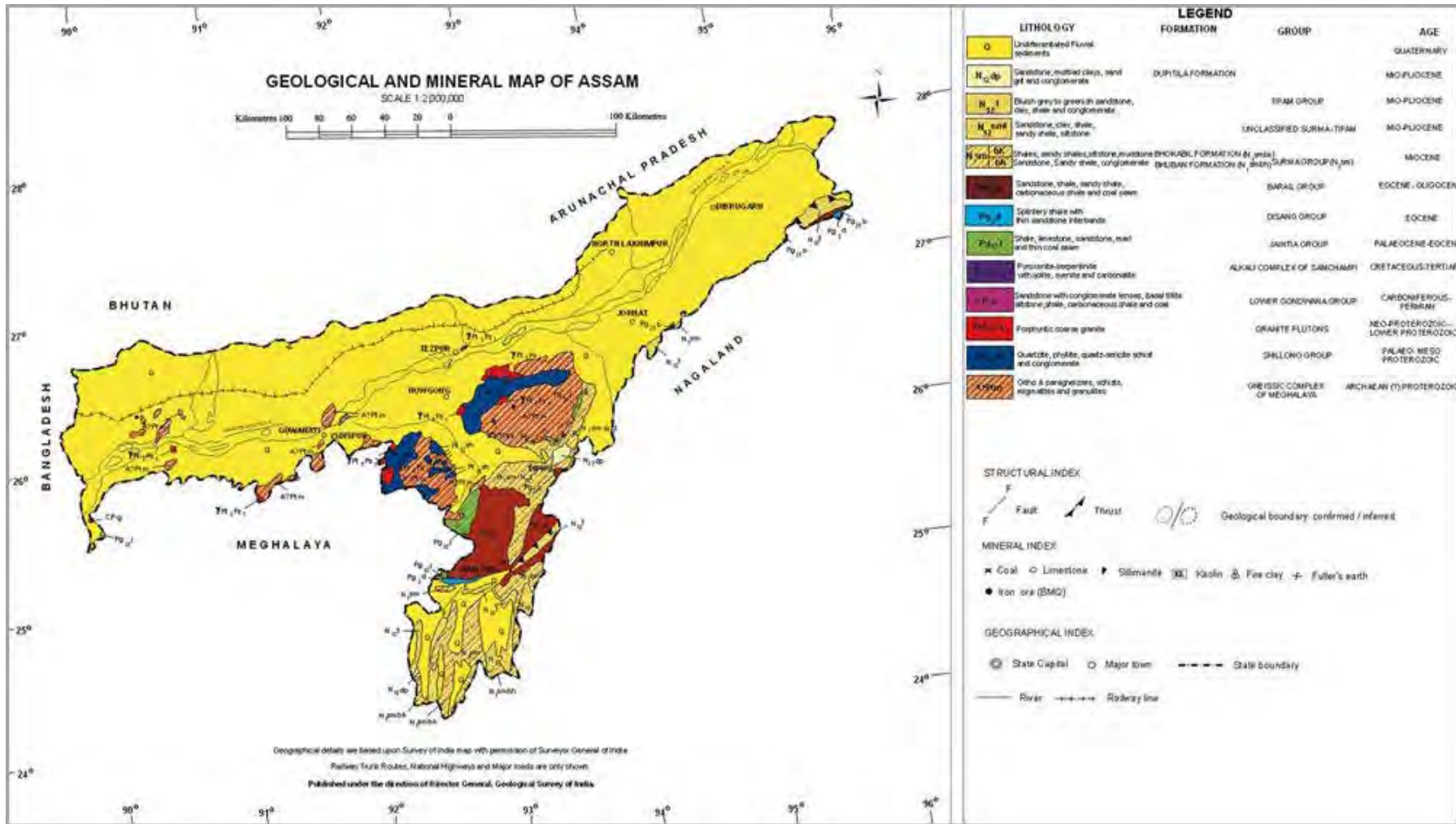
2.1.3 Geology and Geography

The proposed bridge alignment passes over the river Brahmaputra between Dhubri on the north bank and Phulbari on the south bank in the State of Assam and Meghalaya. The topography of the Dhubri/ South Salmara - Mankachar district is very peculiar. It has many rivers, small ranges of hillocks as well as several natural depressions. Physically, the greater part of the district is levelled plain land. Whereas in the West Garo Hills district with its undulating topography, the district constitutes the vast alluvial plains of the Brahmaputra River system. The monotony of the flat alluvial tract is interrupted by the presence of Archaean inliers in the form of disconnected hillocks referred to as inselbergs, and these occur especially in the eastern and southern parts of the district.



Source: Department of Mining & Geology, Government of Meghalaya

Figure 2-4: Geological map of Meghalaya



Source: Department of Mining & Geology, Government of Assam

Figure 2-5: Geological map of Assam

The Soil type of an area is dependent on factors like geology, relief, climate and vegetation. The soil of the Dhubri/South Salmara - Mankachar district has been found to be heterogenous in character. Most of the places, particularly the riverine identifies that loamy to sandy-loam soil is predominant. In some areas, clay to heavy clay soil are also present. Soil reaction is acidic and found to vary from 5.6 to 6.5 in pH scale. Whereas in greater parts of West Garo Hills district Soils are sandy and silty loam, or clay loam. It is found to be highly acidic to slightly alkaline in nature, is moderately permeable and characterised by the presence of low organic carbon and low soluble salts. Soils restricted to inselberg areas are more clayey, lateritic, less permeable and are highly acidic in nature. From an agricultural point of view, the soils in major parts of the area are suitable for all sorts of crops cultivation.

In the proposed Dhubri – Phulbari bridge of the study area, loamy to sandy-loam soil is predominant. In some areas, clay to heavy clay soil also present.

2.1.4 Geohydrology

The Dhubri / South Salmara-Mankachar district covers an area of 1664.10 sq.km. It is situated in the extreme south-west corner of the state and has an international boundary with Bangladesh in the west and south west and is bounded by the Kokrajhar district in the north, Goalpara district in the east and north-east, the Garo Hills district of Meghalaya in the south and the Kochbehar and Jalpaiguri districts of West Bengal in the north-west.

Surface Water source in the Dhubri / South Salmara - Mankachar District:

The district spreads on both sides of the Brahmaputra River. A number of perennial streams flow through the district from north to south and join the Brahmaputra River. The major streams that drain the area are the Gadadhar, Sankosh, Silai and Gouranga Rivers. A River map showing the regions of Dhubri and South Salmara – Manakchar is given below in Figure. 2-6.

Ground Water source in the Dhubri / South Salmara - Mankachar District:

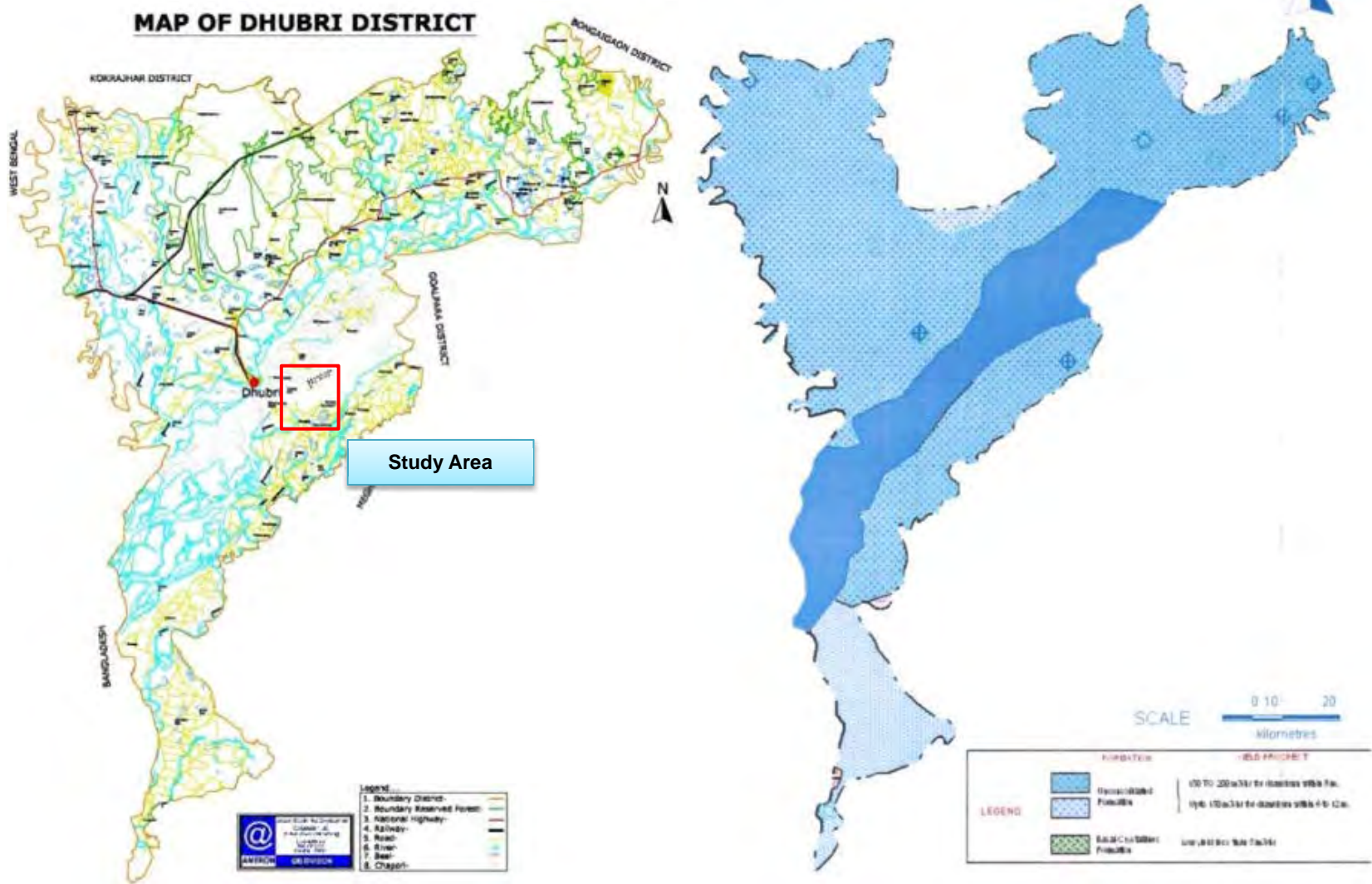
Ground water conditions in the district can be described using either of two distinct hydrogeological units, i.e. conditions prevailing in the consolidated formations, and the conditions prevailing in the unconsolidated formations. The net ground water availability estimated in the year 2009 is 1635.61 mcm. The existing gross ground water draft is 181.12 mcm and the stages of development are 11% only. Future provision for domestic and Industrial use is 65.35mcm and for Irrigation use is 1432.85 mcm. A Hydrogeological map showing the regions of Dhubri and South Salamara - Manakchar is given below in Figure. 2-6.

Surface Water source in the West Garo Hills District:

The topography controls the drainage system as it divides the state into two watersheds, namely the **Brahmaputra system** in the North and the Meghna /Surma system in the South. The Tura system range from watersheds in the West Garo Hills district, from which the rivers flow towards the Bangladesh plains in the south and the Brahmaputra valley in the north and west. A River map showing the regions of West Garo Hills district is given below in Figure. 2-7.

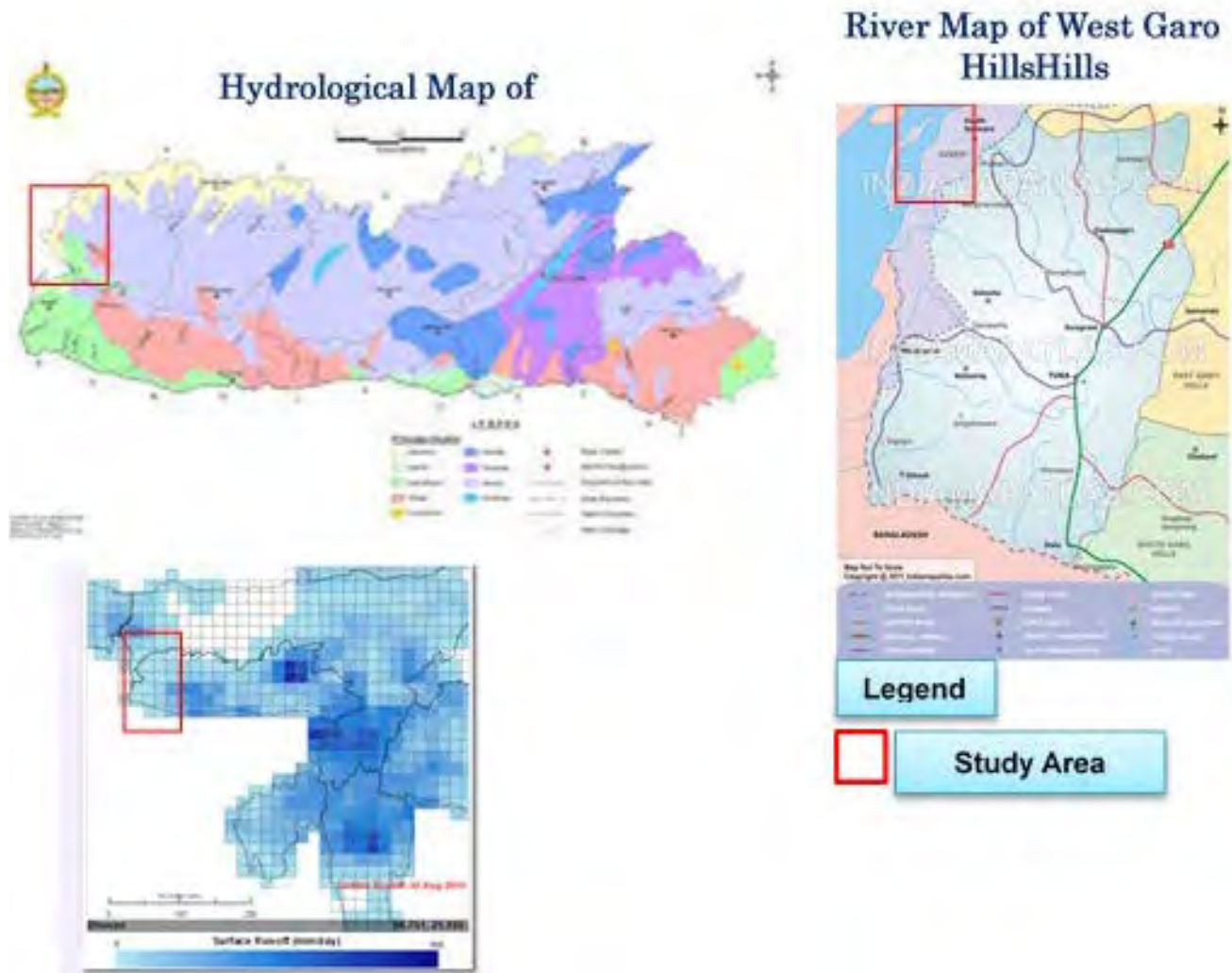
Ground Water source in the West Garo Hills District:

Hydro-geologically, the district can be divided into three units, namely, consolidated, semi consolidated and unconsolidated formations. The depth of the water level varies from 0.53 m bgl to 8.3 m bgl. The aquifer comprises sand and sand with gravel, while clay forms leaky aquitard. The maximum cumulative aquifer thickness is encountered around Ichaguri, Borkona, Barengapara and Betasing in alluvial areas of the West Garo Hills district. The granitic basement is encountered at a very shallow depth (less than 50 m.bgl) in the northern part of the district, while in the western and southern part of the district; basement has not even met a depth of 225 m.bgl. A Hydrogeological map showing the regions of the West Garo district is given below in Figure. 2-7.



Source: <http://dhubri.gov.in/DMPLan> & <http://cgwb.gov.in>

Figure 2-6: River Brahmaputra and Geohydrological Map of Dhubri District in Assam



Source: <http://cgwb.gov.in> & <http://bhuvan.nrsc.gov.in/>

Figure 2-7: Geohydrological & River Map of West Garo Hills, Meghalaya

2.1.5 Ecology

Interviews with the DPR Consultants and Dhubri District Forest Department have confirmed that there are no national parks, nature reserves or protected forests around the planned site of construction. The land portion of the Study area is mainly used as an agricultural land and residential area, so there is no primary forest or pristine ecosystem. However, the Brahmaputra River is a habitat for the Ganges river dolphins, and several of them were observed during the field survey.

The Ganges River dolphin belongs to the Platanistidae Family, and inhabits freshwater areas. Internationally it is a protected organism classified as Endangered in the IUCN Red List and further described in the CITES Appendix I. In India, it is designated as a protected species (Schedule I) by the Indian Wildlife Law (1972), and it is positioned as a National Aquatic Animal as a symbol of India. Its habitat extends to four countries- India, Bangladesh, Nepal and Bhutan; and lives only in limited areas of the Ganges River, Brahmaputra River, and its tributaries (the Meghna River, Karnaphuli River, Sangu River, etc.). The number of inhabitants in the whole world was estimated to be 4,000 to 5,000 in the 1980s, and 2000 in the 1990s; but it is estimated to have been about 1,200 in 2012, the decrease remarkable. The main reasons for the decrease in population are the loss of species that act as prey to the dolphins due to poaching, bycatch, over catching, water pollution, and division of habitat due to dam construction and topography modification of the river through inflow / extraction of sediment.

(1) The Biological Diversity Act, 2002

The Biological Diversity Act is a law stipulated on the conservation, utilization, and benefit sharing of genetic resources and the Biodiversity Board has been established for each state based on this law. The main function of the Board is to give appropriate advice to the state government on issues concerning biodiversity conservation. The designation of Biodiversity Heritage Sites is also stipulated.

As a national policy for conserving biodiversity, the National Biodiversity Action Plan was formulated in 2008, which covers the conservation of biodiversity, its sustainable use, the equal distribution of profits arising from the use of biodiversity, the protected area network focused on the conservation of species, and so forth. Furthermore, it recognizes the importance of regulation on the introduction of alien species, eradication of alien species, and consideration on biodiversity in economic development projects. Assam State has formulated the state forest policy in 2004, among which, in addition to conservation and recovery of forests, strengthening of protected area network, conservation of wetlands, conservation of wetlands, conservation of wildlife as ways to preserve biodiversity preservation of habitats of living beings, promotion of research and research, etc. are listed.

For the sake of aquatic organisms living in the Brahmaputra river including in the Ganges Dynasty, it is necessary to carefully examine the impact of the implementation of the project, especially after conducting detailed surveys in the future.

2.2 Living Environment

2.2.1 Water Quality

There are many low wetlands around the planned construction site, and the Brahmaputra River which also boasts abundant water flow also flows. The turbidity of the Brahmaputra River was very high at the time of field survey in October 2016. As seen in other states in India, unprocessed domestic wastewater flows into the Brahmaputra River, and there are the residents who are bathing in the river and washing. As a result, some degree of artificial contamination (especially

organic matter, etc.) is occurring. Sampling and analysis of the surface water and groundwater was conducted by the DPR survey in March 2016, and the results are shown below. The number of microorganisms exceeds the environmental standard, but others are within the reference value.

Table 2-4: Results of Water Quality Analysis

Sl. No.	Parameter	Unit	CPCB standard for drinking water (desirable limit/ permissible limit)	Chagalchora Bore Well (Ground Water)	Motichora Handpump (Ground Water)	Motichora Brahmaputra (Surface Water)	Savadari Handpump (Ground Water)	Chaitarchar Brahmaputra (Surface Water)
1	Temperature	C	-	22.0	22.6	23.8	23.0	23.0
2	pH value	-	6.5 – 8.5 no relaxation	7.38	7.20	7.56	7.52	7.72
3	Conductivity	µS/cm	-	571.47	593.23	185.09	559.80	182.26
4	Total dissolve solid (TDS)	mg/l	500/2000	371.45	385.60	120.31	363.87	118.26
5	Dissolve Oxygen	mg/l	-	4.3	4.2	6.1	4.8	6.8
6	Turbidity	NTU	5/10	<1.0	<1.0	1.0	<1.0	1.2
7	Salinity	ppt	-	4.8	4	3.8	4	4
8	Alkalinity	mg/l	-	212	221	68	203.90	66
9	Calcium as (CaCO ₃)	mg/l	75/200	162	192.84	50.3	173.60	48.8
10	Magnesium As (CaCO ₃)	mg/l	-	35.6	27.16	16.59	25.40	17.2
11	Total hardness as (CaCO ₃)	mg/l	200/600	197.60	220.0	66.89	199.0	66.0
12	Chloride as (Cl)	mg/l	250/1000	26.80	26.4	0.19	29.70	0.21
13	Iron (as Fe)	mg/l	0.3/1.0	0.238	0.261	0.258	0.252	0.261
14	Manganese (as Mn)	mg/l	0.1/0.3	BDL	BDL	BDL	BDL	BDL
15	Arsenic (as As)	mg/l	0.05 no relaxation	0.02	0.02	<0.01	0.01	<0.01
16	Fluoride (as F)	mg/l	1.0/1.5	0.85	0.98	0.34	0.71	0.38

Source: DPR Study

2.2.2 Air Quality

Air quality analysis was conducted by DPR consultants in March 2016. The results of the analysis are shown below. At all sampling points the air quality was good and parameters were within the national environmental standards.

Table 2-5: Results of Air Quality Analysis

Ambient Air Quality Data March 2016				Location 1 : AQ1 (Village-Chagal Chora)		
S.No	Date	PM2.5, µg/m ³	PM10, µg/m ³	SO ₂ µg/m ³	NO ₂ µg/m ³	CO, µg/m ³
		Gravimetric	IS:5182:Pt-23	IS:5182:Pt-2	IS:5182:Pt-6	IS:5182:Pt-10
1	01.03.2016	36.5	82.5	9.3	16.8	502
2	05.03.2016	32.3	80.6	8.6	15.9	460
3	09.03.2016	44.9	90.3	10.2	22.2	582
4	13.03.2016	39.8	84.5	9.8	18.9	516
	Min	32.3	80.6	8.6	15.9	460
	Max	44.9	90.3	10.2	22.2	582
	Average	38.4	84.5	9.5	18.5	515.0
	98 Percentile	44.6	90.0	10.2	22.0	578.0
NAAQS. For 24 hourly monitoring (except CO for One hour)		60	100	80	80	4000

Ambient Air Quality Data March 2016				Location 2: AQ2 (Village-Savodari)		
S.No	Date	PM2.5,µg/m3	PM10,µg/m3	SO ₂ µg/m3	NO _x µg/m3	CO, µg/m3
		Gravimetric	IS:5182:Pt-23	IS:5182:Pt-2	IS:5182:Pt-6	IS:5182:Pt-10
1	01.03.2016	22.3	73.3	6.8	12.3	312
2	05.03.2016	24.8	65.7	5.9	12.9	230
3	09.03.2016	23.6	69.8	6.4	14.2	345
4	13.03.2016	26.8	75.9	7.2	13.6	308
	Min	22.3	65.7	5.9	12.3	230
	Max	26.8	75.9	7.2	14.2	345
	Average	24.4	71.2	6.6	13.3	298.8
	98 Percentile	26.7	75.7	7.2	14.2	343.0
NAAQS. For 24 hourly monitoring (except CO for One hour)		60	100	80	80	4000

Ambient Air Quality Data March 2016				Location 3: AQ3(Village-Motichora)		
S.No	Date	PM2.5,µg/m3	PM10,µg/m3	SO ₂ µg/m3	NO ₂ µg/m3	CO, µg/m3
		Gravimetric	IS:5182:Pt-23	IS:5182:Pt-2	IS:5182:Pt-6	IS:5182:Pt-10
1	01.03.2016	37.8	83.7	9.7	17.3	527
2	05.03.2016	30.1	76.1	8.7	15.2	482
3	09.03.2016	41.3	88.6	10.1	20.8	561
4	13.03.2016	33.5	82.6	9.3	16.4	432
	Min	30.1	76.1	8.7	15.2	432
	Max	41.3	88.6	10.1	20.8	561
	Average	35.7	82.8	9.5	17.4	500.5
	98 Percentile	41.1	88.3	10.1	20.6	559.0
NAAQS. For 24 hourly monitoring (except CO for One hour)		60	100	80	80	4000

Ambient Air Quality Data March 2016			Location 4 : AQ4 (Village-Chaitarchar)			
S.No	Date	PM2.5,µg/m3	PM10,µg/m3	SO ₂ µg/m3	NO _x µg/m3	CO, µg/m3
		Gravimetric	IS:5182:Pt-23	IS:5182:Pt-2	IS:5182:Pt-6	IS:5182:Pt-10
1	01.03.2016	22.8	56.8	BDL	8.7	220
2	05.03.2016	23.2	60.5	BDL	9.8	283
3	09.03.2016	18.6	54.9	BDL	8.3	212
4	13.03.2016	21.8	58.8	BDL	9.2	249
	Min	18.6	54.9	BDL	8.3	212
	Max	23.2	60.5	BDL	9.8	283
	Average	21.6	57.8	BDL	9.0	241.0
	98 Percentile	23.2	60.4	BDL	9.8	281.0
NAAQS. For 24 hourly monitoring (except CO for One hour)		60	100	80	80	4000

Source: DPR Study

2.2.3 Noise and Vibration

According to the DPR Study, the ambient noise level in the study area is below the national environmental standard. There is no data for vibration.

Table 2-6: Ambient Noise Level in the Study Area

Location	Eq. Noise levels dB(A), Day.(Leq).	Eq. Noise levels dB(A), Night.(Leq)	National Ambient Air quality standard w.r.t. Noise, 2000 in dB(A) Day. (Leq)	National Ambient Air quality standard w.r.t. Noise, 2000 in dB(A) Night. (Leq)
Chagalchora (Residential)	53.2	38.8	55	45
Motichora (Commercial)	60.2	50.8	65	55
Savodari (Residential)	51.8	40.6	55	45
Chaitarchar (Residential)	48.9	36.7	55	45

Source: DPR Study

2.2.4 Soil Quality

During the DPR Study, soil samples were collected from 4 locations and analyzed. The result is as follows.

Table 2-7: Results of Soil Quality Analysis

S.No	PARAMETERS	TEST METHOD	UNIT	Chagal chora	Moti chora	Savodari	Chaitarchar
1.	pH(1:5 suspension)	IS:2720(Part-26)	-	7.38	7.21	7.43	7.28
2.	Electrical Conductivity at 25°C (1:5suspension.)	IS:2720(Part-21)	µS/cm	449	458	418	435
3.	Calcium Sulphate	STP/SOIL	mg/kg	BDL	BDL	BDL	BDL
4.	Magnesium(as Mg)	STP/SOIL	mg/kg	145.34	130.7	123.5	139.80
5.	Organic Matter	IS:2720(Part-22)	% by mass	6.28	5.25	4.61	5.65
6.	Potassium(as K)	STP/SOIL	mg/kg	133.15	127.6	123.5	119.83
7.	Water holding Capacity	STP/SOIL	% by mass	34.65	30.6	29.5	31.18
8.	Porosity	STP/SOIL	% by mass	29.40	25.1	23.8	26.46
9.	Sand	STP/SOIL	% by mass	42.40	38.59	43.70	40.16
10.	Clay	STP/SOIL	% by mass	50.32	54.27	46.82	53.32
11.	Silt	STP/SOIL	% by mass	7.28	7.14	9.48	6.52
12.	Sodium Sulphate	STP/SOIL	mg/kg	15.12	14.8	13.24	13.60
13.	Sodium Absorption Ratio	STP/SOIL	-	4.89	4.61	4.03	4.40
14.	Nitrogen	STP/SOIL	% by mass	0.064	0.060	0.051	0.057
15.	Phosphorus	STP/SOIL	mg/kg	23.4	25.4	20.5	21.06
16.	Bulk Density	STP/SOIL	gm /cc	1.32	1.46	1.26	1.18
17.	Texture	STP/SOIL	-	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay
18.	Moisture Retention Capacity	STP/SOIL	% by mass	22.0	20.5	24.6	19.8
19.	Infiltration Rate	STP/SOIL	mm/hr	24.0	26.4	20.3	21.6
20.	Moisture	STP/SOIL	%	16.20	15.64	13.81	14.58
21.	Sulphates	STP/SOIL	mg/1000g	14.24	15.2	13.64	12.81
22.	Sulphur(as S)	STP/SOIL	mg/kg	0.082	0.087	0.077	0.073
23.	Manganese (as Mn)	STP/SOIL	mg/kg	0.052	0.049	0.040	0.046
24.	Iron (as Fe)	STP/SOIL	mg/kg	0.70	0.75	0.67	0.63
25.	Exchangeable Sodium Percentage	STP/SOIL	mg/kg	0.062	0.066	0.051	0.055

Source: DPR Study

2.3 Socio-economic Environment

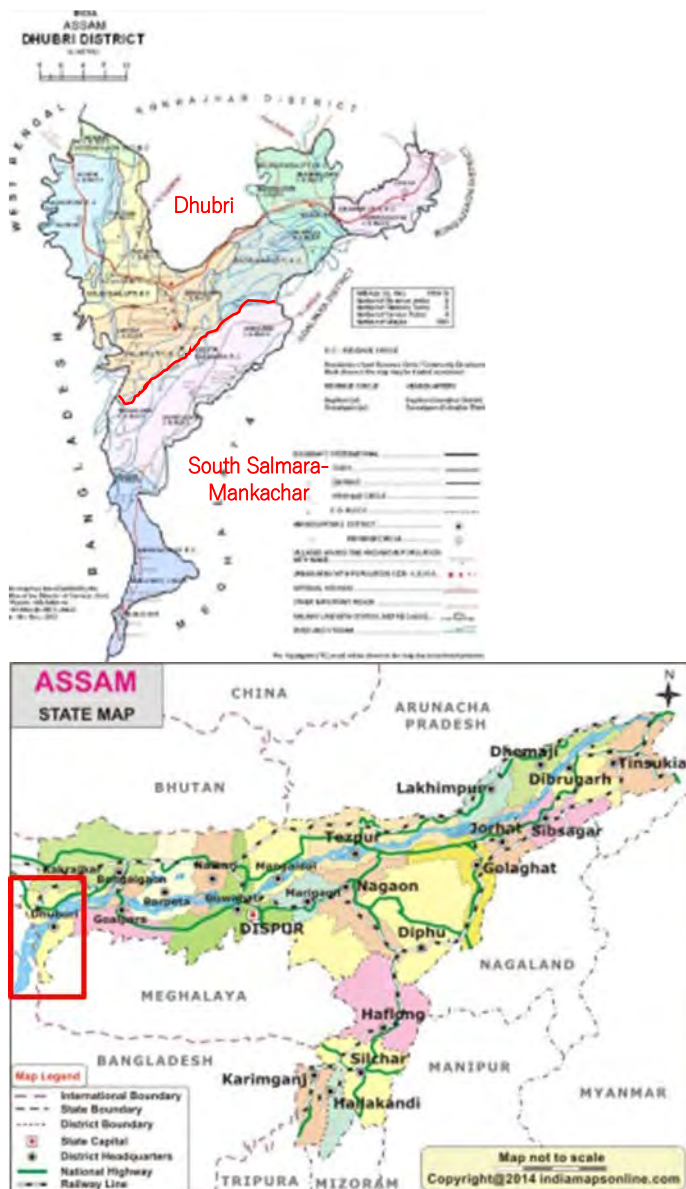
This project is located in the Dhubri District and South Salmara-Mankachar District of Assam State and the West Garo Hills District in Meghalaya State. The western end of the bridge is at Dhubri and it goes across the Brahmaputra River and ends at Phulbari in the north of West Garo Hills. There are Char lands formed in the Brahmaputra River by the sand/silt from the upper stream. This Char land also belongs to the Dhubri and South Salmara-Mankachar Districts.

2.3.1 Assam State

1) Administrative Division

Assam State is located in the northeastern part of India and is bounded on the north by Bhutan and the west by Bangladesh. The Dhubri and South Salmara-Mankachar Districts are situated in the extreme western corner of Assam State. Administratively, the Dhubri District has two subdivisions namely Dhubri and Bilasipara along with eight revenue circles and seven tehsils. The South Salmara-Mankachar District is a newly formed district carved out from the Dhubri District in 2015 and officially became an administrative district in February 2016. It was formerly a subdivision of the Dhubri District. The South Salmara-Mankachar District has 2 revenue circles and 2 tehsils.

The distance from Dhubri town to the capital of Assam State, Dispur is approximately 290km. The distance between Hasingmari town, the capital of South Salmara-Mankachar District located across the Brahmaputra River, and Dispur is approximately 245km by the route through Meghalaya State.



Source: JICA Study Team

Figure 2-8: Map of Assam State

2) Demographic Situation

The total area of the Dhubri District is 2,176km² with the population of 1,949,258. The population density is 896 persons/km², which is more than double compared to the Assam State average (398 people/km²). The population growth during 2001-2010 is 24.4% which is much higher than the Assam State average (17.1%). The literacy rate of the Dhubri District is 58.3% which shows quite a lower rate than that of the state average (72.2%).

The South Salmara-Mankachar District covers 568km², holding a population of 555,114. Out of which, rural population consists of around 95%. The population density of the district is 869 persons/km², which is similar to the Dhubri District. The literacy rate is 39.9%, which is significantly low compared to the state average as mentioned above.

The following Table shows the demographic data of Assam State and two districts in the project sites.

Table 2-8: Demographics of Assam State and Districts in the Project Site

Item	Assam State	Dhubri District	South Salmara-Mankachar District
Area (km ²)	78,438	2,176	568
Population (no.)	31,205,576	1,949,258	555,114
Male-female ratio (no.) (1,000 men)	958	953	—
Population density (ppl/km ²)	398	896	869
Population growth rate (2001-2010)	17.1%	24.4%	—
Urban population	14.1%	10.5%	4.7%
Literacy rate	72.2%	58.3%	39.9%

Source: Census 2011

3) Ethnic Group and Religion

Assam State is home to the Assamese, Bodo and Ahom people. The official languages used in Assam State are Assamese and Bodo. Other than that, Bengali is also used in the project area which is similar to Assamese. The following Table shows the population ratio of the Scheduled Caste (SC)¹ and Scheduled Tribe (ST)². The ratio is lower in the Dhubri District and South Salmara-Mankachar District compared to the Assam state average. Based on the survey, it is confirmed that minority groups, including the Bodo tribes³, are not included in the project affected households.

Table 2-9: Scheduled Caste and Scheduled Tribe in Assam State

Item	India average	Assam State	Dhubri District	South Salmara-Mankachar District
SC population	16.2%	7.2%	3.6%	1.4%
ST population	8.2%	12.5%	0.3%	1.8%

Source: Census 2011

The Dhubri District has a large population of Muslims. Approximately 80% of the population is Muslim and the remaining 20% is Hindu. The South Salmara-Mankachar District is also Muslim dominant, composed of 95% Muslims and 5% Hindu.

4) Economy and Industry

The GSDP of Assam State in 2013-14 accounts for Rs. 885.4 billion and per capita GSDP is Rs. 50,558. The average annual growth rate during the past 10 years was approximately 6%. Industry wise ratio of GSDP in 2013-14 shows that service sector accounts for 60%, agriculture and

¹ Scheduled Caste (SC) refers to the group of people formerly known as Dalit (the lowest class in Hindu society) designated by the Indian Constitution.

² Scheduled Tribe (ST) is a group of tribes designated by the Indian Constitution who has a distinctive culture, are geographically isolated and are socio-economically lagging.

³ For a reference, the Bodo tribe is one of the tribes designated in the sixth schedule in India having its roots in Tibeto-burman languages and call themselves "Bodosa". A majority of the Bodo tribe are Hindu. The Bodo tribe continued armed conflict for their political independence, and Bodoland Autonomous Council was established in western Assam in 1993, and Bodoland Territorial Autonomous District was established in 2003.

industry sector shares 20% respectively. The shares of the agriculture and industry sectors have been decreasing over the past 10 years while the contribution of the service sector is increasing. Sector-wise annual growth rate is 3.8% for agriculture, 2.8% for the industry sector and growth of the service sector is the highest at 10.3%.

Table 2-10: Economic Trend in Assam State

Item	2004-05	2008-09	2013-14	Annual growth (10year average)
GSDP (Rs. in billion)	534.0	640.3	885.4	6.6%
Ratio in GSDP Agriculture (%)	25.6	23.4	21.3	3.8%
Industry (%)	27.5	25.9	21.3	2.8%
Service (%)	46.9	58.1	57.5	10.3%

Note: GSDP in Constant Price (2004-05)

Source: Planning Commission, Government of India

The composition of workers shows that majority of the workers in Assam State are engaged in agriculture related work accounts for 56.2% out of which 25.6% are the landless agriculture labors. At the project site, a majority of the population is cultivating paddies along with pulses and vegetables, in the Char land jute is also one of the major crops. In this area, animal husbandry, fishery and boat operation are also the income source for the population.

Table 2-11: Workers Ratio in Assam State

Item	Assam State	Dhubri District
Worker population (%)	38.4	34.4
Cultivator (%)	33.9	30.7
Agriculture worker (%)	15.4	25.6
Domestic worker (%)	4.1	4.2
Other worker (%)	46.6	39.7

Source: Directorate of Census Operations Assam, 2011

5) Char Lands

One of the peculiar features of the Brahmaputra River which flows in Assam State is the presence of riverine silt islands (the Char lands). The geographical spread of the Char lands is over 14 districts of Assam State and the major part of the project area falls under these Char lands.

The landform of the Char lands changes according to the erosion and deposition of silts and sands over the years. The areas also change in size and shape due to the changes of water level in the rainy season (May to October) and dry season (November to April). The origin of the populations in the Char lands dates back to the colonial period when the British administrators induced a large number of agriculture labors from East Bengal (former Bangladesh). Due to this historical background, the majority of the population in the Char lands is Muslim.

The official surveys focused on the Char lands were carried out in 1992-93 and 2003-04. According to the survey in 2003-04⁴, the total population of the Char lands is 2,490,097 and the population in Dhubri and the South Salmara-Mankachar District alone (former the Dhubri District) is 689,909. The result of those surveys shows that the Char lands represents one of the most backwards areas in the state showing high population growth, high poverty level and a low literacy rate. The population of Below Poverty Line (BPL) is 69% and a literacy level is 14.6%; both of which have worsened in 10 years.

⁴ Socio-Economic Survey Report, 2003-04, Directorate of Char Areas Development, Govt. of Assam.

Table 2-12: Demographics of Char Area in Dhubri / South Salmara-Mankachar district

Year	Population	Population Growth	Household	BPL Household	Literacy
1992-93	233,206	—	—	54.2%	19.1%
2003-04	689,909	51.1%	109,748	69.0%	14.6%

Source: Socio-Economic Survey Report, 2003-04, Directorate of Char Areas Development, Govt. of Assam

In some areas, there are land registration records and private lands are allocated to villagers in the Char lands. However, the villagers in the Char lands are living in movable temporary structures so that they're able to shift their locations as necessary. Based on the interview survey conducted during the site visits, villagers who live on the land that will be under water during the rainy season will move their location to a neighboring area or other village in the Char land. During the dry season, some come back to the original place and others continue to stay in the shifted land.



Temporary residents in the Char Land



Erosion of the Char Land

In terms of basic amenities in the villages of the Char lands, hand pumps are introduced in some areas and some areas are sourcing the drinking water from the river. In a majority of the areas, electricity and sewage systems are unavailable. Lower primary and middle schools are established in the villages, however for higher education, the children must go to nearby towns. Medical sub-centres were provided in some areas, however, there are only visiting doctors available. The infrastructures and facilities are very much limited in those areas.



Hand pump in Char land

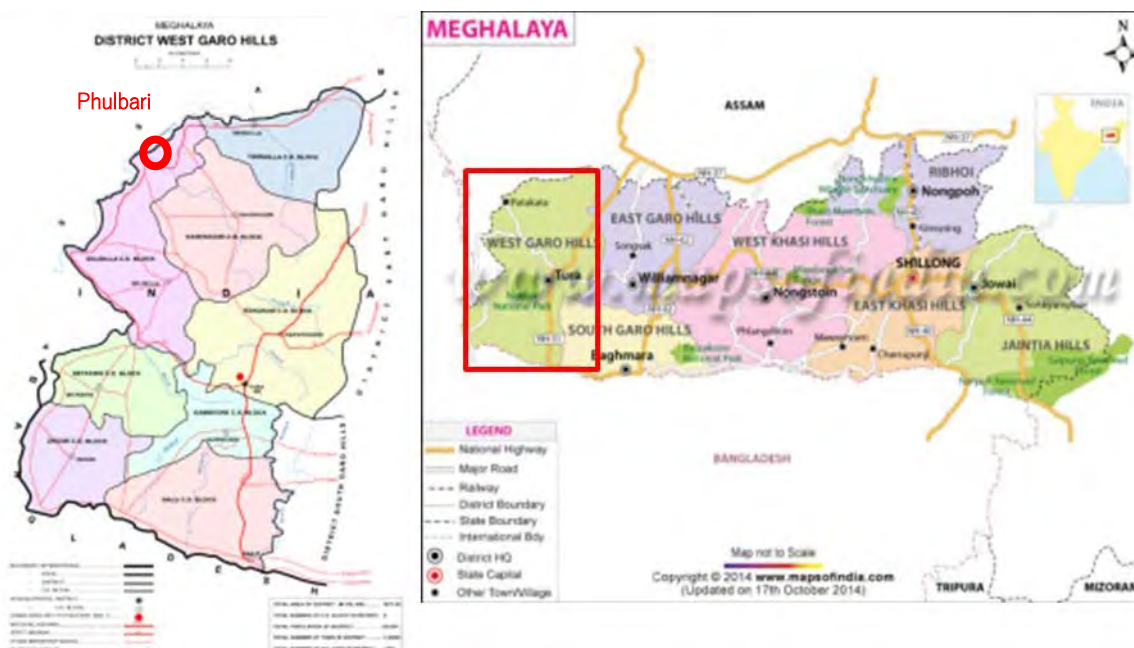


Primary School in Char land

2.3.2 Meghalaya State

1) Administrative Division

Meghalaya State was a part of Assam State before 1970. It was founded as autonomous state in April 1970 and gained its status as an independent State in January 1972. The State shares the border with Assam State in the north and Bangladesh in the south and west. It is composed of 11 Districts. The West Garo Hills District is situated in the western corner of Meghalaya State. The state's capital, Tura, holds the second largest population in the State. The Phulbari village, at the end of the bridge, is located at the north end of the West Garo Hills District. The distance from Phulbari to Tura is approximately 80km, however, due to poor road conditions, it will take 3-4 hours to travel the distance by car.



Source: JICA Study Team

Figure 2-9: Map of West Garo Hills District

2) Demographic Situation

Total area of the West Garo Hills District is 1,650km², which is 7.4% of the total area of Meghalaya State. The district holds a population of 642,923, which is approximately 20% of the state population. The population growth rate of 2001-2010 was 26.7%, which is slightly lower than the state average (28.0%). The literacy rate of the West Garo Hills District is 67.6%, which is lower than the state average of 74.4%. The following Table shows the demographic situation of Meghalaya State and the West Garo Hills District.

Table 2-13: Demographic Situation of Meghalaya State

Item	Meghalaya State	West Garo Hills District
Area (km ²)	22,429	1,650
Population (no.)	2,966,889	642,923
Male-female ratio (no.) (1,000 men)	28.0%	26.7%
Population density (ppl/km ²)	132	173
Population growth rate (2001-2010)	20.0%	11.6%
Urban population	74.4%	67.6%

Source: Census 2011

3) Ethnic Group and Religion

The main tribes in Meghalaya State are Kashi, Garo and Jaintia who reside in the hills of a different area. The official languages in the state are Kashi, Garo and English. Around the project area, Garo tribes are dominant in the hill area. However, since the end of the bridge locates at the border of Assam State and it is plain area along the Brahmaputra River, Muslims are the main residents. Therefore, the common language used in the project area is Bangali.

Meghalaya State holds large populations of Scheduled Tribe (ST) which is a common feature of the states in North Eastern India. The population of ST in Meghalaya State is 86.2% while Scheduled Caste (SC) population is 0.6%, which is significantly low compared to the Indian average. In the case of the West Garo Hills District, ST accounts for 73.7%, out of which 71.2% is the Garo tribe. However, as described above, Garos are not included in the project affected people.

Table 2-14: Population Ratio of Scheduled Caste and Scheduled Tribes

Item	Phulbari Village	West Garo Hills District	Meghalaya State	India (average)
SC population (%)	11.2%	1.4%	0.6%	16.2%
ST population (%)	1.3%	73.7%	86.2%	8.2%

Source: Census 2011

Owing to the propagation of Christianity under the English colonial era, majority of the population in Meghalaya State is Christians. In the West Garo Hills District, 61% is Christian, 19% is Hindu, 17% is Muslim and other religions such as Buddhist and Shikh constitute 4%.

4) Economy and Industry

The GSDP of Meghalaya State in the 2013-14 accounts for Rs. 65.6 billion and the annual average growth rate in the past 10 years is 10.5%. The industry wise contribution to GSDP in 2013-14 shows that the service sector accounts for 54.1%, industry sector 31.4% and agriculture sector 14.6%. The trend over 10 years demonstrates that the contribution of agriculture sector in GSDP is decreasing while the ratio of the service and industry sectors is increasing.

Table 2-15: Economic Trend of Meghalaya State

Item	2004-05	2008-09	2013-14	Annual growth (10-year average)
GSDP (Rs. in billion)	65.6	90.0	134.7	10.5%
Ratio in GSDP Agriculture (%)	23.3%	18.6%	14.6%	2.9%
Industry (%)	26.1%	30.1%	31.4%	14.6%
Service (%)	50.6%	55.6%	54.1%	11.9%

Note: GDP in Constant Price (2004-05)

Source: Planning Commission, Government of India

The composition of the working population in the West Garo Hills District is 39.8%, which is almost the same as Meghalaya the state average. 62.8% of the workers are engaged in agriculture related work. The agriculture in the West Garo Hills District is predominantly paddy cultivation and animal rearing is the secondary occupation in the area.

Table 2-16: Workers Composition in Meghalaya State

Item	Meghalaya State	West Garo Hills District
Worker population (%)	40.0	39.8
Cultivator (%)	41.7	47.2
Agriculture worker (%)	16.7	15.5
Domestic worker (%)	1.7	3.0
Other worker (%)	39.8	34.3

Source: Directorate of Census Operations Meghalaya, 2011

Since the project area is located at the north-western end of Meghalaya state and is distant from the major cities, transportation infrastructures are not properly maintained and economic activities in this area are limited.

CHAPTER 3 Legal Framework

3.1 Major Laws and Regulations Relevant to the Project

Within the framework of environmental laws of India, the Environmental (Protection) Act of 1986 and its enforcement rights have been given to the Ministry of Environment, Forest & Climate Change (MOEFCC). It has overall authority over the administration and implementation of the EIA related policies, laws and regulations, sustainable development and the pollution control in India. MOEFCC identifies the need to enact new laws and to issue amendment to the existing environmental legislations when required, in order to continue to conserve and protect the environment in India. The Central Pollution Control Board (CPCB) and respective State Pollution Control Board (SPCB) implement the acts. At state level, the Department of Environment and Forest of Assam / Meghalaya perform a role similar to that of MOEFCC.

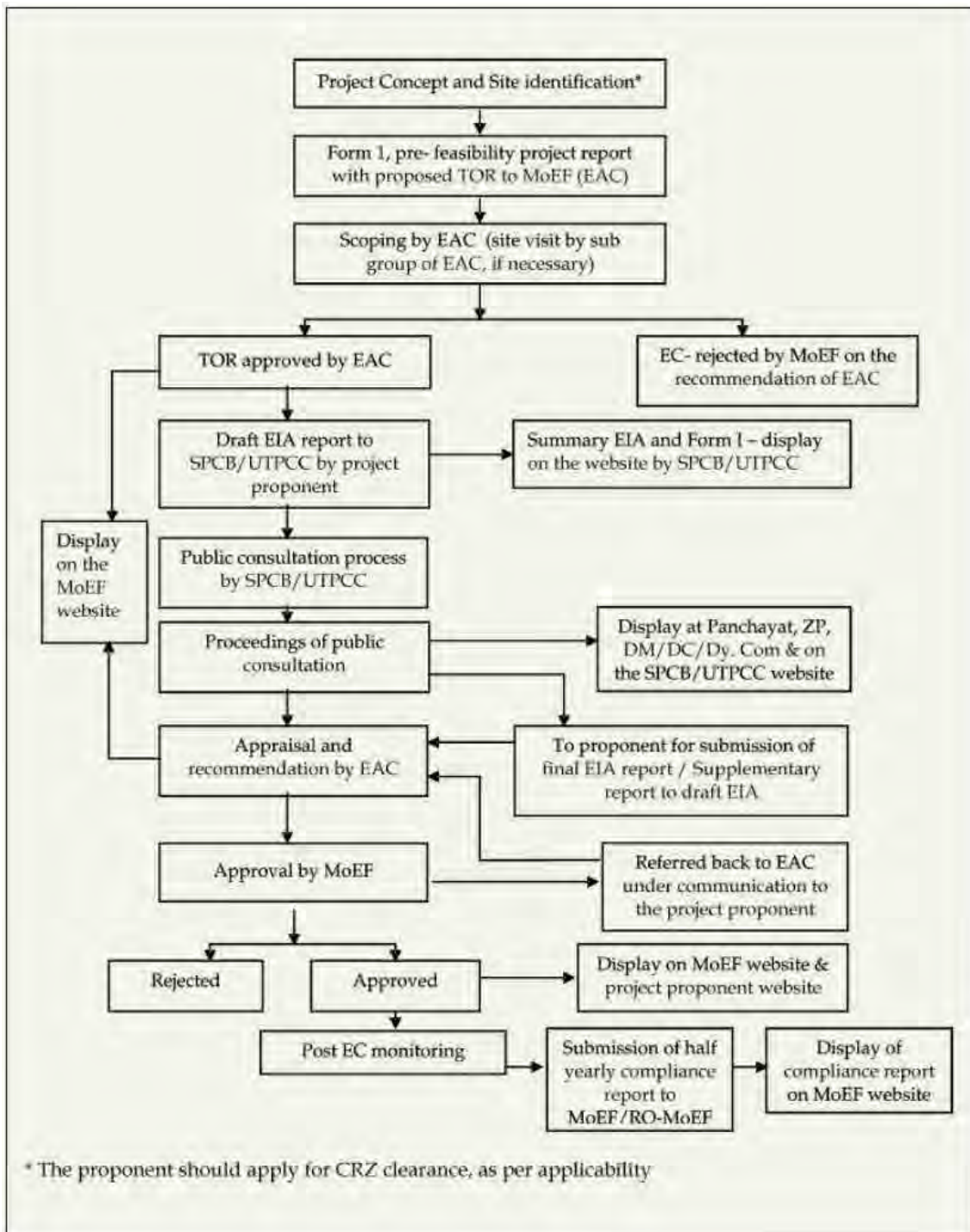
3.1.1 The Environment (Protection) Act, 1986

The Environment (Protection) Act, 1986 is the umbrella legislation which aims to protect the environment of India. Subject to the provisions of the Act, the Central Government has the power to take all measures as deemed necessary or expedient for the purpose of protecting and improving the quality of the environment and preventing, controlling and abating environmental pollution. The implementation of Environment (Protection) Rules, which was formulated in 1986, provides various standards for the emission and discharge of environmental pollutants (Schedule I to IV). The central government has delegated the power vested on it under the Section 5 of the Act to the State Government. This law is applicable to this project for environment protection in general.

3.1.2 Notification of the Environmental Impact Assessment of Development Projects

The Environmental Impact Assessment Notifications in 2006 have been subject to amendments in 2009, 2012, 2013, and 2014. The Expert Appraisal Committee or State Level Expert Appraisal Committee are given power to and are requested to establish recommendations for decision making at the central government level. The Expert Appraisal Committee of the central government and the State Level Expert Appraisal Committee are to meet once every month for screening, scoping and the appraisal of development projects.

Those projects intended to promote economic development at the national level as well as projects for each industrial sector in India are obliged to follow the EIA notification guidelines.



Source: Environmental Impact Assessment Guidance Manual for Highways, 2010

Figure 3-1: Environmental Clearance Process for Category A Projects

3.1.3 Wildlife Protection Act, 1972

Amendments were made to the Wildlife Protection Act in 1982, 1986, 1991, 1993, 2002, 2006 and 2013 in order to protect wildlife in India. Code of conduct in terms of wildlife protection, trade of wildlife products, punishment for illegal hunting etc. have been amended from time to time.

3.1.4 The Biological Diversity Act, 2002

The Biological Diversity Act is a law stipulated on the conservation, utilization, and benefit sharing of genetic resource and the Biodiversity Board has been established for each state based on this law. The main function of the Board is to give appropriate advice to the state government on issues concerning biodiversity conservation. The designation of Biodiversity Heritage Sites is also stipulated.

As a national policy for conserving biodiversity, the National Biodiversity Action Plan was formulated in 2008, which covers the conservation of biodiversity, its sustainable use, the equal distribution of profits arising from the use of biodiversity, the protected area network focused on the conservation of species, and so forth. Furthermore, it recognizes the importance of regulation on the introduction of alien species, eradication of alien species, and consideration on biodiversity in economic development projects. Assam State has formulated the state forest policy in 2004, among which, in addition to conservation and recovery of forests, strengthening of protected area network, conservation of wetlands, conservation of wetlands, conservation of wildlife as ways to preserve biodiversity preservation of habitats of living beings, promotion of research and research, etc. are listed.

3.1.5 The Forest (Conservation) Act, 1980 (amended in 1988)

The Forest (Conservation) Act, 1980 amended in 1988, pertains to the cases of diversion of the use of forest area and the felling of roadside trees and those in the plantation areas. Depending on the size of the area subject to clearing, a license for felling trees should be obtained. The level of governments that is empowered to issue permission differs depending on the type of forest clearance:

- If the area of forests subject to clearing exceeds 20ha (or 10ha in the hilly area) then prior permission of the Central Government is required;
- If the area of forest clearance has a forest density of more than 40%, permission to undertake any work is needed from the Central Government, irrespective of the area to be cleared;
- If the area of forest subject to clearing is between 5ha to 20ha, the Regional Office of Chief Conservator of Forests is empowered to approve it; and
- If the area of forest subject to clearing is below or equal to 5ha, the State Government can issue permission.

3.1.6 The Water (Prevention and Control of Pollution) Act, 1974

The Water (Prevention and Control of Pollution) Act, 1974 resulted in the establishment of the central and state level Pollution Control Board (CPCB/SPCB). Their responsibilities include managing water quality and effluent standards as well as prosecuting offenders and issuing licenses for construction and the operation of certain facilities.

3.1.7 The Air (Prevention and Control of Pollution) Act, 1981

The CPCB and the SPCB are empowered to set air quality standards, monitor and prosecute offenders under this Act. Powers have also been conferred to give instructions to the concerned authority in charge of vehicle registration under the Motor Vehicles Act, 1988, with regards to ensuring emission standards for automobiles.

3.1.8 The Motor Vehicles Act, 1988

The Indian Motor Vehicles Act empowers the State Transport Authority to enforce standards for the control of vehicular pollution and prevention of air pollution. The authority also checks emission standards of registered vehicles, collects road taxes, and issues vehicular licenses. In August 1997, the Pollution under Control Certificate (PUC) program was launched in order to control vehicular emissions in all states of India.

3.1.9 The Land Acquisition Act, Rehabilitation and Resettlement Act, 2013

The new “Rights to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR 2013)” replaced the Land Acquisition Act of 1894. It has so far served as the basic policy document on which the GOI passes resolution to acquire land for different projects, while traditionally it did not allow for compensation on a placement basis. The LARR 2013 came into force on January 1st, 2014, and the Assam/ Meghalaya States put the act into practice.

3.2 JICA/WB/ADB’s Guidelines for Environment and Social Considerations

3.2.1 JICA Environmental and Social Guidelines

Application of JICA’s Guidelines for Environment and Social Considerations (ESCs) is required if a project is funded by JICA. If a significantly adverse impact on the environment or society has been identified during a JICA-assisted project, the following has to be thoroughly considered and studied.

(1) ESCs are Pre-Requirement

- a. JICA will take necessary measures to ensure that the appropriate ESC is given;
- b. When JICA reviews a project proposal and finds that the project could cause negative impacts on the environment or society, JICA advises that the project proponents provide appropriate ESC;
- c. If the negative impact of the project cannot be avoided or mitigated to an acceptable level, JICA will not support its implementation.

(2) Respect Human Rights

- a. Development project should aim for fair distribution of its benefits and must not burden or exclude certain stakeholders for the sake of others;
- b. The project proponents must respect the rights of all people concerned, and pay special attention to vulnerable social groups such as women, elderly, the poor, people with disabilities, indigenous peoples, ethnic minorities, and other minority groups to ensure that they are involved in decision-making processes and that they benefit from the project;
- c. JICA’s ESC Guidelines define ‘stakeholders’ as local residents including non- titleholders who are affected by the project as well as local NGOs. By involving local stakeholders from the early stage of the project, the project proponents can receive their inputs and plan appropriate measures to address their concerns, avoid conflict, and achieve higher results with their support. For this reason, the project proponents should conduct a series of consultations with local stakeholders in an interactive and meaningful manner. During this process, appropriate consideration must be given to socially vulnerable people such as women, children, the elderly and ethnic minorities.

(3) Avoid Adverse Impacts

- a. Priority should be given to the avoidance of adverse impacts on the environment or society when a project is planned;
- b. Minimization or mitigation of impacts should be considered only if avoidance is not feasible and if the benefit of the project outweighs the cost of mitigation measures;
- c. The project proponents must assess the environmental and social impacts at the earliest possible stage of planning, and implement ESC measures in accordance with the ESC Guidelines 9.

(4) Information on ESC Must be Disclosed to the Public

- a. Information disclosure is key in ESC. Project proponents must proactively release relevant information to the public;
- b. Sharing information with a wide range of stakeholders from the early stage, the project proponents can utilize their feedback to improve the plan/project. In addition, the project proponents can ensure that unnecessary concerns and misunderstandings among the stakeholders are ameliorated.

(5) Host Country's Laws, Standards, Policies and Plans

- a. A JICA-funded project must comply with the laws, standards, policies, and plans of the host country;
- b. If the standard set by the host country differs from the international standard, the project proponents are advised to adopt an international standard that better serves the purpose of attaining a higher level of ESC.

(6) The World Bank's Safeguard Policies

ESC in a JICA project must be in line with the World Bank's Safeguard Policies including:

- a) Operational Policy on Environmental Assessment (OP 4.01);
- b) Natural Habitats (OP 4.04);
- c) Involuntary Resettlement (OP 4.12);
- d) Indigenous Peoples (OP 4.10), and other relevant policies.

3.2.2 World Bank's Environment Safeguard Policy

In respect to the Safe Guard Policies as listed above, the World Bank Performance Standards are imposed on the borrowers in terms of the requirement of the environmental impact assessment and resettlement action plan as guidelines for environmental study. It is a compulsory requirement for financing economic development projects that developing countries borrow funds from the World Bank. Major points of concern of its Performance Standards are summarized as follows:

- a. PS 1: Assessment and Management of Environmental and Social Risks and Impacts
Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of the project.
- b. PS 2: Labour and Working Conditions

The requirements labour and working conditions set out in part guided by a number of international conventions and instruments, including those of the International Labour Organization (ILO) and the United Nations (UN).

c. PS 3: Resource Efficiency and Pollution Prevention

This Performance Standard outlines a project-level approach to resource efficiency and pollution prevention and control in line with internationally disseminated technologies and practices. The Performance Standard promotes the ability of private companies to adopt such technologies and practices as far as their use is feasible in the context of a project that relies on commercially available skills and resources.

d. PS 4: Community Health, Safety, and Security

Performance Standard 4 recognizes that project activities, equipment, and infrastructure can increase community exposure to risks and impacts. In addition, communities that are already subjected to impacts from climate change may also experience an acceleration and/or intensification of impacts due to project activities. While acknowledging the public authorities' role in promoting the health, safety, and security of the public, this Performance Standard addresses the client's responsibility to avoid or minimize the risks and impacts on community health, safety, and security that may arise from project related-activities, with particular attention to vulnerable groups.

e. PS 5: Land Acquisition and Involuntary Resettlement

Involuntary resettlement refers both to physical displacement (relocation or loss of shelter) and to economic displacement as a result of project-related land acquisition and/or restrictions on land use. However, where involuntary resettlement is unavoidable, it should be minimized and appropriate measures to mitigate adverse impacts on displaced persons and host communities should be carefully planned and implemented.

f. PS 6: Biodiversity Conservation and Sustainable Management of Natural Resources

This Performance Standard recognizes that protecting and conserving biodiversity, maintaining ecosystem services, and the sustainable management of living natural resources are fundamental to sustainable development. The requirements set out in this Performance Standard have been guided by the Convention on Biological Diversity. This Performance Standard addresses how clients can sustainably manage and mitigate impacts on biodiversity and ecosystem services throughout the project's lifecycle.

g. PS 7: Indigenous Peoples

Performance Standard 7 recognizes that Indigenous Peoples are social groups with identities that are distinct from mainstream groups in national societies.

h. PS 8: Cultural Heritage

Consistent with the Convention Concerning the Protection of the World Cultural and Natural Heritage, this Performance Standard aims to ensure that clients protect cultural heritage in the course of their project activities.

3.2.3 Safeguard Policy of Asian Development Bank

(1) Latest Development of ADB Operations

The ADB's Environment Policy mandates the consideration of environment in all aspects of ADB's operations. The "Environment Policy and Operations Manual (OM) 20: Environmental Considerations in ADB Operations" outlines ADB's environmental assessment procedures and requirements. In 2003, ADB updated the old guidelines of 1993 and the contents are summarized as follows:

- a. Introduced a check-list system of the Rapid Environmental Assessment (REA) for determining the environment category;
- b. Introduction of the Country Environmental Analysis (CEA) as a requirement in preparation of the Country Strategy and Program (CSP);
- c. Introduction of the Strategic Environmental Assessment (SEA) as an optional tool for the environmental assessment for program loans, sector development program loans, and sector loans;
- d. Establishing a new category FI for lending activities to financial intermediaries and other intermediaries and outlining the environmental assessment requirements to apply to this category;
- e. Strengthening the requirements of Environmental Management Plans (EMP);
- f. Recommending environmentally responsible procurement; and
- g. Strengthening public consultation as an integral part of environmental assessment and management.

(2) General Contents of EIA Study

- a. Coordinate with environment and government concerned agencies;
- b. Prepare a project description, define the study area, collect environmental baseline data, prepare site maps, and other relevant maps for the study area;
- c. Identify potential environmental impacts based on the information obtained on the proposed project and the baseline environmental conditions of the study area;
- d. Identify alternatives and analyse the environmental impacts of each alternative and propose measures to avoid or prevent impacts;
- e. Estimate the magnitudes of environmental impacts and assess the significance of the impacts;
- f. Recommend environmental mitigation measures and estimate the mitigation costs;
- g. Prepare an EMP to be implemented by the executing agency during project implementation, operation and abandonment;
- h. Prepare the EIA and SEIA reports;
- i. Conduct public consultation and ensure information disclosure; and develop plans for public consultation and information disclosure during project implementation;
- j. Assess the executing agency's capacity to undertake an environmental review of the environmental assessment report and EMP recommendations, and recommend measures for capacity building if necessary; and
- k. Ensure that the proposed project, with EIA and EMP implementation, conforms to the Government and ADB environmental assessment requirements, policies and regulations.
- l. Economic assessment that should be carried out includes i) the costs and benefits of environmental impacts; ii) the costs, benefits, and cost effectiveness of mitigation measures; and iii) for environmental impacts that have not been expressed in monetary values, a discussion of such impacts, if possible, in quantitative terms.

3.3 Comparison of JICA/WB/ADB Guidelines and EIA Regulations of India

The JICA guidelines, World Bank and ADB Operational Manual and Environmental Safeguard policies, procedures & practices described in the Section 9.3.7 to 9.3.9 are compared to the following Government of India's guidelines in order to find the differences and elaborate on a way to fill in the gaps if any.

- “Environmental Guidelines for Selected Infrastructure Projects”;
- “Project Terms of Reference (TOR)”;
- “Environmental guidelines for Road/Rail/Highway Projects”, Government of India, 1989
- “Handbook of environmental procedures and guidelines”, 1994, Government of India
- “Guidelines for Environmental Impact Assessment of Highway Projects” (IRC:104-1988); and
- The Environmental (Protection) Act, 1986 and a series of its amendments as follows:
 - S.O.695, [4/04/2011] - Amendment to EIA Notification, 2006,
 - S.O.156, [25/01/2012] - Amendment to EIA Notification, 2006,
 - S.O.945, [11/06/2007] - Environmental Impact Assessment Notification-2007,
 - S.O.948, [12/06/2007] - Environmental Impact Assessment Notification-2007,
 - S.O.1105, [4/07/2007] - Environmental Impact Assessment Notification-2007,
 - S.O.1134, [12/07/2007] - Environmental Impact Assessment Notification-2007,
 - S.O.1203, [23/07/2007] - Environmental Impact Assessment Notification-2007,
 - S.O.1735, [11/10/2007] - Environmental Impact Assessment Notification-2007,
 - S.O.1736, [11/10/2007] - Environmental Impact Assessment Notification-2007,
 - S.O.1737, [11/10/2007] - Environmental Impact Assessment Notification-2007,
 - S.O.2674, [17/11/2008] - Environmental Impact Assessment Notification-2008,
 - S.O.2244, [22/11/2008] - Environmental Impact Assessment Notification-2008,
 - S.O.195, [19/01/2009] - Environmental Impact Assessment Notification-2009,
 - S.O.3067, [01/12/2009] - Environmental Impact Assessment Notification-2009
 - S.O.1850, [14/08/2012] - Environmental Impact Assessment Notification, 2012

Based on the above, a study on India's laws and regulations, and comparing them to the JICA/WB/ADB Guidelines is carried out in the following stages:

- The baseline environmental information in the study area such as; climate, physiographic features, drainage, geology, flora, fauna, ambient air, water and noise and socio-economic conditions.
- Reviews of the literature, laws and guidelines and discussions with concerned agencies and organizations, National/State Authorities
- A reconnaissance survey along with public consultation that occurred from October 2016 to July 2017 and processes of public consultation continued until the completion of the study to inform the people about the project and collect the information/suggestions on environmental issues.
- The monitoring network with regard to air, water, soil and noise pollution.
- Assessment of the potential significant impacts and identification of the mitigate measures to address impacts adequately.
- Field observations including public consultation.
- Screening, testing and monitoring of environmental factors like air, water, soil and the noise level.
- Collection of secondary data from various departments.
- Compilation, analysis and presentation of the report.

Table 3-1: Comparison between JICA Guideline and Laws in India regarding EIA

No.	Items	JICA Guideline	Laws in India	Principle for this Project
1	Requirement of EIA	<p><u>Environmental and social surveys at the EIA level (Category A projects)</u> Proposed projects likely to have significant adverse impacts on the environment and society. Category A includes projects in sensitive sectors (ex. Roads, railways, and bridges), projects that have characteristics that are liable to cause adverse environmental impacts (ex. Large-scale involuntary resettlement), and projects located in or near sensitive areas. <u>IEE level (Category B projects)</u> Projects whose potential adverse impacts on the environment and society are less adverse than those of Category A projects.</p>	<p><u>Projects requiring EIA (Category A projects)</u> i) New National Highways ii) Expansion of National Highways greater than 100km involving an additional right of way or land acquisition greater than 40m on the existing alignments and 60m on re-alignments and bypasses.</p> <p><u>Projects whose requirements of EIA are judged by the state level Environment Impact Assessment Authority (Category B projects)</u> i) State Highway ii) State highway Expansion projects in hilly terrain (above 1,000 m AMSL) and or ecologically sensitive areas</p>	EIA will be prepared as category A in accordance with JICA Guidelines though not required by Laws in India
2	Scope of Impacts to Be Assessed	In addition to the direct and immediate impacts of projects, their derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined and assessed to a reasonable extent.	Factors which could lead to environmental effects or the potential for cumulative impacts shall be identified. Indirect impacts on the avifauna of the area shall be examined.	Derivative, secondary, and cumulative impacts as well as the impacts of projects that are indivisible from the project are also to be examined.
3	Stakeholder meetings/ Public consultation	Stakeholder meetings shall be held at the stages of the scoping draft and report draft.	Public consultation shall be conducted after submission of draft report.	To hold Stakeholder meetings at the stages of scoping draft and report draft.
4	Disclosure of EIA	EIA reports are required to be made available to local residents of the country in which the project is to be implemented. The EIA reports are required to be available at all times for perusal by project stakeholders such as local residents; and copying must be permitted.	MOEFCC shall display the Summary of the draft EIA report on its website, and also make the full draft EIA available for reference at a notified place during normal office hours at the Ministry in Delhi.	To disclose EIA in accordance with JICA Guidelines.

No.	Items	JICA Guideline	Laws in India	Principle for this Project
5	Certificate regarding the environment and society	If the project requires a certificate other than an EIA regarding the environment and society, indicate the title of said certificate and confirm the approval.	Forest Clearance will be required. The Contractor has to obtain permits from MSPCB for setting up hot-mix plants, batching plants, etc., under the Air and the Water Acts, whose results shall be reported to the Project proponents.	To confirm requirement of permits in accordance with the laws in India.
6	Monitoring	After projects begin, project proponents etc. monitor whether any unforeseeable situations occur and whether the performance and effectiveness of mitigation measures are consistent with the assessment's prediction. They then take appropriate measures based on the results of such monitoring. In cases where sufficient monitoring is deemed essential, project proponents etc. must ensure that project plans include feasible monitoring plans. Project proponents etc. should make efforts to make the results of the monitoring process available to local project stakeholders.	Project proponents are required to submit environmental management plan & monitoring programme. It shall be mandatory for the project management to submit every half a year compliance reports in respect to the stipulated prior environmental clearance terms and conditions.	To implement environmental monitoring in accordance with the laws in India.

Source: JICA Study Team

3.4 Central Level Institutions

(1) National Highways Authority of India

The proposed Dhubri-Phulbari Bridge has been initiated and is being carried out by the National Highways and Infrastructure Development Corporation Limited (NHIDCL), under the auspice of the Ministry of Road Transport & Highways (MORTH). Though the primary responsibility of the Project rests with the NHIDCL, there are various institutions involved in the Project and their level of responsibilities in the project implementation are as follows:

The National Highway Authority of India (NHAI) and Regional Offices under the Ministry of Road Transport and Highway (MORTH) promote the national highway development project while the Border Roads Organization (BRO) under the Border Roads Development Board (BRDB) have control over roads in border regions. The NHIDCL was established for promoting the development of National Highways in North East and border areas of India, and started operation from January 1st, 2015.

The NHAI has been established under the National Highways Authority of India Act of 1988. It is the main nodal agency responsible for developing, managing and maintaining India's network of national highways. It became an autonomous body in 1995. NHAI maintains 70,934km of national highways and expressways across India.

The development of the Dhubri-Phulbari Bridge project has been promoted by NHIDCL, which is a company fully owned by the Ministry of Road Transport & Highways of the Government of India. The function of the NHIDCL is to promote the surveying, designing, building, operating, maintaining and upgrading of national highways and the development of strategic roads such as interconnecting roads in various parts of the country including those in areas with international boundaries with the neighboring countries.

The company also proposes to improve road connectivity and the efficiency of the international trade corridors by expanding about 500km of roads in the North Bengal and Northeastern Region of India.

(2) Ministry of Environment, Forest, and Climate Change (MOEFCC)

The primary responsibility for administration and implementation of the Government of India's (GOI) policy with respect to environmental management, conservation, ecologically sustainable development and pollution control rests with the Ministry of Environment, Forest and Climate Change (MOEFCC). Established in 1985, the MOEFCC is the agency primarily responsible for the review and approval of EIAs pursuant to GOI legislation.

(3) Central Pollution Control Board (CPCB)

Statutory authority attached to the MOEFCC, the main responsibilities of CPCB include the following:

- Planning and implementing water and air pollution control programs;
- Advising the central government on water and air pollution control programs;
- Setting air and water standards; and
- Coordinating the various State Pollution Control Boards.

The role of the CPCB for this Project will only be in an advisory capacity while the Project shall adhere to the norms and standards set up by the Meghalaya State Pollution Control Board (MSPCB).

3.5 State Level Institutions

(1) Public Works Department

The Public Works Department (PWD) is the premier agency of the state government engaged in planning, designing, construction, and maintenance of the government assets in the field of infrastructure development. Assets in infrastructure development include roads, bridges, urban centers, footpaths, new capital complexes, and airports. Assets such as hospitals, schools, colleges, technical institutes, police buildings, prisons, and courts among others are also under the PWD's jurisdiction. PWD Assam / Meghalaya also sustains and preserves these assets through a system of maintenance, which includes specialized services such as rehabilitation works, roads signage, and aesthetic treatments like interiors, landscaping etc.

(2) MOEFCC Regional Offices

MOEFCC has set up regional offices that cover the Northeastern Region including Assam / Meghalaya. It is located in Shillong, Meghalaya. This office is responsible for collecting and furnishing information relating to the EIA of various projects in respect to pollution control

measures, methodology, and status, legal and enforcement measures and environmental protection in special conservation areas such as wetlands, mangroves and biosphere reserves.

(3) State Pollution Control Board, Assam / Meghalaya State Pollution Control Board

The State Pollution Control Boards have the mandate for environmental management at the state level, with emphasis on air and water quality. It is responsible for the planning and executing of state-level air and water initiatives, advising the state government on air, water and industry issues, establishing standards based on the National Minimum Standards, the enforcing and monitoring of all activities within the state under the Air Act, the Water Act and other relevant acts pertaining to pollution control.

They also conduct and organize public hearings for projects as defined by the various Acts and as stipulated by the amendment related to the EIA Act. It also issues No-objection Certificates (NOC) for environment clearance for industrial development defined in such a way as to include road projects' quarrying etc., which usually relate to water and soil contamination.

(4) Assam / Meghalaya State Forest and Environment Department

The Assam / Meghalaya Forest and Environment Department is responsible for the protection and management of the forest areas in the states that are designated for protection, conservation and production purposes. The Forest and Environment Department follows what is laid out in the Forest Working Plans for the various forest divisions to manage and protect the forest resources. These plans form the basis for managing the forest resources. The department is responsible for granting licenses for clearances of the forest areas for various projects, according to the provisions of the Forest (Conservation) Act, 1980. The State Forest and Environment Department performs functions similar to those of the MOEFCC at the state level but more specific to forestry activities including social forestry and production forestry development and licensing.

3.6 Requirements of Environmental Clearance

Environmental Clearance is not required for this project as per the MoEFCC notification, 2013. Other clearances required are as follows:

- 1) The Contractor has to obtain permits from State Pollution Control Board for setting up hot-mix plants, batching plants, etc., under the Air and the Water Acts;
- 2) Clearance from the State Department of Mining is required for establishing quarries;
- 3) Clearance from the Water resource department/Authorities is required for establishment of new tube-wells/bore-holes in case they are required during construction work;
- 4) The provisions as laid down in the Factories Act, 1948, Labor Act, 1988 and the Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 with respect to hygiene and health during the construction stage would apply to the project's implementation works; and
- 5) The provisions of the Hazardous Wastes (Management and Handling) Rules, 1989 and the Chemical Accidents (Emergency Planning, Preparedness, and Response) Rules, 1996 may also be applied during the construction and the operation period.

Table 3-2: Applicable Environmental Clearance

No.	Activity	Statute	Requirement	Competent Authority	Responsible Agency for Obtaining Clearance	Time Required
Pre-Construction Stage (Responsibility: MORTH)						
1	Road-side tree cutting and clearing forest	Forest Conservation Act 1980 & MOEF Letter Dt.18.02.1998	Permission for Road-side tree cutting	State and Central Government	MORTH	2-3 months
2	Filling of Roadside water bodies (ponds and borrow pits)	State Fisheries Policy Draft Wetlands (Conservation & Management) Rules, 2008	Permission for filling of water bodies	State Irrigation Department State Fisheries Department State Wetlands Conservation Committee	MORTH	2-3 months
Construction Stage (Responsibility: Contractor)						
1	Establishing stone crusher, hot mix plant, wet mix plant and Diesel Generator Sets	Water Act of 1974, Air Act of 1981, Noise Rules of 2000 and Environmental Protection Act of 1986 and as Amended	Consent-forest abolishment	States Pollution Control Boards for respective section	Contractor	4-6 months
2	Operating stone crusher, hot mix plant, wet mix plant and Diesel Generator Sets	Water Act of 1974, Air Act of 1981, Noise Rules of 2000 and Environmental Protection Act of 1986 and as Amended	Consent-for operation	States Pollution Control Boards for respective section	Contractor	4-6 months
3	Use and storage of explosive for quarry blasting work	India Explosive Act 1984	Explosive license for use and storage	Chief Controller of Explosives	Contractor	2-3 months
4	Storage of fueloil, lubricants, diesel etc. at construction camp	Manufacture storage and Import of Hazardous Chemical Rules 1989	Permission for storage of hazardous chemical	States Pollution Control Boards for respective section and or Local Authority (DC)	Contractor	4-6 months
5	Quarry Operation	State Minor Mineral Concession Rules, The Mines Act of 1952, Indian Explosive Act of 1984, Air Act of 1981 and Water Act of 1974	Quarry Lease Deed and Quarry License	State Department of Mines and Geology	Contractor	4-6 months
6	Extraction of ground water	Ground Water Rules of 2002	Permission for extraction of ground water for use in road construction activities	State Ground Water Board	Contractor	4-6 months
7	Engagement of labor	Labor Act	Labor license	Labor Commissioner	Contractor	2-3 months

Source: JICA Study Team

3.7 Environmental Standards of India

Based on the Acts and Rules above, CPCB has set up various environmental standards as follows:

- 1) National Ambient Air Quality Standards
- 2) Water Quality Criteria
- 3) Vehicular Exhaust
- 4) Auto Fuel Quality
- 5) Noise and Emission Limits for Diesel Engines for Generators
- 6) Noise Standards

In addition to the above, there are a large number of environmental standards set up for each sector of the manufacturing industries. Since this is a road construction project consisting of the construction of a new bridge, during the construction period, construction debris, soil contamination, air and water pollution, noise and vibration are subject to monitoring in order to maintain emissions and discharges within the standards set up by the CPCB. During the operation and maintenance period, increasing traffic could cause noise and vibration. However, standards on the disposal of construction debris, soil contamination, and vibration that could be caused by

the Project are not clearly defined. The following is a set of environmental standards the Government of India has imposed to date.

Table 3-3: Standards for Ambient Air Quality

Indian Ambient Air Quality Standards					WHO Ambient Air Quality Standards	
S. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		Averaging Period	Guideline value in $\mu\text{g}/\text{m}^3$
			Industrial Residential, Rural and Other Areas	Ecologically Sensitive Area (notified by Central Government)		
(1)	(2)	(3)	(4)	(5)	(1)	(2)
1.	Sulphur Dioxide (SO₂), $\mu\text{g}/\text{m}^3$	Annual* 24 hours**	50 80	20 80	24 hours 10 minutes	125 (Interim target 1) 50 (Interim target 2) 20 (guideline) 500 (guideline)
2.	Nitrogen Dioxide (NO₂), $\mu\text{g}/\text{m}^3$	Annual* 24 hours**	40 80	30 80	1-year 1-hour	40 (guideline) 200 (guideline)
3.	Particular Matter (size less than 10μm) or PM₁₀ $\mu\text{g}/\text{m}^3$	Annual* 24 hours**	60 100	60 100	1-year 24-hour	70(Interim target 1) 50 (Interim target 2) 30 (Interim target 3) 20 (guideline) 150(Interim target 1) 100 (Interim target 2) 75(Interim target 3) 50 (guideline)
4.	Particular Matter (size less than 2.5μm) or PM_{2.5} $\mu\text{g}/\text{m}^3$	Annual* 24 hours**	40 60	40 60	1 – year 24-hour	35(Interim target 1) 25 (Interim target 2) 15 (Interim target 3) 10 (guideline) 75(Interim target 1) 50 (Interim target 2) 37.5 (Interim target 3) 25 (guideline)
5.	Ozone (O₃) $\mu\text{g}/\text{m}^3$	8 hours** 1 hour**	100 180	100 180	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Source: Central Pollution Control Board, India

Table 3-4 Ambient Air Quality Standard by WHO

	Averaging Period	Guideline value in $\mu\text{g}/\text{m}^3$
Sulfur dioxide (SO ₂)	24-hour	125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
	10 minute	500 (guideline)
Nitrogen dioxide (NO ₂)	1-year	40 (guideline)
	1-hour	200 (guideline)
Particulate Matter PM ₁₀	1-year	70 (Interim target-1) 50 (Interim target-2) 30 (Interim target-3) 20 (guideline)
	24-hour	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (guideline)
Particulate Matter PM _{2.5}	1-year	35 (Interim target-1) 25 (Interim target-2) 15 (Interim target-3) 10 (guideline)
	24-hour	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
Ozone	8-hour daily maximum	160 (Interim target-1) 100 (guideline)

Source: IFC

Table 3-5: Vehicle Emission Standards (1991 to Date)

Norms	Passenger Car	Heavy Diesel Vehicles			
	CO (g/km)	CO (g/km)	HC (g.km.hr)	NO _x (g.km.hr)	PM (g.km.hr)
1991 Norms	14.3-27.1	14	3.5	18.0	-
1996 Norms	8.68-12.40	11.2	2.4	14.4	-
1998 Norms	4.34-6.20	-	-	-	-
India stage 2000 norms	2.72	4.5	1.1	8.0	0.4
Bharat stage-II	2.2	4.0	1.1	7.0	0.2
Bharat Stage-III	2.3	2.1	1.6	5.0	0.1
Bharat Stage-IV	1.0	1.5	1.0	3.5	0.0

Source: Central Pollution Control Board, India

Note: Bharat indicates Indian nomenclature of vehicular emission which is the same as the Euro Stage.

Table 3-6: Water Quality

Designated best use	Class	Criteria
Drinking water source without conventional treatment but after disinfections	A	Total coliform organisms MPN/100ml shall be 50 or less
		pH between 6.5 and 8.5
		Dissolved oxygen 6 mg/l or more
		Biochemical oxygen demand 2 mg/l or Less
Outdoor bathing (organised)	B	Total coliform organisms MPN/100ml shall be 500 or less
		pH between 6.5 and 8.5 * Dissolved oxygen 5 mg/l or more
		Biochemical oxygen demand 3 mg/l or Less
Drinking water source with conventional treatment followed by disinfection	C	Total coliform organisms MPN/ 100ml shall be 5000 or less
		pH between 6 and 9
		Dissolved oxygen 4 mg/l or more
		Biochemical oxygen demand 3 mg/l or less
Propagation of wild life, fisheries	D	pH between 6.5 and 8.5
		Dissolved oxygen 4 mg/l or more * Free ammonia (as N) 1.2 mg/l or less
Irrigation, industrial cooling, controlled waste disposal	E	pH between 6.0 and 8.5
		Electrical conductivity less than 2250 micro mhos/cm
		Sodium absorption ratio less than 26
		Boron less than 2mg/l

Source: Central Pollution Control Board, India

Compared to the EHS guideline set forth by the International Financial Corporation (IFC) shown in table 2.1-4 below, the Class A Water Quality Standard of India is lacking a few items such as COD, Total Nitrogen, Total Phosphorus, Oil and Grease. Other parameters are set at equal level or below the EHS Guideline of IFC.

Table 3-7: Water quality standard for international EHS Guideline

Table 1.3.1 Indicative Values for Treated Sanitary Sewage Discharges ^a		
Pollutants	Units	Guideline Value
pH	pH	6 – 9
BOD	mg/l	30
COD	mg/l	125
Total nitrogen	mg/l	10
Total phosphorus	mg/l	2
Oil and grease	mg/l	10
Total suspended solids	mg/l	50
Total coliform bacteria	MPN ^b / 100 ml	400 ^a
Notes: ^a Not applicable to centralized, municipal, wastewater treatment systems which are included in EHS Guidelines for Water and Sanitation. ^b MPN = Most Probable Number		

Source: IFC

Table 3-8: Fuel Quality

Diesel Specification

Contents	1996	2000	2005	2010
Cetane No, Min	45	48	48	51
Sulphur % W/w, Max	0.5	0.25 0.25(metro)	0.05	0.035
Distillation T95	-	370	370	360
Polyaromatic	-	-	-	11

Gasoline Specification

Contents	1996	2000	2005	2010
RVP at 38 Deg.c,kpa	35-70	-	35-60	60
Benzine % by Vol.,Max	5	5.0 3.0(metro)	3.0 (all) 1.0 (metro)	1
Lead G/m3, Max	0.15% (low Pb) 0.013% (unleaded)	0.013	0.013	0.005
Sulphur % by mass, Max	0.10 (low Pb) 0.20 (unleaded)	0.1	0.05	0.015
Aromatics % v/v., Max	-	-	45	42
Oxygen %by Vol., Max	-	-	2	2.7

Source: Central Pollution Control Board, India

Table 3-9: Noise Standard for Diesel Generator

No.	Description
1	The maximum permissible sound pressure level for new diesel generator (DG) sets with rated capacity upto 1000 KVA, manufactured on or after the 1st January, 2005 shall be 75 dB(A) at 1 metre from the enclosure surface.
2	Noise limits for diesel generator sets not covered by 1, shall be as follows:- 2.1 Noise from DG set shall be controlled by providing an acoustic enclosure or by treating the room acoustically, at the users end. 2.2 The acoustic enclosure or acoustic treatment of the room shall be designed for minimum 25 dB (A) insertion loss or for meeting the ambient noise standards, whichever is on the higher side (if the actual ambient noise is on the higher side, it may not be possible to check the performance of the acoustic enclosure/acoustic treatment. Under such circumstances the performance may be checked for noise reduction upto actual ambient noise level, preferably, in the night time). The measurement for Insertion Loss may be done at different points at 0.5 m from the acoustic enclosure/ room, then averaged. 2.3 The DG set shall be provided with proper exhaust muffler with insertion loss of minimum 25 dB (A). 2.4 Guidelines for the manufacturers/ users of Diesel Generator sets shall be as under:- 2.4 (1) The manufacturer shall offer to the user a standard acoustic enclosure of 25 dB (A) insertion loss and also a suitable exhaust muffler with insertion loss of 25 dB(A). 2.4 (2) The user shall make efforts to bring down the noise levels due to the DG set, outside his premises, within the ambient noise requirements by proper citing and control measures. 2.4 (3) Installation of DG set must be strictly in compliance with the recommendations of the DG set manufacturer. 2.4 (4) A proper routine and preventive maintenance procedure for the DG set should be set and followed in consultation with the DG set manufacturer which would help prevent noise levels of the DG set from deteriorating with use.

Source: Central Pollution Control Board, India

Table 3-10: Vehicle Emission Standards (1991 to Date)

Norms	Passenger Car	Heavy Diesel Vehicles			
	CO (g/km)	CO (g/km)	HC (g.km.hr)	NOx (g.km.hr)	PM (g.km.hr)
1991 Norms	14.3-27.1	14	3.5	18.0	-
1996 Norms	8.68-12.40	11.2	2.4	14.4	-
1998 Norms	4.34-6.20	-	-	-	-
India stage 2000 norms	2.72	4.5	1.1	8.0	0.4
Bharat stage-II	2.2	4.0	1.1	7.0	0.2
Bharat Stage-III	2.3	2.1	1.6	5.0	0.1
Bharat Stage-IV	1.0	1.5	1.0	3.5	0.0

Source: Central Pollution Control Board, India

Note: Bharat indicates Indian nomenclature of vehicular emission which is the same as the Euro Stage.

Table 3-11: Noise Emission Standards

S. No.	Type of vehicle	Noise Limits from 1 st January, 2003, dB(A)
1.0	Two wheeler	
1.1	Displacement upto 80 cc	75
1.2	Displacement more than 80 cc but upto 175 cc	77
1.3	Displacement more than 175 cc	80
2.0	Three wheeler	
2.1	Displacement upto 175 cc	77
2.2	Displacement more than 175 cc	80
3.0	Vehicles used for carriage of passengers and capable of having not more than nine seats, including the driver's seat	74
4.0	Vehicles used for carriage of passengers having more than nine seats, including the driver's seat, and a maximum gross Vehicle Weight(GVW) of more than 3.5 tonnes	
4.1	With an engine power less than 150 KW	78
4.2	With an engine power of 150 KW or above	80
5.0	Vehicles used for carriage of passengers having more than nine seats, including the driver's seat: Vehicles used for carriage goods.	
5.1	With maximum GVW not exceeding 2 tonnes	76
5.2	With maximum GVW greater than 3 tonnes but not exceeding 3.5 tonnes	77
6.0	Vehicles used for transport of goods with a maximum GVW exceeding 3.5 tonnes.	
6.1	With an engine power less than 75 KW	77
6.2	With an engine power of 75 KW or above but less than 150 KW	78
6.3	With an engine power of 150 KW or above,	80*

Source: Central Pollution Control Board, India

Table 3-12: Ambient Noise Standards

Ambient Air Quality Standards in respect of Noise

Area Code	Category of Area / Zone	Limits in dB(A) Leq*	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

- Note:-
1. Day time shall mean from 6.00 a.m. to 10.00 p.m.
 2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
 3. Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority
 4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

Source: Central Pollution Control Board, India

Indian noise standards are at the same level as the EHS guideline of IFC.

CHAPTER 4 Analysis of Alternatives

4.1 Alternatives Subject to Analysis

There are four options that must be considered in terms of impact mitigation measures and are as follows:

(1) Zero Option

No project intervention is implemented, i.e. present status i.e. transportation by boats, is to be continued to be used;

(2) Alternative mode of transportation such as ferry

As an alternative to the construction of a new bridge, capacity by boat transportation across Brahmaputra River can be increased by constructing ferry terminals at Dhubri and Phulbari.

(3) The Alternative Route connects Dhubri and Phulbari by widening of existing NH-31 B and SH-46 through existing bridge near Goalpara

The Alternative Routes to connect Dhubri and Phulbari through NH-31 B and SH-46 and utilize the existing bridge near Goalpara would have approximately 200km length,



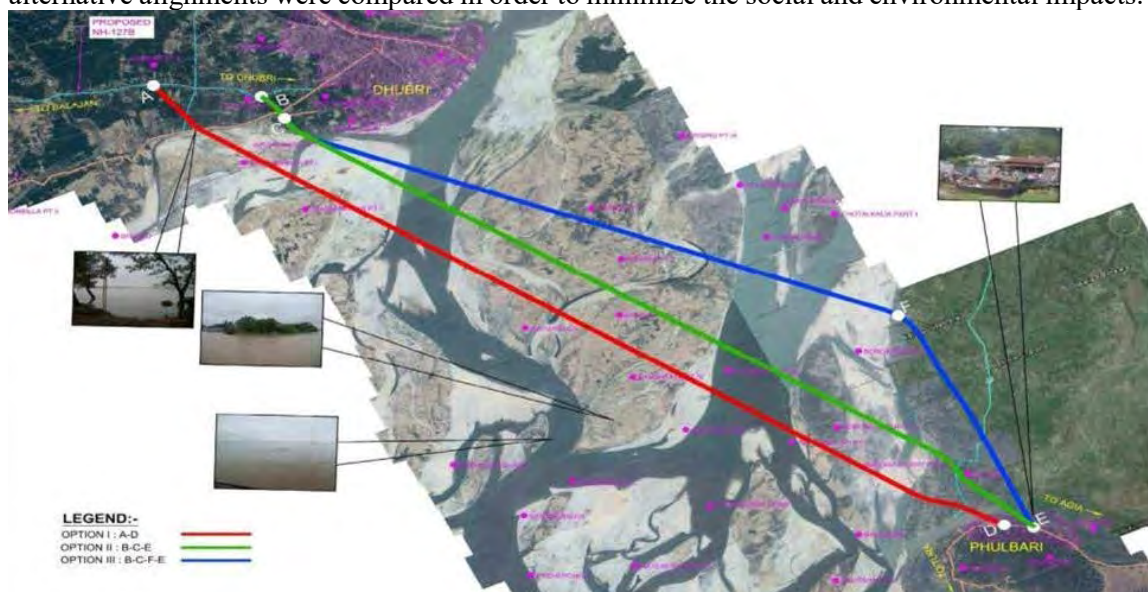
Source: JICA Study Team

Figure 4-1: The Alternative Route connects Dhubri and Phulbari by widening of existing NH-31 B and SH-46 through existing bridge near Goalpara

(4) The Proposed Bridge Option – DPR Design

The proposed Bridge is the construction of two Four-lane bridges including approaches over River Brahmaputra between Dhubri on the North Bank and Phulbari on the South Bank in the state of

Assam/Meghalaya on NH-127B (Length: 20km) with minimum PAPs. In this option, three alternative alignments were compared in order to minimize the social and environmental impacts.



Source: DPR Inception Report

Figure 4-2: Alignment of Two / Four lane bridge between Dhubri and Phulbari

4.2 Criteria for Analysis of the Alternatives

Criteria for the analysis of the selected four alternatives are shown in the following Table. These criteria are based on the importance of the Project being a bridge project running through the Dhubri, South Salmara-Mankachar districts in Assam State and Phulbari in Meghalaya State.

Table 4-1: Criteria for the Evaluation of the Alternatives

No.	Alternative Models	Criteria of Evaluation
1	Zero Option (No project is implemented)	Connectivity - Road Connectivity as a means of infrastructure for communication or transportation of goods - If current connectivity should be improved - Contribution to the development of local/state economy
2	Alternative mode of transportation such as a ferry	
3	The Alternative Route connects Dhubri and Phulbari by widening of existing NH-31 B and SH-46 through existing bridge near Goalpara	Environmental Pollution - CO2 emission could increase/decrease with the road - Noise and vibration - Health conditions could be improved/worsened
4	The Proposed Bridge Option – DPR Design alignment AD	Socio-economic Conditions - Contribution to road accidents - Contribution to improve/worsen living standard - If resettlement was involved - If land acquisition is involved
5	The Proposed Bridge Option – DPR Design alignment BE	
6	The Proposed Bridge Option – DPR Design alignment BFE	
		Natural Environment - impacts on fisheries and other aquatic life - Effects on the ecological conditions
		Others

No.	Alternative Models	Criteria of Evaluation
		<ul style="list-style-type: none"> - If it is worth implementing the project despite effects on the natural/social environment, or economic conditions - Technical viability of the bridge construction

Source: JICA Study Team

4.3 Results of the Analysis of Alternatives

(1) Zero Option

The Zero option of the project is to take no project intervention. This option is assessed as follows:

a. Advantages

- There will be no involuntary resettlement involved in the Zero Option
- No tree cutting and agricultural areas lost to the road / bridge construction works
- No construction works and no pollution
- No impact on Aquatic Fauna

b. Disadvantages

- No road network between Dhubri and Phulbari
- Existence boat transportation takes more time and inconveniences the people
- No local area development
- No Economic development in project districts

(2) Alternative mode of transportation such as ferry

Alternative to the construction of a new bridge, capacity by boat transportation across Brahmaputra River can be increased by constructing ferry terminals at Dhubri and Phulbari. However constructing ferry terminals will require large-scale change in geology, topography and hydrology of the existing river banks of the Brahmaputra which may cause negative impacts on the habitat of the endangered river dolphins.

a. Advantage

- Provide transport connectivity to Dhubri and Phulbari
- Land acquisition and involuntary resettlement will be incurred but on a smaller scale

b. Disadvantage

- Significant negative impacts on the ecosystem of the Brahmaputra River by the dredging of ferry terminals
- High maintenance and operation cost for ferry boats
- Susceptible to natural disasters such as flooding
- Travel time is dependent on ferry time schedule

(3) The Alternative Route connect Dhubri and Phulbari by widening of existing NH-31 B and SH-46 through existing bridge near Goalpara

The Alternative Routes to connect Dhubri and Phulbari through NH-31 B and SH-46 and utilize the existing bridge near Goalpara will have approximately 200km length.

a. Advantages

- Better connectivity to villages / towns falling in the 200km alignment
- Overall economic development of the project area
- No impact on Aquatic ecology of Brahmaputra River

b. Disadvantage

- Very high resettlement as settlements are all along the existing highway
- Acquisition of land and cutting of large numbers of trees
- Construction works likely to cause significant traffic jams throughout the construction

- period, dust during dry season and muddy roads during rainy season.
- Very high construction cost due to long length

(4) The Proposed Bridge Option – DPR Design

The proposed Bridge is the construction of two Four-lane bridges including approaches over Brahmaputra River between Dhubri on the North Bank and Phulbari on the South Bank in the state of Assam/Meghalaya on NH-127B (Length: 20km) with minimum PAPs, this option is assessed as follows:

a. Advantage

- Provide easy and short distance connectivity to Dhubri and Phulbari
- Less number of PAPs
- Overall infrastructure development and economic development of the area.
- Negative ecological impacts on Brahmaputra are smaller compared to other options.
- No need for deforestation

b. Disadvantage

- Involuntary resettlement of the local residents will be reduced, however, in acquisition of approximate 65 Ha of land and significant number of PAPs.
- Construction works should cause significant traffic jams throughout the construction period, dust during dry season and muddy roads during rainy season.
- Increase of traffic volume including heavy load vehicles likely to cause noise, air pollution, and increase in traffic accidents along the road while some traffic is diverted to bypasses.
- Impact on aquatic fauna in Brahmaputra River during construction phase.

Given the above analysis results, the results of comparing and examining each option were ranked and are shown in the table below. Furthermore, the score was allocated according to the rank, and the option with the highest total score was selected as the best. The main objective of this project is to bring positive influence on the regional economy, so the “impact on local economy” was given a double score. As a result, **The Proposed Bridge Option** is recommended.

Table 4-2: Analysis of alternatives

Sr. No	Factors	Without Project Impacts	With Project Impacts		
			Alternative mode of transportation such as ferry	The Alternative Route connect Dhubri and Phulbari by widening of existing NH-31 B and SH-46 through existing bridge near Goalpara	With Proposed bridge
1	Involuntary resettlement	+++ No involuntary resettlement is incurred.	++ Land acquisition and involuntary resettlement will be incurred around ferry terminal area but on smaller scale.	-- Large scale of involuntary resettlement is expected due to upgrading of 200km of existing road.	+ Middle scale of involuntary resettlement is incurred along the alignment of the proposed bridge.
	Score	4	1	3	2
	Weighted score	4	1	3	2
2	Impact on natural ecosystem	+++ No direct impacts on natural ecosystem.	- Significant negative impacts are caused on the ecosystem of the Brahmaputra River	+ Natural environment is altered along the existing road for 200km,	++ Some impacts are caused on Brahmaputra River ecosystem during

Sr. No	Factors	Without Project Impacts	With Project Impacts		
			Alternative mode of transportation such as ferry	The Alternative Route connect Dhubri and Phulbari by widening of existing NH-31 B and SH-46 through existing bridge near Goalpara	With Proposed bridge
			by dredging of ferry terminals and navigation channels.	but no impacts on the Brahmaputra River.	construction phase, but there will be little impact during operation phase.
			2	1	3
			4	1	3
3	Pollution	+ Present status is continued.	- Possibility of water pollution such as oil leak from ferries.	++ Air pollution and CO2 emission may decrease due to improved road conditions.	+++ Overall air pollution and CO2 emission will be greatly reduced because travel distance between Dhubri and Phulbari is shortened by the bridge.
			3	1	4
			2	1	4
4	Impact on local economy	- No positive or negative impact on local economy.	+ Connectivity between Dhubri and Phulbari is improved by the ferry, but it is susceptible to natural disasters such as flooding.	++ Connectivity between Dhubri and Phulbari is improved to some extent.	+++ Transport between Dhubri and Phulbari takes less time and becomes efficient, and it will enhance the local economy.
			3	2	4
			1	4	8
	Total score	12	12	9	17
	Rank	2	2	4	1
	Evaluation	Local economic development is obstructed by the lack of road connectivity.	Expected positive impact is small while significant negative social and environmental impact is anticipated.	Scale of involuntary resettlement can be kept relatively small, but serious negative impacts on natural environment are anticipated.	Involuntary resettlement and impact on natural environment is anticipated. However, improvement of transportation will contribute to the development of local socioeconomic development.

Legend

+++ : best (most desirable) option; score 4 points

++: second-best option; score 3 points

+ : third-best option; score 2 points

-: worst (least desirable) option; score 1 point

Source: JICA Study Team

4.3.2 Comparison of bridge alignment options

In order to minimize the social and environmental impacts, three alignment options were compared. The three options were set as follows. Each line is a line connecting the following combinations of the six points in the table below.

- i) Option 1 represented by line AD: This option is designed to avoid residential areas in the Dhubri town and the islands as much as possible. The total length of the bridge and approach road will be longer, but the negative social impacts can be minimized.
- ii) Option 2 represented by line BE: This option is designed to connect Dhubri and Phulbari in the shortest distance. The total length of the bridge and approach road can be minimized, but the start point of the bridge falls on the dense residential area of Dhubri town, alignment passes through residential area of the islands.
- iii) Option 3 represented by line BFE: This option is designed to cross Brahmaputra River at a right angle. The navigable section of the bridge can be shortened and residential area on the islands can be avoided, but the start point of the bridge falls on the dense residential area of Dhubri town and the alignment is composed of more curves.

The proposed alignment option was finalized based on a desk study of satellite imageries available from “Google Earth” and a reconnaissance survey at site. The alignment options are detailed, node-wise in Figure 4-2 and the nodes are described below.

Table 4-3: Location of Nodes for the Bridge Alignment Alternatives

NODE	LOCATION
Node-A	At km 55+200 on proposed NH-127B, near Adabari Junction
Node-B	At Balajan Dhubri road, near Choto Bashjani (1.3km east of Adabari Junction)
Node-C	At College Road Junction with the bund road, near Bidyapara
Node-D	At Agia-Tura NEC Road, 400 m from Phulbari Ghat towards Agia
Node-E	At Agia-Tura NEC Road, 1km from Phulbari Ghat towards Agia
Node-F	On Southern Bank of Brahmaputra, near Borokalia Surjyamara

Source: DPR Inception Report

The methodology is adopted to review these three alignments by covering the following aspects.

Table 4-4 Evaluation Criteria

	Parameter	Evaluation	Data collection
Social Aspects	Affected structures	Larger number will cause larger impact	Satellite image and land survey
	Land to be acquired	Larger number will cause larger impact	Satellite image and land survey
	Permanent Char Land	Larger number will cause larger impact	Satellite image and land survey
Environmental Aspects	Total Length	Larger number will cause larger impact	Construction design by DPR consultants
	Agriculture Land	Larger number will cause larger impact	Construction design by DPR consultants
	Total Length over Brahmaputra River	Larger number will cause larger impact	Satellite image
Engineering Aspects	Total Length	Smaller number is preferable	Construction design by DPR consultants
	Length of bridge approach	Smaller number is preferable	Construction design by DPR consultants
	Horizontal Geometry : Total no. of curves	Smaller number is preferable	Construction design by DPR consultants
	Horizontal Geometry: Total length of curves	Smaller number is preferable	Construction design by DPR consultants
Indicative Cost Aspects	Total Approximate Civil Construction Cost	Smaller number is preferable	Construction design by DPR consultants

Social Aspects

The number of affected structures is considered as an equivalent to the scale of resettlement expected from the Project. Size of Land to be acquired is indicative of the scale of possible losses of livelihood considering that the population in the area is largely dependent on their land. The length of alignment passing through Permanent Char Land is also included in the parameters to evaluate the impact on Char people whose socio-economic status is lower than that of the inland communities.

Environmental Aspects

Total length is indicative of negative impacts such as noise, vibration, and air pollution at operation phase. As the total length increases, vehicles need to travel longer distances and larger negative impacts are anticipated.

Agriculture Land that overlaps with the alignment will be lost due to the construction of the bridge and cause negative environmental impacts such as loss of environmental services. Total Length over the Brahmaputra River is indicative of negative impacts of the project on the river ecosystem and endangered aquatic species such as Ganges river dolphins. The longer the length over Brahmaputra River is, the larger the damage on the river ecosystem will be.

Engineering Aspects

With regard to the total length of the bridge, because of higher construction technologies and costs of bridges compared with embankments, a shorter bridge length is rated favorable. With regard to the length of the approach, because of the necessity of new road constructions of approaches to connect the bridge and the existing roads, a shorter approach length is rated favorable. With regard to the number of curves, because of easier drivability of roads with fewer curves, the fewer is rated favorable. With regard to the total length of curves, because of the requirement of complex structures and higher construction technologies, a shorter length is rated favorable.

Based on the above aspects, the parameter scores for various aspects and options are as follows. The numerical score was calculated by the following equation:

$$\text{Score for Option X} = 10 * \text{value of Option X} / \text{Max value for 3 options}$$

Table 4-5 Evaluation and Comparison of the Alternatives

Item	Unit	Max. Score	Option 1		Option 2		Option 3	
			Qty	Score	Qty	Score	Qty	Score
Social Aspects								
Affected structures	No.	10.0	122	6.52	170	9.09	187	10.00
Land to be acquired	ha	10.0	55.20	7.69	63.00	8.77	71.76	10.00
Permanent Char Land	km	10.0	6.30	9.40	6.70	10.00	5.10	7.61
Total Score		30.0		23.61		27.86		27.61
Evaluation				++		+		+
Environmental Aspects								
Total Length	km	10.0	19.282	10	17.847	9.26	18.797	9.75
Agriculture Land	ha	10.0	0.012	3.42	0.018	5.14	0.035	10
Total Length over Brahmaputra River	km	10.0	2.85	10	2.67	9.36	2.20	7.72
Total Score		30.0		23.42		27.76		37.47
Evaluation				++		+		-
Engineering Aspects								
Total Length	km	10.0	18.360	10.00	17.01	9.26	17.995	9.80
Length of bridge approach	km	10.0	0.471	10.00	0.465	9.87	0.430	9.13

Item	Unit	Max. Score	Option 1		Option 2		Option 3	
			Qty	Score	Qty	Score	Qty	Score
Horizontal Geometry : Total no. of curves	no.	10.0	3	6.00	5	10.00	5	10.00
Horizontal Geometry: Total length of curves	M	10.0	983.2	3.24	2054.1 5	6.77	3035.09	10.00
Total Score		40.0		29.24		35.90		38.93
Evaluation				++		+		-
Indicative Cost Aspects								
Total Approximate Civil Construction Cost	Cr.	10.0	2858	9.47	3018	10.00	2889	9.57
Total Score		10.0		9.47		10.00		9.57
Evaluation				++		+		++
Total Rank				1		2		3

As for the social aspects, Option 1 has less impact with respect to the number of affected structures and the size of the land to be acquired. Although Option 3 has less impact on the poor, the total score shows Option 1 as the most favorable option.

As for the environmental aspects, differences among the three options were relatively small for the total length and the total length over Brahmaputra, but impacts on agriculture land were most significant for Option 3.

As for the engineering aspects, although Option 1 is unfavorable with respect to a longer bridge length and approaches, it has a fewer curves and a shorter curve length deemed to be favorable. The comprehensive rating gives Option 1 the highest score.

Based on the above, Option 1, i.e. proposed bridge over river Brahmaputra between Dhubri on North Bank and Phulbari on South Bank in the state of Assam/Meghalaya on NH-127B, alignment AD (Length: 20km), is recommended.

CHAPTER 5 Scoping Analysis

5.1 Procedures of Scoping Analysis

Depending on the scale and nature of works during the various stages of the project, there are positive and negative impacts to the natural and social environment. These impacts are different in the intensity, in the spatial reach, and in whether it is irrevocable or temporary.

The scoping matrix highlights anticipated impacts that occur on various environmental and social components during the scoping stage of the project. The project may affect the aquatic ecosystem in terms of the impacts to the natural environment. Also, the ROW for this project is 60m in width, and social impacts such as land acquisition and resettlement are anticipated.

5.2 Scoping Matrix: Preliminary Analysis of the Environmental Impacts

The scoping matrix is shown in the table below. According to the JICA Guideline (2010), the impacts are rated as follows:

“A” denotes that severe/irrevocable impact is expected (+: Positive impact, -: Negative impact)

“B” denotes that significant impact is expected (+: Positive impact, -: Negative impact)

“C” denotes that impact is relatively small (+: Positive impact, -: Negative impact)

“D” denotes that impact with little significance occurs (+: Positive impact, -: Negative impact)

Table 5-1: Scoping Matrix for the Proposed Bridge Option

Item	Scoping Analysis of the Anticipated Environmental Impacts			Rational of the Impact Assessment
	Pre-construction	Construction Stage	Operation Stage	
Pollution				
Air Pollution	D	B-	B-	P: No impact is expected.
				C: Some negative impacts are expected due to the operation of construction equipment and vehicles. One example is dust incidental to earthwork especially during the dry season.
				O: Air pollution is expected to increase due to increase traffic volume on the road.
Water Pollution	D	B-	D	P: No impact is expected.
				C: Turbid water due to the earthworks, bridge pier construction work and wastewater effluents from construction workers' camps / yards are expected to pollute the Brahmaputra river to some extent.
				O: No impact is expected.
Wastes / Hazardous Materials	D	B-	D	P: No impact is expected.
				C: Waste will be generated from construction workers' camps. Waste generated from construction and demolition work may include hazardous materials that must be treated before final disposal.
				O: No impact is expected.
Soil Contamination	D	B-	D	P: No impact is expected.
				C: Impacts on soil from deposition of pollutants from construction materials in the construction site are expected to be small. Since there is no major industrial activity along the road, it is unlikely that soil along the road is already polluted.
				O: No impact is expected.
Noise and Vibration	D	B-	B-	P: No impact is expected.
				C: Noise and vibration generated by the operation of construction equipment and vehicles, although they are temporary. Construction schedule should take into account the location of schools, hospitals and religious facilities that require silence during parts of the day.
				O: Noise and vibration level are likely to increase due to greater traffic volume along the road. Specific measures may be required to minimize impacts on schools, hospitals and religious facilities.
Ground Subsidence	D	D	D	P/C/O: No impact is expected.
Offensive Odor	D	D	D	P/C/O: No impact is expected.
Bottom sediment	D	C	C	P: No impact is expected.
				C/O: The piers may cause slight change in the hydrodynamics and cause erosion of bottom sediment.
Natural Environment				
Wildlife Reserve/ protected area	D	D	D	P: No impact is expected.
				C: No protected area exists within 10km radius of project area.
				O: No protected area exists within 10km radius of project area.
	D	A-	B-	P: No impact is expected.

Item	Scoping Analysis of the Anticipated Environmental Impacts			Rational of the Impact Assessment
	Pre-construction	Construction Stage	Operation Stage	
Eco-system/Bio-diversity				<p>C: During the construction period, ecosystem in the project area including local flora and fauna will be damaged to some extent.</p> <p>O: Increase of traffic volume will cause negative impacts on the ecosystem including fauna and flora along the project road.</p>
Topography/Geology	D	B-	D	<p>P: No impact is expected.</p> <p>C: Changes in topographic conditions over the project area takes place due to the need for cutting and filling work.</p> <p>O: No impact is expected.</p>
Hydrology	D	B-	B-	<p>P: No impact is expected.</p> <p>C: Construction work may cause minor and temporary impacts on hydrology because of pier construction, or the local use of water.</p> <p>O: Cutting and / or filling should result in minor changes of local hydrology.</p>
Eco-system/Bio-diversity	D	A-	B-	<p>P: No impact is expected.</p> <p>C: During the construction period, ecosystems in the project area including local flora and fauna are damaged to some extent.</p> <p>O: Increase of traffic volume will cause negative impacts on the ecosystem including fauna and flora along the project road.</p>
Social Environment				
Involuntary Resettlement	A-	D	D	<p>P: The project will likely affect over 700 families.</p> <p>C: Resettlement will be completed before construction begins and thus no resettlement is expected during operation.</p> <p>O: No impact is expected, as relocation will be completed before construction begins.</p>
Poor People	A-	B+	B+/B-	<p>P: Given the limited coping capacity of the poor, it is necessary to assess their vulnerability and develop appropriate mitigation measures.</p> <p>C: The poor can benefit from employment opportunities during construction work.</p> <p>P: In the long-term, economic development in the region is likely to benefit the poor. However, the poor may not be able to receive benefits from the project due to the lack of skills and coping capacity.</p>
Ethnic Minorities/Indigenous People	C	C	C	<p>P/C/O: According to initial site survey, there are no ST/SCs in the project area. However, the presence of ethnic minorities will be confirmed during the census survey.</p>
Local Economy and Livelihood	A-	B+/B-	B+/B-	<p>P: Loss of income sources and livelihood due to involuntary resettlement are expected to negatively affect the local economy and livelihood.</p> <p>C: Economic activity of fishermen may have negative impact during construction period. On the other hand, employment opportunities of various skill levels will be created by the project.</p> <p>O: Economic activity of boat operators may be affected. On the other hand, by improving transportation network, access to market and public facilities will be improved and positive impact on regional development can be expected.</p>
Land Use	B-	B-	D	<p>P: Land acquisition and involuntary resettlement are likely to cause changes in the existing land use patterns.</p> <p>C: Land use is expected to change for the construction of construction yards and workers' camps, however the impact is temporary.</p>

Item	Scoping Analysis of the Anticipated Environmental Impacts			Rational of the Impact Assessment
	Pre-construction	Construction Stage	Operation Stage	
				O: Land usage along the alignment will be permanently changed, however a negative impact is not expected. Construction yard will be restored to their original conditions by the contractors.
Utilization of Local Resources	D	B-	D	<p>P: No impact is expected.</p> <p>C: The use of local resources such as sand, crushed stone, etc. for the construction activities may have negative impact on the local use.</p> <p>O: No impact is expected as use of local resources is not expected during operation.</p>
Water Usage, Water Rights and Communal Rights	D	D	D	P/C/O: No impact is expected.
Social Infrastructure and Services	B-	B-	B+/B-	<p>P: One school may be affected and require relocation.</p> <p>C: If the school will be relocated to the area close to the alignment, noise from increased traffic is expected.</p> <p>O: If the school will be relocated to the area close to the alignment, noise from increased traffic is expected. In the long term, the project is expected to improve access to social infrastructure and services by providing a better transport network.</p>
Social Institutions and Local Decision-making Institutions	D	D	D	P/C/O: Land acquisition and involuntary resettlement will be implemented based on existing social and local decision-making institutions so no impact will be expected.
Unequal Distribution of Benefit and Damage	B-	B-	B-/B+	<p>P: Land acquisition and involuntary resettlement will lead to unequal distribution of benefits and damage between those who are directly affected by the project and those who are not.</p> <p>C: Those who are affected by Land acquisition and resettlement should have preference in access to employment opportunities by the construction work.</p> <p>O: There is a possibility of uneven distribution of benefits between bridge connection site and Char land. In the long term, the project is expected to have a positive impact on the local economy through an improved transportation network.</p>
Local Conflicts of Interests	D	D	D	P/C/O: No impact is expected.
Cultural and Historical Heritage	D	D	D	P/C/O: The proposed bridge does not traverse or run near major cultural or historical heritage sites.
Landscape	D	D	D	P/C/O: No impact is expected.
Gender	B-	B-	D	<p>P: Involvement of women should be ensured during the course of the land acquisition and resettlement process.</p> <p>C: Equal opportunity should be sought for employment during construction work.</p> <p>O: No impact is expected.</p>

Item	Scoping Analysis of the Anticipated Environmental Impacts			Rational of the Impact Assessment
	Pre-construction	Construction Stage	Operation Stage	
Children's Rights	B-	D	D	<p>P: One school playground will be affected by land acquisition.</p> <p>C/O: Child labor is unlawful according to Article 24 of the Indian Constitution. Only adults are eligible for potential employment opportunities created by the project.</p>
Public Health (sanitation and infectious diseases)	D	B-	D	<p>P: No impact is expected.</p> <p>C: Influx of construction workers is likely to increase the health risk, particularly that of STD / STI and HIV / AIDS.</p> <p>O: No impact is expected.</p>
Occupational Health and Safety (OHS)	D	B-	B-	<p>P: No impact is expected.</p> <p>C: Occupational health and safety of construction work should be properly managed through adequate EMP.</p> <p>O: Maintenance and repair work should take into account the occupational health and safety of the workers.</p>
Others				
Accidents	D	B-	B-	<p>P: No impact is expected.</p> <p>C: Increased risk of accidents associated with construction activities is expected due to the operation of heavy equipment and vehicles.</p> <p>O: Risks of accidents is expected to increase due to greater traffic volume and speed.</p>
Climate Change	D	D	D	<p>P: No impact is expected.</p> <p>C: The use of construction machines and operation of vehicles will result in an increase of GHG emissions, though the impact is small and short-term.</p> <p>O: The new bridge will shorten the truck transportation distance which reduces GHG emission. On the other hand, traffic volume is expected to increase. However, it is not significant enough to have impact on climate change and transboundary effects.</p>

Source: JICA Study Team

5.3 TOR of Natural and Socio-economic Environment Survey

TOR of the Natural Environment and Socio-economic Survey is shown in the table below.

Table 5-2: TOR of Natural and Socio-economic Environment Survey

Item	Locations	Items Subject to Investigation	Method of Assessment and Estimation of Impacts
Air Quality	3-4 locations along the bridge alignment (approximately every 10km)	<ul style="list-style-type: none"> PM2.5, PM10, NOx, SO2 	<ul style="list-style-type: none"> Review of DPR environmental study Continuous 24 hours per location (1 weekday) Accordance with environmental standards in India General trend of increase in traffic and vehicles is taken into account and CO₂ increase is qualitatively analysed.
Water Quality	3-4 locations along the bridge alignment	<ul style="list-style-type: none"> Water temperature, turbidity (NTU), pH, BOD5, COD 	<ul style="list-style-type: none"> Review of DPR environmental study Accordance with environmental standards in India Impacts during the construction period and operation and maintenance period are qualitatively analysed based on construction plan and similar projects
Solid Waste		<ul style="list-style-type: none"> Solid waste production and disposal during the construction period Solid waste produced during the maintenance works of the Project 	<ul style="list-style-type: none"> Review of DPR environmental study Impacts during the construction period and operation and maintenance period are qualitatively analysed based on construction plan and similar projects
Soil Contamination	3-4 locations along the bridge alignment	<ul style="list-style-type: none"> pH, Manganese, Iron, etc. 	<ul style="list-style-type: none"> Review of DPR environmental study Soil sampling and laboratory analysis Impacts during the construction period and operation and maintenance period are qualitatively analysed based on construction plan and similar projects
Noise and Vibration	3-4 locations along the bridge alignment	<ul style="list-style-type: none"> Noise level 	<ul style="list-style-type: none"> Review of DPR environmental study Accordance with environmental standards in India Impacts during the construction period and operation and maintenance period are qualitatively analysed based on construction plan and similar projects
Bottom Sediment		<ul style="list-style-type: none"> Hydrodynamic analysis 	<ul style="list-style-type: none"> Review of DPR environmental study Impacts during the construction period and operation and maintenance period are qualitatively analysed based on construction plan and similar projects
Ecosystem/ Biological Diversity	Entire Project Area	<ul style="list-style-type: none"> Presence/absence of rare species 	<ul style="list-style-type: none"> Field Survey Document survey Hearing Survey on local NGO/ experts. Impacts during the construction period and operation and maintenance period are qualitatively analysed based on construction plan and similar projects
Hydrogeography	Entire Project Area	<ul style="list-style-type: none"> Existing waterways such as rivers, streams and agricultural canals as well as sewage channels 	<ul style="list-style-type: none"> Review of DPR environmental study Document survey Field survey, map location study of the disaster-prone areas

Item	Locations	Items Subject to Investigation	Method of Assessment and Estimation of Impacts
			<ul style="list-style-type: none"> Impacts during the construction period and operation and maintenance period are qualitatively analysed based on construction plan and similar projects
Geography/ Geomorphology	Entire Project Area	<ul style="list-style-type: none"> Areas subject to cut and fill slope creation 	<ul style="list-style-type: none"> Review of DPR environmental study Document survey Field survey Impacts during the construction period and operation and maintenance period are qualitatively analysed based on construction plan and similar projects
Involuntary Resettlement	Within ROW	<ul style="list-style-type: none"> Population, asset inventory, livelihood Resettlement and rehabilitation cost 	<ul style="list-style-type: none"> Census Survey Focused Group Discussion Estimate the quantitative impact of affected households, land and properties. Estimate the cost of resettlement and rehabilitation, restoration program
Poor People	Within ROW	<ul style="list-style-type: none"> Livelihood and employment status Literacy 	<ul style="list-style-type: none"> Census Survey Socio-economic Survey Estimate the impacts based on result of Field Survey, Review of Document plus Similar Examples
Ethnic Minorities/ Indigenous People	Within ROW	<ul style="list-style-type: none"> Ethnicity, Language Livelihood 	<ul style="list-style-type: none"> Census Survey Socio-economic Survey Estimate the impacts based on result of Field Survey, Review of Document
Local Economy and Livelihood	Within ROW and area surrounding the proposed alignment	<ul style="list-style-type: none"> Regional economic situation Social structure Income and livelihood 	<ul style="list-style-type: none"> Census Survey Socio-economic Survey Focused Group Discussion Estimate likely impacts on the local economy based on Review of Document plus Similar Examples Estimate the impact on livelihoods based on the quantitative data of the socioeconomic status of PAPs
Land Use	Within ROW	<ul style="list-style-type: none"> Land utilization Extent of Impact by the project 	<ul style="list-style-type: none"> Socio-economic Survey Review project content Estimate the impacts based on result of Field Survey, Review of Document plus Similar Examples
Utilization of Local Resources	Area surrounding the proposed alignment	<ul style="list-style-type: none"> Volume of local resource use Extent of Impact by the project 	<ul style="list-style-type: none"> Socio-economic Survey Review project content Estimate the impacts based on result of Field Survey and Review of Document
Social Infrastructure and Services	Area surrounding the proposed alignment	<ul style="list-style-type: none"> Target facilities Distant from ROW, location Accessibility 	<ul style="list-style-type: none"> Socio-economic Survey Estimate the impacts based on information of utility infrastructure and public facilities (medical, school, religious facilities)

Item	Locations	Items Subject to Investigation	Method of Assessment and Estimation of Impacts
Unequal Distribution of Benefit and Damage	Within ROW and area surrounding the proposed alignment	<ul style="list-style-type: none"> Livelihood of PAP and surrounding area Utilization of Affected Land 	<ul style="list-style-type: none"> Census Survey Focused Group Discussion Estimate the impacts based on result of income sources of PAPs and other villagers plus Similar Examples
Gender	Within ROW and area surrounding the proposed alignment	<ul style="list-style-type: none"> Social Structure Livelihood and employment status Literacy 	<ul style="list-style-type: none"> Socio-economic Survey Focused Group Discussion Documents and reports of similar projects in the neighbouring areas. Estimate the impacts based on result of Field Survey, Review of Document plus Similar Examples
Children's Rights	Within ROW and area surrounding the proposed alignment	<ul style="list-style-type: none"> Number of students Facilities nearby 	<ul style="list-style-type: none"> Socio-economic Survey Estimate the impacts based on result of Field Survey plus Similar Examples
Public Health (sanitation and infectious diseases)	100m from the proposed alignment	<ul style="list-style-type: none"> Rate of disease, epidemic and tendency 	<ul style="list-style-type: none"> Review of documents of the similar projects. Estimate the epidemic of diseases and tendency through Review of Document plus Similar Examples
Occupational Health and Safety (OHS)	Area surrounding the proposed alignment	<ul style="list-style-type: none"> Risk of Safety and Health, countermeasure 	<ul style="list-style-type: none"> Review of documents including EMP of the similar projects. Estimate the impacts based on Similar Examples
Accidents	Area surrounding the proposed alignment	<ul style="list-style-type: none"> Traffic demand Accident risk and measures 	<ul style="list-style-type: none"> Review of documents including EMP of the similar projects. Estimate accident risk, tendency and measures based on Review of Plan plus Similar Examples

Source: JICA Study Team

CHAPTER 6 Anticipated Environmental Impacts

6.1 Impacts on the living environment

6.1.1 Survey Results

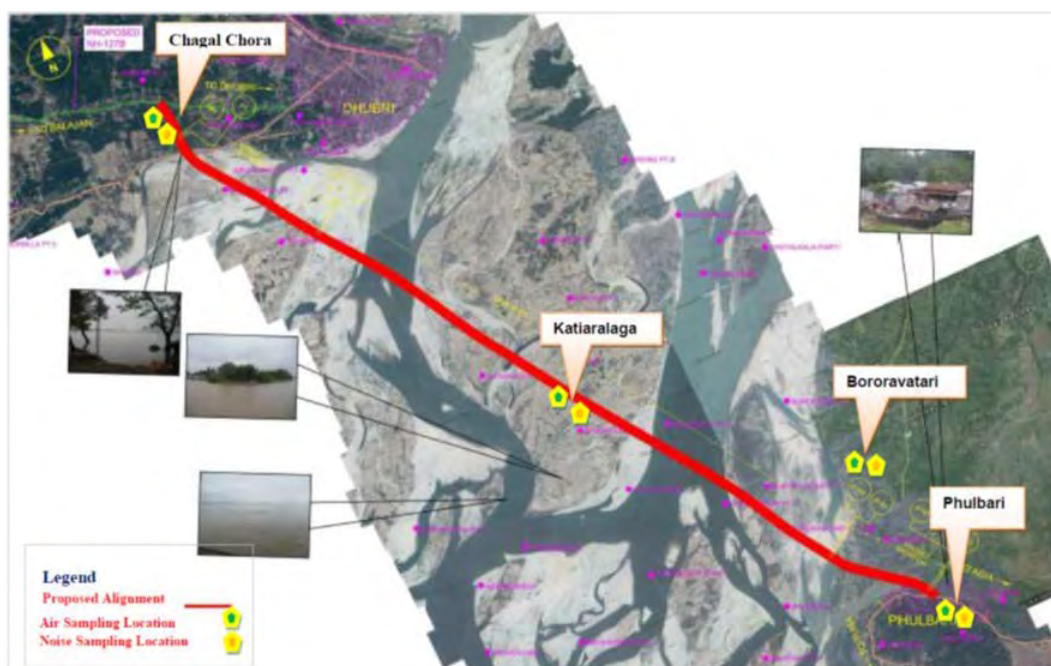
1) Air Quality

Ambient air samples were collected and analyzed at 4 locations along the proposed alignment of the bridge in October 2016. The results are shown below. At all sampling locations, the concentrations of air pollutants were below the national environmental standards.

Table 6-1: Ambient Air Quality along proposed Dhubri – Phulbari bridge

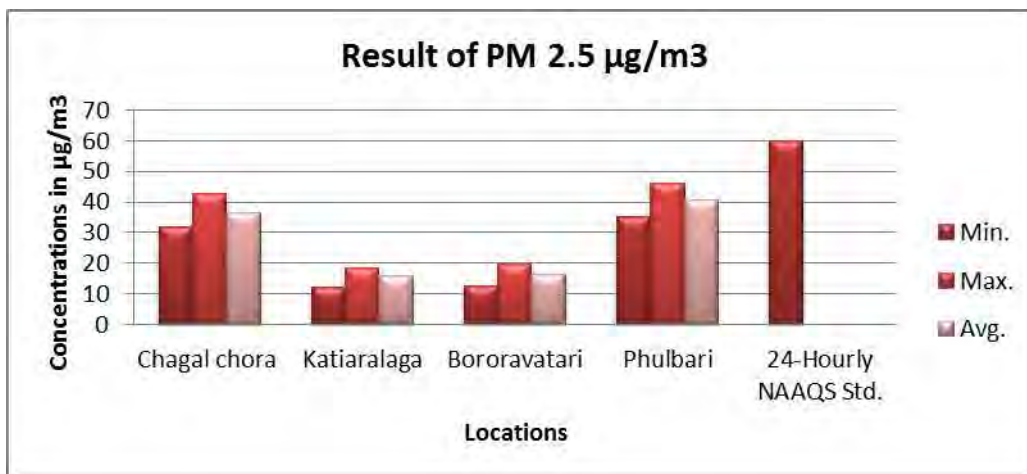
Chagal chora (Latitude 26°02'0.32"N & Longitude 89°56'15.67"E)					
	PM _{2.5} ,µg/m3	PM ₁₀ ,µg/m3	SO ₂ µg/m3	NOx µg/m3	CO, µg/m3
Min	31.7	78.6	8.2	15.2	450
Max	42.6	86.3	10.2	22.4	750
Average	36.6	81.8	9.0	18.6	567.1
Katiaralaga (Latitude 25° 57' 49.90" N & Longitude 89° 58'38.26" E)					
	PM _{2.5} ,µg/m3	PM ₁₀ ,µg/m3	SO ₂ µg/m3	NOx µg/m3	CO, µg/m3
Min	12.2	45.2	BDL	8.2	220
Max	18.3	56.4	BDL	10.4	290
Average	16.0	50.8	BDL	9.2	251.3
Bororavatari (Latitude 25° 55' 03.91" N & Longitude 90° 00' 53.50" E)					
	PM _{2.5} ,µg/m3	PM ₁₀ ,µg/m3	SO ₂ µg/m3	NOx µg/m3	CO, µg/m3
Min	12.8	47.2	BDL	8.8	230
Max	19.6	59.4	BDL	11.6	310
Average	16.2	54.2	BDL	9.9	270.0
Phulbari (Latitude 25° 53' 21.04" N & Longitude 90° 02' 13.40" E)					
	PM _{2.5} ,µg/m3	PM ₁₀ ,µg/m3	SO ₂ µg/m3	NOx µg/m3	CO, µg/m3
Min	35.2	79.6	8.9	16.2	460
Max	46.2	88.7	11.5	23.7	780
Average	40.7	83.2	10.1	19.6	576.3

Source: JICA Study Team



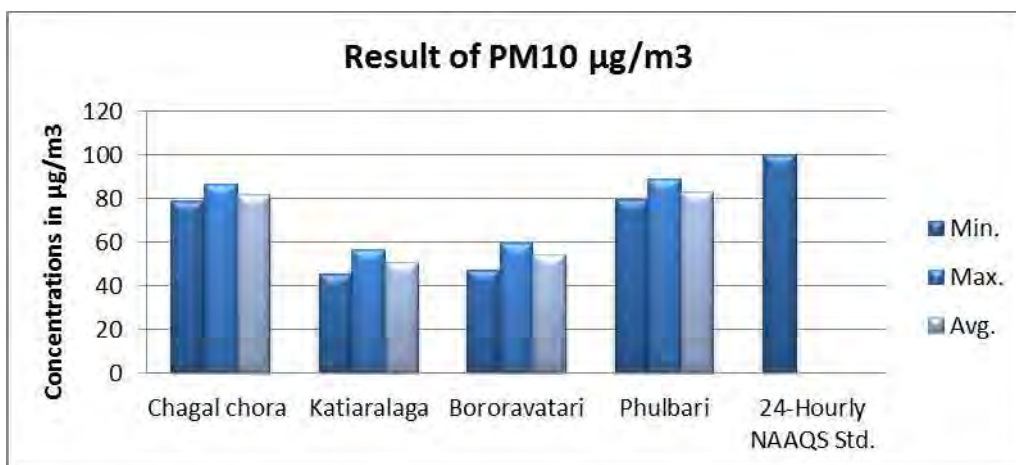
Source: JICA Study Team

Figure 6-1: Sampling locations for ambient air quality and noise level



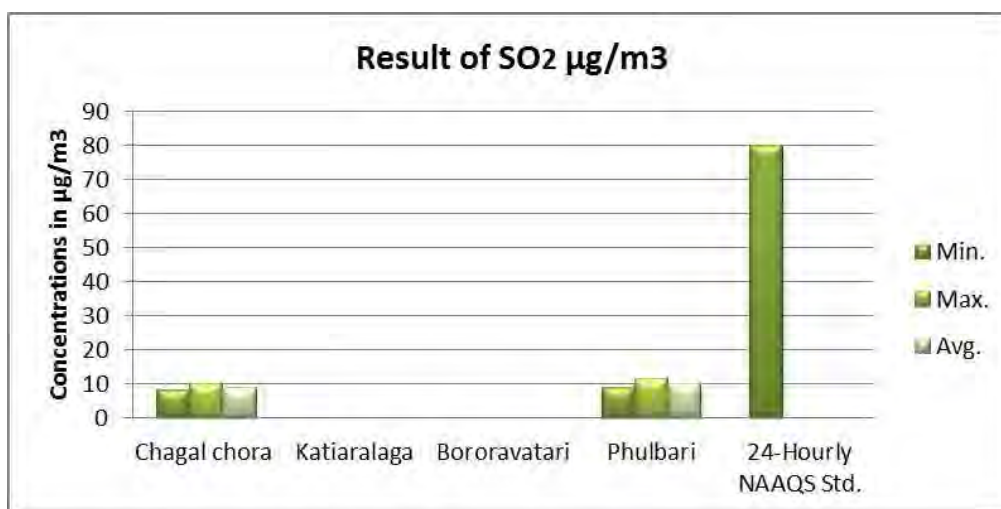
Source: JICA Study Team

Figure 6-2: Concentration of PM2.5 at locations along proposed Dhubri – Phulbari bridge on NH-127B



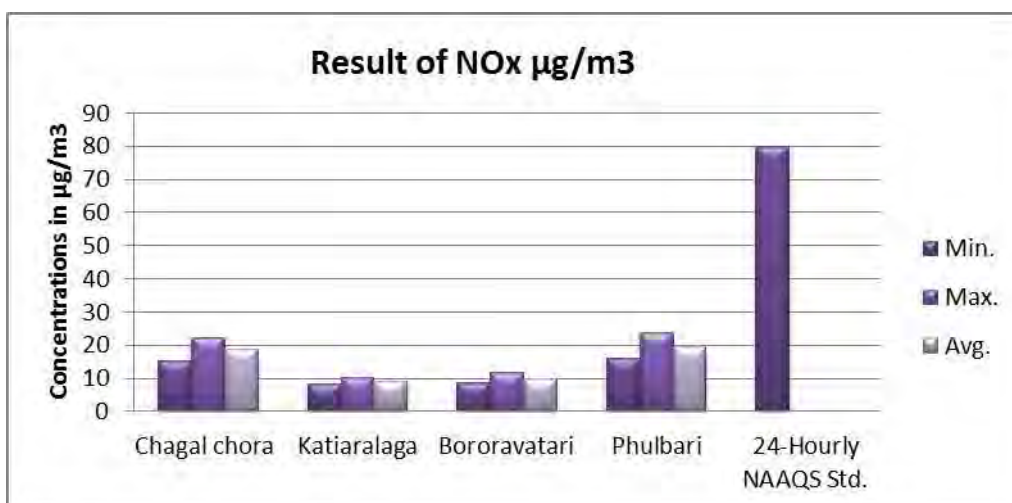
Source: JICA Study Team

Figure 6-3: Concentration of PM10 at locations along proposed Dhubri – Phulbari bridge on NH-127B



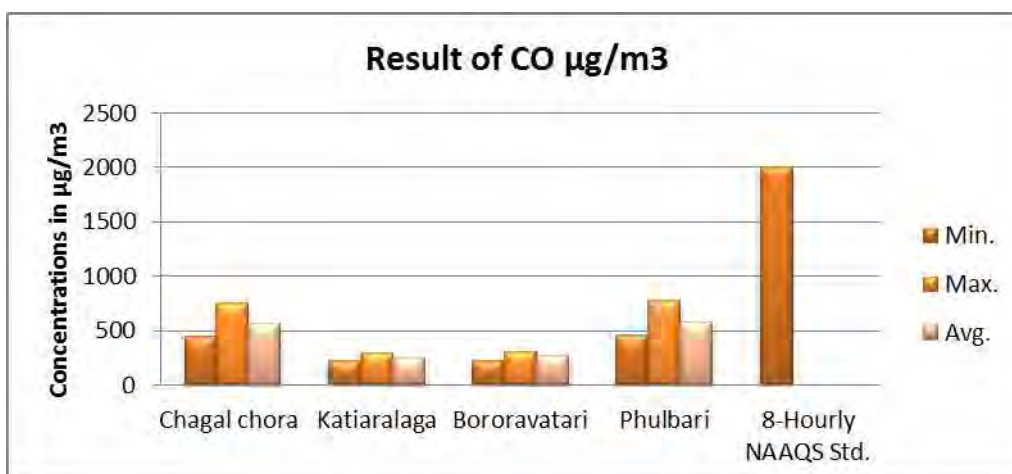
Source: JICA Study Team

Figure 6-4: Concentration of SO₂ at locations along proposed Dhubri – Phulbari bridge on NH-127B



Source: JICA Study Team

Figure 6-5: Concentration of NO_x at locations along proposed Dhubri – Phulbari bridge on NH-127B

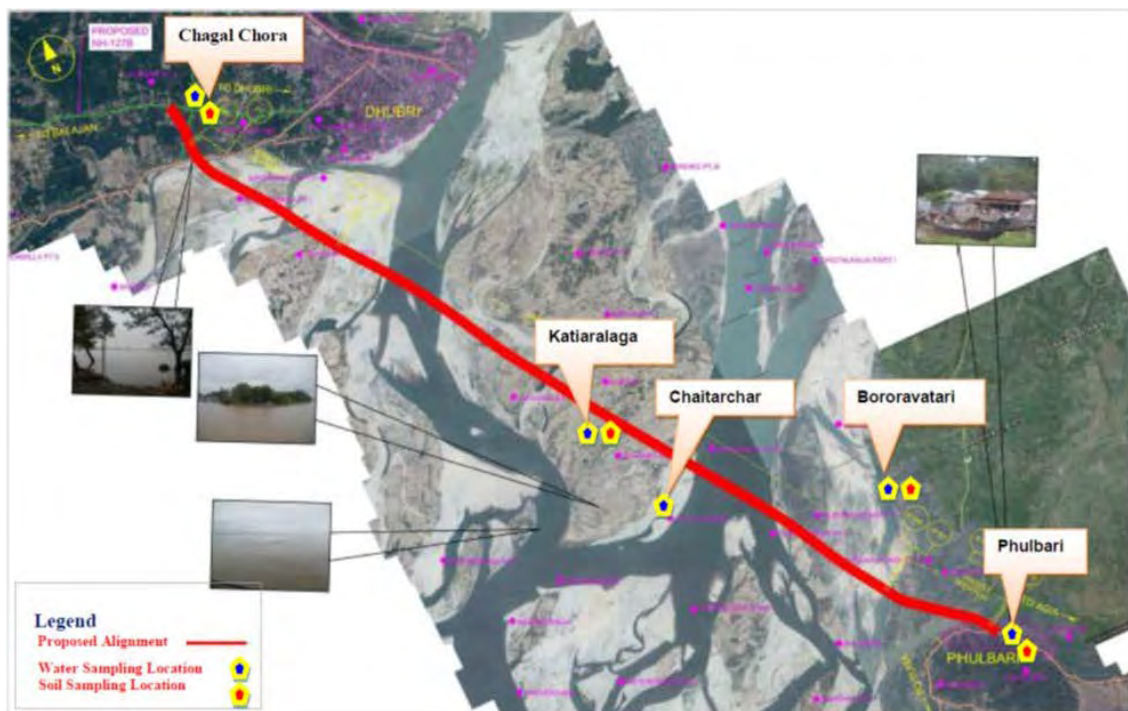


Source: JICA Study Team

Figure 6-6: Concentration of CO at locations along proposed Dhubri – Phulbari bridge on NH-127B

2) Water and Soil Quality

The monitoring of the water quality (surface and ground water) was performed at five identified locations in October 2016, in accordance to the Indian Standard Drinking Water Specification – IS 10500: 2012 and the quality met the IS Standards except for the pH, which is mildly acidic in Phulbari (dug well) and found to be 6.2 in pH scale. The bacteriological parameters are well within the standard limit except at Bororavatari perhaps due to waste from human intervention in the form of release of untreated waste. As for the soil quality, the results indicate no pollution.



Source: JICA Study Team

Figure 6-7: Sampling locations for water and soil quality

Table 6-2: Water quality (Surface and Ground water) along proposed Dhubri – Phulbari Bridge on NH-127B

Sl. No.	Parameters	Unit	Limit (as per IS:10500-2012)		Chagal Chora (Latitude 26°02'0.58"N & Longitude 89°56'15.22"E) (Bore well)	Chaitarchar (Latitude 25°55'49.65"N & Longitude 89°59'30.77"E) (Brahmaputra River)	Katiaralaga (Latitude 25°57' 48.71" N & Longitude 89°58'34.52" E) (Hand pump)	Bororavatari (Latitude 25°55' 00.77" N & Longitude 90°01' 45.56" E) (Jinger River)	Phulbari (Latitude 25°53' 21.04" N & Longitude 90°02' 13.40" E) (Dug well)
			Desirable Limit	Permissible Limit					
1	pH	-	6.5-8.5	No Relaxation	6.56	7.54	7.29	6.63	6.02
2	Colour	Hazen	5	25	<5	<5	<5	<5	<5
3.	Turbidity	NTU	5	10	BDL	5.5	BDL	6.5	BDL
3	Dissolved Oxygen	% By Mass	5	10	7.2	6.5	6.5	7.0	6.0
4	BOD (at 27°C 3-Days)	mg/l	-	-	<2.0	3.8	<2.0	4.2	<2.0
5	COD	mg/l	-	-	BDL	10.6	BDL	16.0	BDL
6	TKN	mg/l	-	-	3.1	3.2	2.5	3.5	2.0
7	Total Hardness (as CaCO ₃)	mg/l	200	600	204.30	60.4	186.60	45.6	120
8	Calcium (as CaCO ₃)	mg/l	75	200	168	44.40	153	34.6	94
9	Magnesium (as CaCO ₃)	mg/l	30	100	38.3	16.0	33.6	11	26
10	Ammonia (NH ₃)	mg/l			BDL	BDL	BDL	BDL	BDL
11	Electrical Conductivity	Microm/ho s/cm	-	-	649.87	184.17	660.99	177.91	598.06
12	Chloride (as Cl)	mg/l	250	1000	23.99	0.5	27.3	4.49	50.99
13	Sulphate (as SO ₄)	mg/l	200	400	46.52	8.4	38.4	19.6	41.0
14	Phosphates	mg/l	-	-	BDL	BDL	BDL	BDL	BDL
15	Nitrate (as NO ₃)	mg/l	45	No Relaxation	10.68	3.8	8.32	2.6	9.6
16	Fluoride (as F)	mg/l	1	1.5	0.45	0.32	0.31	0.28	0.23
17	Arsenic (As)	mg/l	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
18	Lead (as Pb)	mg/l	-	-	<0.01	<0.01	<0.01	<0.01	<0.01

Sl. No.	Parameters	Unit	Limit (as per IS:10500-2012)		Chagal Chora (Latitude 26°02'0.58"N & Longitude 89°56'15.22"E) (Bore well)	Chaitarchar (Latitude 25°55'49.65"N & Longitude 89°59'30.77"E) (Brahmaputra River)	Katiaralaga (Latitude 25° 57' 48.71" N & Longitude 89° 58'34.52" E) (Hand pump)	Bororavatari (Latitude 25° 55' 00.77" N & Longitude 90° 01' 45.56" E) (Jinger River)	Phulbari (Latitude 25° 53' 21.04" N & Longitude 90° 02' 13.40" E) (Dug well)
			Desirable Limit	Permissible Limit					
19	Mercury(as Hg)	mg/l	-	-	<0.001	<0.0001	<0.001	<0.001	<0.001
20	Phenols	mg/l	-	-	<0.01	<0.01	<0.01	<0.01	<0.01
21	Cyanides	mg/l	-	-	BDL	BDL	BDL	BDL	BDL
22	TDS	mg/l	500	2000	422.41	119.71	429.64	115.64	388.74
23	Iron (as Fe)	mg/l	0.3	1.0	0.165	0.24	0.18	0.54	0.14
24	Alkalinity as (CaCO ₃)	mg/l	200	600	221	68	216	51	168
25	Sodium (as Na)	mg/l	-	-	32.6	12	56.7	16.30	62.5
26	Potassium (as K)	mg/l	-	-	1.8	1.33	3.5	2.2	3.8
27	Total Organic Carbon (TOC)	mg/l	-	-	3.2	0.092	2.7	1.9	2.6
28	Zinc	mg/l	5	15	<0.05	0.044	<0.05	<0.05	0.208
29	Cadmium	mg/l	0.003	No Relaxation	<0.001	<0.01	<0.001	<0.001	<0.001
30	Chromium	mg/l	0.05	No Relaxation	<0.05	<0.01	<0.05	<0.05	<0.05
31	Manganese (as Mn)	mg/l	0.1	0.3	<0.1	<0.1	<0.1	<0.1	<0.1
32	Nitrite (as No ₂)	mg/l	<0.01	No Relaxation	<0.01	<0.01	<0.01	<0.01	<0.01
Bacteriological Parameters									
1.	Fecal Coliform	MPN/100 ml	Shall Not be Detectable		Absent	168	Absent	210	Absent
2.	Total Coliform	MPN/100 ml	Shall Not be Detectable		Absent	655	Absent	740	Absent

Source: JICA Study Team

Table 6-3: Soil quality (Surface and Ground water) along proposed Dhubri – Phulbari Bridge on NH-127B

S.No.	PARAMETERS	TEST METHOD	UNIT	Chagal chora (Latitude 26°01'59.13"N & Longitude 89°56'16.42"E)	Katiaralaga (Latitude 25° 57' 48.75" N & Longitude 89° 58'34.64" E)	Bororavatari (Latitude 25° 55' 07.21" N & Longitude 90° 00' 56.29" E)	Phulbari (Latitude 25° 53' 20.24" N & Longitude 90° 02' 14.60" E)
1.	pH(1:5 suspension)	IS:2720(Part-26)	-	6.2	5.9	5.4	6.5
2.	Electrical Conductivity at 25°C (1:2suspension.)	IS:2720(Part-21)	μS/cm	449	490	378	461
3.	Calcium Sulphates	STP/SOIL	mg/kg	BDL	BDL	BDL	BDL
4.	Magnesium (as Mg)	STP/SOIL	mg/kg	132.85	123.4	145.6	115.0
5.	Organic Matter	IS:2720(Part-22)	% by mass	6.36	5.12	5.76	6.67
6.	Potassium (as K)	STP/SOIL	mg/kg	128.5	114.3	122.7	137.9
7.	Water Holding Capacity	STP/SOIL	% by mass	31.1	22.8	29.36	26.71
8.	Porosity	STP/SOIL	% by mass	23.3	17.3	22.82	32.7
9.	Sand	STP/SOIL	% by mass	38.0	37.8	39.3	36.4
10.	Clay	STP/SOIL	% by mass	54.6	55.2	52.7	54.4
11.	Silt	STP/SOIL	% by mass	7.4	7.0	8.0	9.2
12.	Sodium Sulphates	STP/SOIL	mg/kg	13.9	12.20	15.76	12.5
13.	Sodium Absorption Ratio	STP/SOIL	-	4.12	4.49	4.51	5.23
14.	Nitrogen	STP/SOIL	% by mass	0.062	0.057	0.051	0.076
15.	Phosphorus	STP/SOIL	mg/kg	22.7	18.4	16.20	21.93
16.	Bulk Density	STP/SOIL	gm/cc	1.30	1.37	1.52	1.45

S.No.	PARAMETERTS	TEST METHOD	UNIT	Chagal chora (Latitude 26°01'59.13"N & Longitude 89°56'16.42"E)	Katiaralaga (Latitude 25° 57' 48.75" N & Longitude 89° 58'34.64" E)	Bororavatari (Latitude 25° 55' 07.21" N & Longitude 90° 00' 56.29" E)	Phulbari (Latitude 25° 53' 20.24" N & Longitude 90° 02' 14.60" E)
17.	Texture	STP/SOIL	-	Sandy Clay	Sandy Clay	Sandy Clay	Sandy Clay
18.	Moisture Retention capacity	STP/SOIL	%by mass	20.6	18.9	22.3	19.6
19.	Infiltration Rate	STP/SOIL	mm/hr	23.4	21.0	19.66	24.2
20.	Moisture	STP/SOIL	%	16.82	14.3	13.28	15.6
21.	Sulphates	STP/SOIL	mg/1000g	13.4	15.7	17.9	14.62
22.	Available Sulphur (as S)	STP/SOIL	mg/kg	0.081	0.072	0.060	0.078
23.	Available Manganese (as Mn)	STP/SOIL	mg/kg	0.048	0.040	0.051	0.059
24.	Available Iron(as Fe)	STP/SOIL	mg/kg	0.63	0.71	0.68	0.076
25.	Exchangeable Sodium Percentage	STP/SOIL	mg/kg	0.076	0.052	0.067	0.059

Source: JICA Study Team

3) Noise Levels

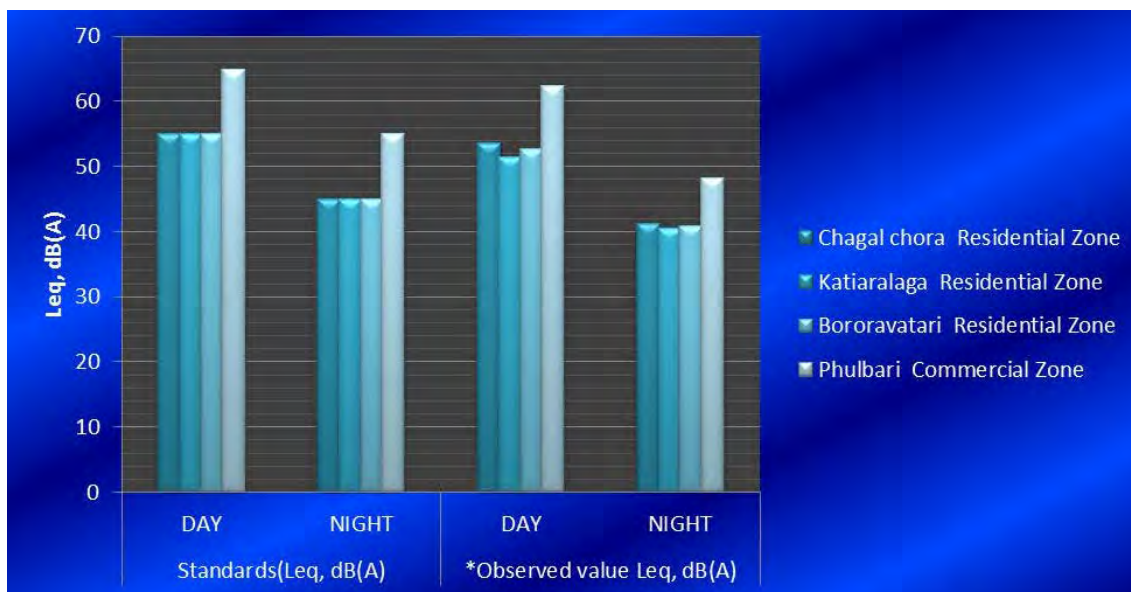
Monitoring of the noise levels were done at four identified locations along the proposed Dhubri – Phulbari bridge on NH-127B during October 2016, as per Ambient Air Quality standards with respect to noise, (2000). Results of noise levels are presented in Table below, a map of ambient noise locations is presented in Figure 6-8 and a location wise comparative chart for noise levels is presented in Figure 6-8.

Currently there is no source of vibration in the project area. Therefore vibration data was not measured.

Table 6-4: Noise Levels along proposed Dhubri – Phulbari Bridge on NH-127B

Sl. No	Date of Monitoring	Location	ZONE	Standards (Leq, dB(A))		*Observed value Leq, dB(A)	
				DAY	NIGHT	DAY	NIGHT
1	04.10.2016	Chagal chora (Latitude 26°02'0.58"N & Longitude 89°56'15.22"E)	Residential Zone	55	45	53.6	41.2
2	04.10.2016	Katiaralaga (Latitude 25° 57' 48.75" N & Longitude 89° 58'34.64" E)	Residential Zone	55	45	51.4	40.5
3	05.10.2016	Bororavatari (Latitude 25° 55' 05.21 N & Longitude 90° 00' 54.81" E)	Residential Zone	55	45	52.7	40.8
4	05.10.2016	Phulbari (Latitude 25° 53' 20.91" N & Longitude 90° 02' 15.30" E)	Commercial Zone	65	55	62.4	48.2

Source: JICA Study Team



Source: JICA Study Team

Figure 6-8: Ambient Noise Quality Results at locations along proposed Dhubri – Phulbari bridge on NH-127B

6.1.2 Anticipated Impacts and Mitigation Measures

1) Air Quality

Impacts

During the construction phase, the short-term and localized degradation of air quality will occur from dust generation due to the procurement and transportation of raw materials from quarries and borrow pits, site clearance, use of heavy vehicles, machinery/ equipment, stone crushing handling and the storage of aggregates and generation of fine particulate matter (smoke) in asphalt processing. Dust would be generated from the haulage of materials and detouring of traffic on non-permanent, temporary pavement etc. Hot mix plants contribute substantially to the deterioration of air quality due to emissions of oxides of Sulphur, Hydrocarbons and particulate matter. During the construction period, temporary impacts include the generation of Odor from construction activities as well as from construction camps. During the construction of the road, the movement of different types of construction machinery and vehicle will increase. This in another way increases the fuel consumption. From the results of the ambient air quality monitoring conducted along the road, it is noted that the monitoring parameters are within the standards as prescribed by the Central Pollution Control Board. The concentration of the air pollutants will further increase during construction period but for a limited period only. The impacts on the air quality during construction will be mostly localized and concentrated within the ROW. The impacts due to dust generation may be felt downwind of the site rather than the site itself due to local wind patterns.

During the operation phase, the project road is mostly passing through the rural areas with alluvial soil. Dust generation due to the movement of vehicles is envisaged along the project road, but not in significant amount. Due to increase in speed and volumes of vehicular traffic on the project corridor, marginal increase in the air pollutant levels is expected but not significant. Construction of the bridge will attract larger communities to use this corridor which in-turn increases the fuel consumption and can have direct impact on the national economy and local ecosystem.

Mitigation Measures

The hot mix plants, crushers and the batching plants will be sited at least 500m in the downwind direction from the nearest settlements and forest areas. All precautions to reduce the level of dust emissions from the hot mix plants, crushers and batching plants will be taken. The hot mix plant will be fitted with a dust extraction system. Asphalt and concrete plants will be operated in conformity with government pollution control legislation, and located away from the settlements as far as possible. All vehicles, equipment and machinery used for construction will be regularly maintained to ensure that the pollution emission levels conform to the SPCB norms. Regular monitoring of particulate matter at crusher sites, during the construction, will be conducted. Regular water sprinkling will be done on the cement and earth mixing sites, asphalt mixing site and temporary service and access roads. After compacting the earthwork, water will be sprayed to prevent dust emission. The vehicles delivering construction material will be covered to avoid spilling. Planting of trees/vegetation on the periphery of the construction site will be taken.

During the operation stage of the project, vehicular emissions of critical pollutants (PM2.5, PM10, CO, HC, SO₂, and NO_x) will be monitored and roadside tree plantation will be maintained. Over the long-term, projected increase in traffic volume, particularly ones of heavy trucks, may pose health threat to roadside community. The peak hourly estimated traffic volumes for the years 2020 and 2035 have been considered to project future air quality scenarios to provide an indication of long-term variations in air quality. The future level of air pollution, modeled based on the projected increase in traffic volume indicates that the level of pollution (CO and NO_x levels) will remain below the standard during the projected period (2035). Nevertheless, mitigation measures such as introducing speed limit and other measures to control congestion in built-up area may be necessary in the longer term. The RSPM values may increase as the traffic volume increases, however implementation of new Euro Norms in vehicle & Air Pollution control measures will ensure that values do not exceed the limit during operation stages.

Also, local communities should be well informed of the risk of air pollution. Awareness raising campaigns may include distribution of facemask to mitigate risk of air pollution and other information kits. Finally, relevant data (e.g. actual/projected traffic volume and likely emissions) shall be shared with relevant State authorities so that mitigation measures can be developed.

2) Water Quality

Impacts

Bridge projects may marginally lead to increased run-off during construction stages, which will increase sediment accumulation in nearby water bodies, the impacts due to the increased run-off would be negligible due to the project road. During construction, the disposal of solid and liquid waste from labor camps, fuel and lubricant spills, or leaks from construction vehicles, pollution from fuel storage and distribution sites and that from hot-mix plants is likely to affect water quality unless adequate mitigation measures are designed. Hence, change in natural drainage pattern is very insignificant to the present state of the project. No chemical pollution is expected since no hazardous materials will be used during the construction phase.

Use of water for construction activities such as compaction, suppression, concrete work may pose pressure on local water supplies; the demand would be met from surface water bodies like ponds, canal and rivers. Municipal water supply will be used only for drinking purposes (for construction camps), if available, and if permitted by the local municipal authority. No local/municipal water supply would be used for construction purposes.

Road and bridge projects may marginally lead to increased run-off during operational stages due to increases in impervious surfaces and sediment will accumulate in water bodies.

In the operation stage, pollutants from vehicles, and accidental fuel spills may make their way into the receiving environment. The major pollutants of concern are suspended solids, oil and grease, lead etc. No adverse direct impact on the water quality (both underground and surface water bodies) is expected during the operation period. The change in natural drainage pattern is expected to be very insignificant from the present state of the project.

Mitigation Measures

To avoid contamination of the various water bodies and drainage channels, construction work close to the watercourses or other water bodies will be avoided, especially during monsoon period. All necessary precautions will be taken to construct temporary or permanent devices to prevent water pollution due to increased siltation and turbidity. All wastes arising from the project will be disposed of, as per the State Pollution Control Board/Central Pollution Control Board norms, so as not to block the flow of water in the channels. The wastes will be collected, stored and taken to approve disposal sites.

To avoid contamination of the water body and drainage channels from fuel and lubricants, the vehicles and equipment will be properly maintained and refueled only at designated places. The slopes of embankment leading to water bodies will be modified and re-canalized so that contaminants do not enter the water body. Oil and grease traps will be provided at fueling locations, to prevent contamination of water.

Discharge of oil and grease is most likely from construction vehicle parking areas, vehicle repair areas and workshops. An oil interceptor shall be provided to ensure that all wastewater flows into the interceptor prior to its discharge. The device has a chamber for separation of oil and water and can handle 200 L/hour of wastewater. The oil float appearing on the surface is removed by periodic cleaning once a week by skimming off the oil film from the surface.

The sewage system (including septic tanks and soak pits) for construction camps will be properly designed and built so that no water pollution takes place in any water body or watercourse. The workplace will have proper medical approval by local medical, health or municipal authorities. The contractor will make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remains unaffected. Due to the non-availability of water required for construction, if a new tube-well is to be bored, prior sanction and approval by the Central Ground Water Board (CGWB) will be obtained. Wastage of water during the construction will be minimized.

3) Wastes/Hazardous Materials

Types of construction waste which are expected to be generated include asphalt chunks, chunks of concrete, surplus soil, construction scrap materials and organic waste generated by construction workers. The amount and percentage composition of construction waste will depend on the final design and the schedule of the construction, and thus generic mitigation measures proposed in EMP should be updated once the final ROW drawing is completed. All other construction wastes are also planned to comply with relevant central or State laws pertaining to waste management.

Candidate locations with sufficient and necessary conditions for spoil bank construction have been screened with the following criteria:

To minimize the transportation of surplus soil, spoil banks should be located using the following conditions:

- Ground shape with concavity topography
- Ground gradient less than 22 degrees which is assumed as an average angle for spoil banks slope with necessary steps
- Not in built-up area
- Not in protected forest/private forest

4) Soil

Impacts

The contamination of soil during construction stage is primarily due to construction and allied activities. The soil contamination may take place due to solid waste from the labor camps set-up during the construction stage. This impact is significant at locations of construction camps; stockyards, hot mix plants, etc. The sites where construction vehicles are parked and serviced are likely to be contaminated because of leakage or spillage of fuel and lubricants. The contamination of soils can also occur at the site of hot-mix plants from leakage or spillage of asphalt or bitumen. At the site of batching plants, because of spillage of cement and leakage of curing agents, soil contamination can occur. The contamination of soil may take place due to dumping of solid waste in an unscientific manner, leaching of fuel/oil & grease from workshops, or petrol stations and DG sets.

During the operation stage, soil pollution due to accidental vehicle spills or leaks is a low probability but potentially disastrous to the receiving environment, should they occur. These impacts can be long term and irreversible depending upon the extent of the spill.

Mitigation Measures

At construction yards, the vehicles/equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not occur and contaminate the surrounding soil. It will be ensured that the fuel storage and refueling sites are kept away from drainage channels and important water bodies. At wash-down and refueling areas, “Oil Water Separators” shall be provided. All spills and discarded petroleum products shall be disposed of in accordance to the Hazardous Waste Management and Handling Rules. Fuel storage and re-fueling areas will be located at least 500m away from all water bodies near the road alignment. The fuel storage and refueling areas shall not be located on agricultural lands or productive lands to avoid topsoil contamination. The earthwork will be carried out strictly in accordance with the design so that no excess earth is borrowed. The construction waste generated will be reused in the construction of the highway.

Bituminous waste will be used after milling and in the case of bituminous waste being required to be disposed of it shall be disposed in a secured way by providing a 50mm thick layer of clay. The solid waste generated during the construction phase, which includes municipal waste both organic and inorganic in nature, shall be stored/treated/disposed of in accordance with Municipal Solid Waste (Management & Handling) Rules. The hazardous waste may include oil waste, biomedical waste, E-waste etc. This shall be disposed of in accordance with the Hazardous Waste (Management, Handling & Trans boundary Movement) Rules, Biomedical Waste (Management and Handling) Rules and E-Waste (Management and Handling) Rules respectively.

In the operation stage, the petrol pumps and vehicle washing area located along the ROW will be monitored regularly for any spillage, and corrective remedial measures like the spread of sand, and the provision of oil and grease separators for the passing of wash water from petrol pumps and vehicle washing areas, before diverting it to water bodies. The solid waste generated from the way side amenities will include Municipal Waste both organic and inorganic, hazardous waste (like used batteries), will be treated in accordance with Municipal Solid Waste (Management & Handling) Rule and Hazardous Waste (Management, Handling & Trans boundary Movement) Rules.

5) Noise and vibration

Impacts

During the construction, the major sources of noise pollution is the movement of vehicles transporting the construction material to the construction yard and the noise generating activities at the yard itself. Mixing, casting and material movement are primary noise generating activities in the yard and will be uniformly distributed over the entire construction period. Construction activities are expected to produce noise levels in the range of 80 - 95 dB (A). The major work will be carried out during the daytime. The noise levels in the project area during the construction stage will be intermittent and temporary in nature. Typical noise levels associated with the various construction activities and construction equipment are presented in the table below.

Table 6-5: Typical Noise Levels of Construction Equipment

Construction Equipment	Noise Level dB(A)
Bulldozer	80
Front end loader	72-84
Jack hammer	81-98
Crane with ball	75-87
Crane	75-77
Bulldozer	80
Backhoe	72-93
Front end loader	72-84
Cement & Dump trucks	83-94
Jack hammer	81-98
Scraper	80-93

Construction Equipment	Noise Level dB(A)
Welding generator	71-82
Grader	80-93
Roller	73-75
Concrete mixer	74-88
Concrete pump	81-84
Concrete vibrator	76
Paver	86-88
Truck	83-94
Tamper	74-77
Air compressor	74-87
Pneumatic tools	81-98

Source: U.S. Environmental Protection Agency, noise from Construction Equipment and Operations. Building, Equipment and Home Appliance. NJID. 300.1. December 31, 1971

At the moment, the noise level is within the desired level. The noise level will increase during the construction period, which may have significant impact for a limited period on the surrounding environment. The noise levels in the working environment are compared with the standards prescribed by the Occupational Safety and Health Administration (OSHA-USA) which in-turn are being enforced by the Government of India through Model rules framed under the Factories Act. The acceptable limits for each shift being of 8 hours in duration, the equivalent noise level exposure during the shift is 90 dB(A). Hence, noise generated due to various activities in the construction camps may affect workers, if an equivalent 8-hour exposure is more than the safety limit. ACGIH (American Conference of Government Industrial Hygienists) proposed an 8-hour Leq limit of 85 dB(A). Exposure to impulses or impact noise should not exceed 140 dB(A). The workers in general are likely to be exposed to an equivalent noise level of 80-90 dB(A) in an 8-hour shift for which all statutory precautions as per the law should be taken into consideration.

During the operation stage of the project, reduction of vehicular engine noise (as a result of reduced congestion from the earlier, smoother flow of traffic due to 2 separate lanes), vehicular body noise (as a result of reduced development roughness) and the reduction of blowing of horns will bring the noise levels down, but as the volume of traffic, mainly heavy duty traffic, will increase in the future due to rapid development and industrialization along the road corridor, the noise may increase slightly.

Mitigation Measures

The high noise levels may cause discomfort for local residents and workers. Following mitigation measures shall be adopted to keep the noise and vibration levels under control.

- The plants and equipment used for construction will strictly conform to Central Pollution Control Board (CPCB) noise standards. Vehicles, equipment and construction machinery shall be monitored regularly with particular attention to silencers and mufflers to maintain noise levels to a minimum;
- Workers in the vicinity of high noise levels must wear ear plugs and helmets and should be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 90 dB(A);
- In construction sites within 150 m of human settlements, noisy construction will be stopped between 10 PM and 6 AM except in the case of laying of cement concrete pavement for which a lower working temperature is a requirement;
- Hot mix plants, batching or aggregate plants shall not be located within 500m of sensitive land use for schools and hospitals;

- For places close to the sensitive receptors such as hospitals and schools, noise barriers such as earth, concrete, wood, metal or double-glazing of windows for façade insulation shall be used;
- Phase demolition, earthmoving, and ground-impacting operations are not to occur in the same time period. Unlike noise, the total vibration level produced could be significantly less when each vibration source operates separately;
- Construction machinery will be located away from the settlements;
- Careful planning of machinery operation and scheduling of operations can reduce the noise levels. Use of equipment, emitting noise not greater than 90 dB(A) for the eight-hour operations shift, and the locating of construction yards at a distance of at least 500m from any residential areas can be adhered to;
- Use of noise shields to construction machinery and provision of earplugs to the heavy machine operators are some of the mitigation measures, which should be followed by the contractors during the civil works;
- The noise control measures include limitations on allowable grades. Open-graded asphalt and avoidance of surface dressings to reduce tire noise in sensitive areas. Maintenance of proper road surface repairs will also help in reducing noise levels;
- Use of air horns should be minimized on the highway during nighttime. During daytime hours, use of horns should be restricted to the sensitive locations. This can be achieved through the use of sign boards along the roadside;
- Future development along the road should follow correct land use norms so that sensitive receptors are not located along the road, specifically along the bypasses; and
- The development of greenbelt along the main road can also bring about a considerable reduction in noise levels. The area available on both sides of the road should be used to develop greenbelt, comprised of selected species of trees with high canopies to provide added attenuation of noise.

6) Bottom Sediment

Impacts

During the pre-construction phase, surveying of the riverbed during pre-construction activity could affect the bottom sediment quality. However, the expected level of impact is low, temporary, and limited.

During construction activity, when foundations and piers of the bridge are constructed, there may be mobilization of the bottom sediments causing high, temporary, yet localized environmental impacts. Constructed foundations and piers may produce scour around them when the velocity of water becomes high due to flooding during and after construction. However, the expected level of impact is low, temporary, and limited.

Mitigation Measures

Mobilization of bottom sediments will require the EPC Contractor to install turbidity curtains around the foundation and pier under construction. Minimization of scour will require the EPC Contractor to suspend construction during flooding. Those scours will naturally be filled up and stabilize after the flooding. The EPC Contractor will monitor the velocity of water flow for a flood warning.

6.2 Natural Environment

6.2.1 Survey Results

1) Ecology

The survey was conducted in October 2016. Primary information was collected by geo-spatial survey using GPS for land use and land cover in the area and visual survey during site visit of the floral and faunal biodiversity both in land and water, and threats to biodiversity.

The secondary source of data collection included on-site discussion with local people, boatmen, fishermen, knowledgeable people, local NGO, the faculty of Department of Zoology, Guwahati University, Guwahati, Assam, as well as information collection from published studies available as research and development publications, reports and bulletin of individual faculty and research institutions like Forest Department, BSI, ZSI, IUCN, CPCB, etc..

The area includes predominantly the flood plain or riparian ecosystem of the river Brahmaputra. In certain places, island habitation or small villages, e.g., Armari, Balughat, etc., are evident in the region.

Local people (rural inhabitants) practice conventional, natural living based on resources. Agriculture of subsistence nature, and fishing are the major economic activities of these people.

Habitation towards Dhubri and South Salmara-Mankachar consists of land based plantation of plantation crops and forest species, buildup areas and water bodies; while the area towards Phulbari includes scattered patches of barren land or waste land, forestry plantations of sal, sagaun or teak and occasionally eucalyptus. Natural forest is totally obscured in the bridge impact area. Deciduous forest (Champion and Seth 1968) is recorded only in the West Garo Hills near Phulbari (beyond 15km distance).

Biodiversity of agricultural species of plants is enumerated in the following Table. A total of 37 species of diverse economic use were recorded in the island habitations predominantly including vegetable crops (16 species). The Animal husbandry includes rearing of goats, cows and buffalo, rarely pigs or ducks. Backyard poultry is also practiced on a small scale by some inhabitants. The practice of aquaculture (rearing fishes and prawn) is altogether absent.

Table 6-6: Domesticated agro-biodiversity in the Study Area

Scientific Name	Family	Crop Type	Local/ English Name
<i>Allium cepa</i>	Amaryllidaceae	Vegetable	Piyaj
<i>Allium sativum</i>	Amaryllidaceae	Spice	Lahsun
<i>Amaranthus sp.</i>	Amaranthaceae	Vegetable	Lalsag
<i>Anacardium occidentale</i>	Anacardiaceae	Plantation Crop	Kaju
<i>Ananas comosus</i>	Bromeliaceae	Fruit	Pineapple
<i>Areca catechu</i>	Arecaceae	Plantation Crop	Tambul
<i>Artocarpus hetrophyllus</i>	Moraceae	Vegetable	Kathal
<i>Brassica spp.</i>	Brassicaceae	Oilseed	Sarson
<i>Capsicum annum</i>	Solanaceae	Vegetable	Mirch
<i>Carica papaya</i>	Caricaceae	Fruit	Papita
<i>Cier aeriatinum</i>	Fabaceae	Pulse	Chana
<i>Citrus media</i>	Rutaceae	Fruit	Nimbu
<i>Cocos nucifera</i>	Arecaceae	Fruit	Narikol
<i>Colocasia antiquoram</i>	Aracea	Vegetable	Kachchu
<i>Corchorus capsularis</i>	Malvaceae	Fibre	Jute
<i>Coriandrum sativum</i>	Apiaceae	Condiment & Spice	Dhania
<i>Cucumis sativa</i>	Cucurbitaceae	Fruit	Kheera

Scientific Name	Family	Crop Type	Local/ English Name
<i>Cucurbita pepo</i>	Cucurbitaceae	Vegetable	Kaddu
<i>Daucus carota</i>	Apiaceae	Vegetable	Gajar
<i>Hevia brasiliensis</i>	Euphorbiaceae	Plantation Crop	Ruber
<i>Lens esculenta</i>	Fabaceae	Pulse	Masur
<i>Luffa</i> spp.	Cucurbitaceae	Vegetable	Lauki
<i>Lycopersicon esculentum</i>	Solanaceae	Vegetable	Tamatar
<i>Momordica charantia</i>	Cucurbitaceae	Vegetable	Karela
<i>Musa indica</i>	Musaceae	Fruit	Kela
<i>Oryza sativa</i>	Poaceae	Cereal	Dhan
<i>Phaseolus mungo</i>	Fabaceae	Pulse	Urd
<i>Psidium guajava</i>	Myrtaceae	Fruit	Amrud
<i>Raphanus sativa</i>	Brassicaceae	Vegetable	Muli
<i>Sesamum indicum</i>	Pedaliaceae	Oilseed	Til
<i>Solanum melongena</i>	Solanaceae	Vegetable	Began
<i>Solanum tuberosum</i>	Solanaceae	Vegetable	Aalu
<i>Spinach oleracea</i>	Amaranthaceae	Vegetable	Palak
<i>Trigonella foenium graecum</i>	Fabaceae	Vegetable	Methi
<i>Triticum aestivum</i>	Poaceae	Cereal	Gehu
<i>Zea mays</i>	Poaceae	Cereal	Makka
<i>Zingiber officinalis</i>	Zingiberaceae	Rhizome	Adrakh

Source: JICA Study Team

The diversity of flora (macrophytes) of terrestrial and aquatic ecosystems, in the wild, is listed in Table 6-7. A total of 75 plant species were recorded, including herbs (34 species), shrubs (06 species), trees (21 species) and climbers (04 species). The area included 27 plant species as invasive alien species, comprising of herbs (22), shrubs (03), small trees (01) and climbers (01) (Table 6-8). The flood plain areas are occupied by native *Saccharum spontaneum* grass, which was well established in the riparian ecosystem on account of the availability of a suitable habitat.

Table 6-7: Plant Biodiversity in the Study Area

Scientific Name	Family	Habit	Local Availability	IUCN * Status
(A) ANGIOSPERMS				
<i>Acacia pennata</i>	Mimosaceae	Herb	Common	LC
<i>Ageratum conyzoides</i>	Asteraceae	Herb	Very Common	NA
<i>Albizia procera</i>	Mimosaceae	Tree	Rare	NA
<i>Anthocephalus chinensis</i>	Rubiaceae	Tree	Common	NA
<i>Artocarpus integrifolia</i>	Moraceae	Small Tree	Common	NA
<i>Arundinella nepalensis</i>	Poaceae	Herb	Common	NA
<i>Arundo donax</i>	Poaceae	Herb	Common	LC
<i>Asparagus racemosus</i>	Liliaceae	Trailing Herb	Rare	NA
<i>Bauhinia acuminata</i>	Caesalpiniaceae	Small Tree	Common	LC
<i>Bombax ceiba</i>	Bambacaceae	Tree	Very Common	NA
<i>Cardamine impatiens</i>	Brassicaceae	Herb	Common	NA
<i>Cassia fistula</i>	Caesalpiniaceae	Small Tree	Common	NA
<i>Cassia tora</i>	Caesalpiniaceae	Shrub	Common	NA
<i>Chrysopogon fulvus</i>	Poaceae	Herb	Common	NA
<i>Cissampelos pariera</i>	Manispermaceae	Herb	Rare	NANIC
<i>Commelina bengalensis</i>	Commelinaceae	Herb	Very Common	NANIC
<i>Cyperus rotundus</i>	Cyperaceae	Herb	Abundant	NANIC
<i>Dendrocalamus hamiltonii</i>	Poaceae	Herb	Common	NA
<i>Dioscorea bulbifera</i>	Dioscoreaceae	Climber	Common	NA

Scientific Name	Family	Habit	Local Availability	IUCN Status *
<i>Erythrina variegata</i>	Papilionaceae	Small Tree	Rare	NA
<i>Eucalyptus tereticornis</i> **	Myrtaceae	Tree	Rare	NA
<i>Euphorbia emodi</i>	Euphorbiaceae	Herb	Common	LC
<i>E. hirta</i>	Euphorbiaceae	Herb	Common	NA
<i>Ficus hispida</i>	Moraceae	Tree	Common	NA
<i>Galium</i> sp.	Rubiaceae	Herb	Common	NA
<i>Gmelina arborea</i>	Verbenaceae	Tree	Common	NA
<i>Imperata cylindrica</i>	Poaceae	Herb	Common	LC
<i>Ipomoea aquatica</i>	Convolvulaceae	Herb	Common	NA
<i>I. cairica</i>	Convolvulaceae	Creeper	Very common	NA
<i>Justicia adhatoda</i>	Acanthaceae	Shrub	Common	NA
<i>Lagerstroemia parviflora</i> **	Lytharaceae	Tree	Rare	NA
<i>Lathyrus aphaca</i>	Fabaceae	Herb	Common	NA
<i>Lemna minor</i>	Lemnaceae	Herb	Common	LC
<i>Lepidium virginicum</i>	Brassicaceae	Herb	Common	NA
<i>Litsea glutinosa</i>	Lauraceae	Tree	Rare	NA
<i>Mallotus philippensis</i>	Euphorbiaceae	Small Tree	Common	NA
<i>Mimosa pudica</i>	Mimosaceae	Herb	Rare	NA
<i>Phragmites karka</i>	Poaceae	Herb	Common	LC
<i>Phyllanthus emblica</i>	Euphorbiaceae	Tree	Common	NA
<i>Poa annua</i>	Poaceae	Herb	Common	LC
<i>Potamogeton pectinatus</i>	Potamogetonaceae	Herb	Common	LC
<i>Pycnopus</i> spp.	Cyperaceae	Herb	Abundant	NA
<i>Ranunculus arvensis</i>	Ranunculaceae	Herb	Common	NA
<i>Saccharum spontaneum</i>	Poaceae	Herb	Abundant	LC
<i>Sapium baccatum</i>	Euphorbiaceae	Tree	Common	NA
<i>Scripus</i> spp.	Cyperaceae	Herb	Common	NA
<i>Shorea robusta</i>	Dipterocarpaceae	tree	Rare	NA
<i>Smilax zylanica</i>	Smilacaceae	Climber	Rare	LR
<i>Solanum erianthum</i>	Solanaceae	Herb	Common	NANIC
<i>Sonchus</i> spp.	Asteraceae	Herb	Common	NA
<i>Stellaria media</i>	Caryophyllaceae	Herb	Common	NA
<i>Syzygium cumini</i>	Myrtaceae	Tree	Common	NA
<i>Tectona grandis</i> **	Verbenaceae	Tree	Common	NA
<i>Thysanolaena maxima</i>	Poaceae	Herb	Common	NA
<i>Tinospora cordifolia</i>	Manispermaceae	Climber	Rare	NA
<i>Toona ciliata</i>	Meliaceae	Tree	Common	NA
<i>Trewia nudiflora</i>	Euphorbiaceae	Tree	Rare	LR
<i>Vitex peduncularis</i>	Verbenaceae	Tree	Rare	NA
<i>Zizyphus mauritiana</i>	Rhamnaceae	Tall Shrub	Abundant	NANIC
(B) FERNS AND FERN ALLIES				
<i>Adiantum caudatum</i>	Adiantaceae	Herb	Common	NA
<i>Equisetum diffusum</i>	Equisetaceae	Herb	Common	NA
<i>Marselia minuta</i>	Marseliaceae	Herb	Common	NANIC
<i>Pteris biaurita</i>	Pterideae	Herb	Rare	NA
<i>Seleginella helferi</i>	Selaginellaceae	Herb	Common	NANIC

*Based on the IUCN Red List of the Species Version 2016-3, downloaded on Dec. 28, 2016.

** Planted / Cultivated

Abbreviations: VU = Vulnerable, NA = Not assessed but present in the catalogue of Life, NANIC = Not assessed and not present in the catalogue of Life, LC = Least concern, LR = Low risk

Source: JICA Study Team

Table 6-8: Invasive Alien Plants in the Study Area

Species	Family	Habit	Nativity
<i>Aerva javanica</i>	Amaranthaceae	Herb	Tropical America
<i>Ageratum conyzoides</i>	Asteraceae	Herb	Brazil
<i>Amaranthus spinosus</i>	Amaranthaceae	Herb	Tropical America
<i>Anagallis arvensis</i>	Primulaceae	Herb	Europe
<i>Argemone mexicana</i>	Papaveraceae	Herb	Tropical South America
<i>Calotropis procera</i>	Asclapiadaceae	Shrub	Tropical America
<i>Cannabis sativa</i>	Cannabaceae	Herb	Tropical America
<i>Chenopodium album</i>	Chenopodiaceae	Herb	Tropical America
<i>Cleome viscosa</i>	Capparaceae	Herb	Tropical America
<i>Cuscuta reflexa</i>	Cuscutaceae	Climber	Mediterranean region
<i>Datura metal</i>	Solanaceae	Shrub	Tropical America
<i>Eichhornia crassipes</i>	Pontederiaceae	Herb	Tropical America
<i>Euphorbia hirta</i>	Euphorbiaceae	Herb	Tropical America
<i>E. thymifolia</i>	Euphorbiaceae	Hurb	Tropical America
<i>Galinsoga paviflora</i>	Asteraceae	Herb	Tropical America
<i>Lantana camara</i>	Verbenaceae	Shrub	Tropical America
<i>Oxalis corniculata</i>	Oxalidaceae	Herb	Europe
<i>Parthenium hysterophorus</i>	Asteraceae	Herb	Tropical America
<i>Physalis minima</i>	Solanaceae	Herb	Tropical America
<i>Portulaca oleracea</i>	Portulacaceae	Herb	Tropical South America
<i>Prosopis juliflora</i>	Mimosaceae	Small Tree	Mexico
<i>Saccharum spontaneum</i>	Poaceae	Herb	Tropical America
<i>Side acuta</i>	Malvaceae	Herb	Tropical America
<i>Solanum nigrum</i>	Solanaceae	Herb	Tropical America
<i>Tridax procumbens</i>	Asteraceae	Herb	Tropical America
<i>Typha angustifolia</i>	Typhaceae	Herb	Tropical America
<i>Xanthium strumarium</i>	Asteraceae	Herb	Tropical America

Source: JICA Study Team

The faunal diversity as recorded for the bridge influenced area is listed in Table below. Evidently, 177 animal species belonging to mammals (10), avifauna (68), reptiles (15) amphibians (04), fish (70), and invertebrates (10) are recorded for the study site. The status of occurrence of these species as on the field study and following the Wildlife Act (amended in 2013) as well as the IUCN status are also in the Tables. The diversity of fish fauna as recorded for the area along with the IUCN status and local availability is enlisted in Table below. Some migratory species were found in the study area and indicated in bold letter in the table below. Ganges river dolphins are known to have local migration pattern due to water level change between wet and dry season, but they are seen in Dhubri area all year around, All of the other migratory species were birds, and no seasonal variation was found in reptiles, amphibians, fish and invertebrate according to interview and literature surveys.

Table 6-9: Animal biodiversity in the Study Area

Scientific Name	Local /English Name	Status* WLA	IUCN** Status
Mammals			
<i>Canis aureus</i>	Jackal		LC
<i>Cynomys badius</i>	Bay Bamboo rat		NANIC
<i>Lepus nigricollis</i>	Hare	Sch.III	LC
<i>Macaca mulatta</i>	Monkey		LC
<i>Mus musculus</i>	House mouse		LC

Scientific Name	Local /English Name	Status* WLA	IUCN** Status
<i>Platanista gangetica ssp. gangetica</i>	Dolphin	Sch. I	EN
<i>Pteropus giganteus</i>	Flying fox	Sch. I	LC
<i>Trachypithecus pileatus</i>	Capped Langur	Sch. I	VU
<i>Sus scrofa</i>	Wild Boar		LC
<i>Vulpes bengalensis</i>	Fox	Sch. III	LC
Birds			
<i>Actitis hypoleucos</i>	Common Sandpiper		LC
<i>Alcedo atthis</i>	Common Kingfisher		LC
<i>Anas crecca</i>	Common Teal		LC
<i>A. acuta</i>	Northern Pintail		LC
<i>A. strepera</i>	Gadwall		LC
<i>A. platyrhynchos</i>	Mallard		LC
<i>Alcedo atthis</i>	Common Kingfisher		LC
<i>Anastomus oscitans</i>	Asian Openbill		LC
<i>Ardea alba</i>	Great Egret		LC
<i>A. cinerea</i>	Grey Heron		LC
<i>A. intermedia</i>	Intermediate Egret		LC
<i>Ardea cinerea</i>	Grey Heron		LC
<i>Ardeola grayii</i>	Indian Pond Heron		LC
<i>Aythya baeri</i>	Baer's Pochard		CR
<i>A. ferina</i>	Common Pochard		LC
<i>A. fuligula</i>	Tufted Duck		LC
<i>A. nyroca</i>	Ferruginous Duck		NT
<i>A. platyrhynchos</i>	Mallard		LC
<i>Bubulcus ibis</i>	Bagula, Cattle Egret		LC
<i>Calidris minuta</i>	Little Stint		LC
<i>Ceryle rudis</i>	Pied Kingfisher		LC
<i>Charadrius dubius</i>	Little Ringed Plover		LC
<i>Chlidonias hybrida</i>	Whiskered Tern		LC
<i>Chroicocephalus ridibundus</i>	Black-headed Gull		LC
<i>Circus melanoleucos</i>	Pied Harrier		LC
<i>Corvus splendens</i>	House Crow		LC
<i>Cuculus micropeterus</i>	Indian Cuckoo		NANIC
<i>Dendrocygna javanica</i>	Lesser Whistling Duck		LC
<i>Dendrocopus mahrattensis</i>	Woodpecker		NANIC
<i>Egretta garzetta</i>	Little Egret		LC
<i>Falco tinnunculus</i>	Common Kestrel		LC
<i>Fulica atra</i>	Common Coot		LC
<i>Gallinago gallinago</i>	Common Snipe		LC
<i>Gracula religiosa</i>	Hill Myna	Sch. II	LC
<i>Gyps indicus</i>	Vulture	Sch. I	CR
<i>Halcyon smyrnensis</i>	White-throated Kingfisher		LC
<i>Hirundo rustica</i>	Barn Swallow		LC
<i>Hydrophasianus chirurgus</i>	Pheasant-tailed Jacana		LC
<i>Leptoptilos javanicus</i>	Lesser Adjutant		VU
<i>L. dubius</i>	Greater Adjutant		VU
<i>Mareca strepera</i>	Gadwall		LC
<i>M. penelope</i>	Eurasian Wigeon		LC
<i>Metopidius indicus</i>	Bronze-winged Jacana		LC
<i>Microcarbo niger</i>	Little Cormorant		LC
<i>Motacilla flava</i>	Western Yellow Wagtail		LC
<i>M. alba</i>	White Wagtail		LC

Scientific Name	Local /English Name	Status* WLA	IUCN** Status
<i>M. citreola</i>	Citrine Wagtail		LC
<i>M. cinerea</i>	Grey Wagtail		LC
<i>Otus spilocephalus</i>	Mountain Scops Owl	Sch. I	LC
<i>Rostratula benghalensis</i>	Greater Painted-snipe		LC
<i>Passer domesticus</i>	House Sparrow		LC
<i>Perdicula asiatica</i>	Jungle Bush Quail		LC
<i>Ploceus philippinus</i>	Baya		LC
<i>Pluvialis fulva</i>	Pacific Golden Plover		LC
<i>Podiceps nigricollis</i>	Blacknecked grebe		LC
<i>Porphyrio porphyrio</i>	Purple Swamphen		LC
<i>Psittacula krameri manillensis</i>	Parrot	Sch. I	NA
<i>Spatula clypeata</i>	Red-crested Pochard		LC
<i>S. querquedula</i>	Garganey		LC
<i>Sturnus contra</i>	Grey-headed Myna	Sch.I	NA
<i>Tachybaptus ruficollis</i>	Little Grebe		LC
<i>Tringa stagnatilis</i>	Marsh Sandpiper		LC
<i>T. glareola</i>	Wood Sandpiper		LC
<i>T. nebularia</i>	Common Green Shank		LC
<i>T. ochropus</i>	Green Sandpiper		LC
<i>Vanellus vanellus</i>	Northern Lapwing		LC
<i>V. cinereus</i>	Grey-headed Lapwing		LC
<i>V. indicus</i>	Red-wattled Lapwing		LC
Reptiles			
<i>Aspideretes gangeticus</i>	Gangetic softshell turtle	Sch. I	VU
<i>Aspideretes hurum</i>	Indian peacock softshell turtle	Sch. I	VU
<i>Bungarus fasciatus</i>	Common Indian Krait	Sch. II	LC
<i>Chitra indica</i>	Narrow-headed softshell turtle		EN
<i>Crotalus sp.</i>	Viper		LC
<i>Cyclemys sp.</i>	Asian leaf turtle		NT
<i>Hemidactylus flaviviridis</i>	House Gecko		NA
<i>Lissemys punctata</i>	Indian flap-shelled turtle		LC
<i>Melanochelys tricarinata</i>	Tricarinate turtle	Sch. I	VU
<i>Morenia petersi</i>	Indian eyed turtle		VU
<i>Naja naja</i>	Cobra	Sch. II	DD
<i>Pangshura smithii</i>	Brown roofed turtle		NT
<i>Pangshura sylhetensis</i>	Assam roofed turtle		EN
<i>P. tentoria</i>	Indian tent turtle		LC
<i>Varanus bengalensis</i>	Common Indian Monitor	Sch. I	LC
Amphibians			
<i>Bufo melanostictus</i>	Common Asian Toad		LC
<i>Hoplobatrachus tigerinus</i>	Indian Bull Frog	Sch. I	LC
<i>Polypedates sp.</i>	Frog		LC
<i>Spaerotheca brericeps</i>	Burrowing Frog		NANIC
Fish			
<i>Ailia coila</i>	Gangetic ailia		NT
<i>Amphipnous cuchia</i>	Cuchia		NA
<i>Anabas testudineus</i>	Climbing perch		DD
<i>Aorichthys seenghala</i>	Giant river-catfish		NA
<i>A. aor</i>	Long-whiskered catfish		LC
<i>Apistogramma borelli</i>	Bareli		NA
<i>Aspidoparia moror</i>	Boreala		NANIC
<i>Badis badis</i>	Blue perch		LC
<i>Bagarius bagarius</i>	Devil catfish		NT

Scientific Name	Local /English Name	Status* WLA	IUCN** Status
<i>Barillus bendalensis</i>	Barilius		NANIC
<i>B.barna</i>	Barilius		NANIC
<i>Batasio sp.</i>	Tengra		NA
<i>Catla catla</i>	Catla		NA
<i>C.striatus</i>	Sal		NANIC
<i>Chaca chaca</i>	Angler catfish		LC
<i>Chanda nama</i>	Elongate glassy perchlet		LC
<i>C.ranga</i>	Indian Glassy Fish		LC
<i>C.baculis</i>	Chanda		NA
<i>Channa marulius</i>	Sal		LC
<i>C. orientalis</i>	Chengeli		NA
<i>C.punctatus</i>	Spotted snakehead		NA
<i>C.striatus</i>	Striped snakehead		NA
<i>Cirrhinus mrigala</i>	Mrigal		LC
<i>C. reba</i>	Mrigal		LC
<i>Clarias butrachus</i>	Magur		NANIC
<i>C.gariepinus</i>	African sharptooth catfish		LC
<i>Clupisoma garua</i>			LC
<i>Colisa chuna</i>	Honey Gourami		NA
<i>C.fasciata</i>	Banded gourami		NA
<i>C.lalia</i>	Dwarf gourami		NA
<i>Ctenopharyngodon idella</i>	Grass carp		NA
<i>Cyprinus carpio*</i>	Common carp/Chinese carp		VU
<i>C. nudus</i>	Common carp/Chinese carp		NA
<i>Eutropiichthys vacha</i>			LC
<i>E. murius</i>	Kangong		LC
<i>Gudusia chapra</i>	Indian river shad		LC
<i>Heteropneustes fossilis</i>	Asian stinging catfish		LC
<i>Hypophthalmichthys molotrix</i>	Silver carp		NA
<i>Labeo rohita</i>	Rohu/Rau		NANIC
<i>L. calbasu</i>	Orangefin labeo		LC
<i>L. gonius</i>	Kuria labeo		LC
<i>L. dero</i>	Kalabans		LC
<i>L. boga</i>	Bogabata		LC
<i>L. pangusia</i>	Bholung		NT
<i>Macrognathus pancalus</i>	Indian spiny eel		LC
<i>M aculeatus</i>	Lesser spiny eel		NA
<i>Mastacembelus armatus</i>	Common Spiny Eal		LC
<i>Monopterusuchia</i>	Cuchia		LC
<i>Mystus bleekeri</i>	Day's mystus		LC
<i>M. cavasius</i>	Dwarf Tengra		LC
<i>M. gulio</i>	Long Whiskers Catfish		LC
<i>M. tengara</i>	Tingorah		LC
<i>M. vittatus</i>	Striped dwarf catfish		LC
<i>Nanuas nandus</i>			NANIC
<i>Neolissocheilus hexagonolepis</i>	Mahseer		NA
<i>Noemachilus beavani</i>	Botia		NANIC
<i>N. botia</i>	Striped Louch		NANIC
<i>Notopteru notopterus</i>	Bronze featherback		NANIC
<i>N chitala</i>			NANIC
<i>Ompok bimaculatus</i>	butter catfish		NT
<i>O. pabo</i>	Pabo catfish		NT
<i>O. pabda</i>	Pabdah catfish		NT

Scientific Name	Local /English Name	Status* WLA	IUCN** Status
<i>Pangasius pangasius</i>	Pangas catfish		LC
<i>Punctius chola</i>	Puthi/Punti		NANIC
<i>P. javanicus</i>			NANIC
<i>P. sarana</i>	Fire fin barb		NANIC
<i>P. ticto</i>			NANIC
<i>Rita rita</i>	Rita		LC
<i>Tenualosa ilisha (Hilsa ilisha)</i>	Ilis/Ilisha		LC
<i>Wallago attu</i>	Wallago		NT
Invertebrates			
<i>Macrobrachium choprai</i>	Prawn		NA
<i>M. rosenbergii</i>	Prawn		NA
<i>Macrognathus aral</i>	Toru		LC
<i>Chilades Laius</i>	Lime blue		NA
<i>Graphium sarpedon sarpedon</i>	Common Bluebottle		NA
<i>Mycalensis perseus blasius</i>	Common Bushbown		NANIC
<i>Anopheles stepnensi</i>	Anepheles Mosquito		NANIC
<i>Culex quinquefaeciatus</i>	Culex Mosquito		NANIC
<i>Hippasa lycosina</i>	Grassland spider		NA
<i>Pholcus phalangiodes</i>	House Spider		NANIC

*According to Wildlife Act, 1972 amended in 2013.

**Based on the IUCN Red List of the Species Version 2016-3, downloaded on Dec. 29, 2016.

Bold: Migratory species

Abbreviations: VU = Vulnerable, NA = Not assessed but present in the catalogue of Life, NANIC = Not assessed and not present in the catalogue of Life, LC = Least concern, LR = Low risk, NT = Near Threatened, EN = Endangered, CR = Critically Endangered, DD = Data Deficient

Source: JICA Study Team

Dr. Abdul Wakid, a Project Scientist at the Wildlife Institute of India and Head (honorary) of the Gangetic Dolphin Research and Conservation Division (GDRCD) of Aaranyak, an Assam based leading environmental NGO, has 17 years of experience in the scientific study and conservation activities of the Ganges River Dolphins in Assam State. He conducted a series of dolphin surveys in the Brahmaputra river system, starting from 2005. In the last census conducted in 2012, Dr. Wakid and his team estimated dolphin population in Brahmaputra river system as follows.

Brahmaputra river system (including 2 tributaries): 635 dolphins

Brahmaputra River (not including tributaries): 583 dolphins

Brahmaputra River between the Golpara Bridge and Bangladesh border: 92-96 dolphins

During the 2012 survey, Dr. Wakid recorded the highest density of the dolphin population in the section between the Goalpara Bridge and the Bangladesh border, including the river stretches within the proposed bridge construction site of the Dhubri District. Highest density of dolphin population was recorded in the dolphin survey conducted in 2005. The breeding season for the Gangetic dolphins of Brahmaputra River is recorded as February to June. Dolphins are found in and around Dhubri area throughout the year but aggregate in the deep section of the river in the winter and more spread to the side channels during the summer. The population has had an upward trend since 2008 because of the lot of community engagement and awareness activities conducted since 2008.

2) Hydrology/geology/geography

A riverbed topographic map of the Brahmaputra River was created for the area of the 20km width including the Bridge crossing section by the riverbed configuration survey. The survey included the Gandadhar River on the north bank and the Jinjiram River on the south bank, and tributaries of the Brahmaputra River, to consider any influence from those rivers.

Existing data and materials were collected from all available resources including the observation data from the Brahmaputra and Barak Basin organization (B&BBO), Shillong of the Central Water Commission (CWC), available literature to assess the catchment areas and hydraulic parameters, interviews of local people, DPR of Naranarayan Bridge, and physical model studies conducted by NEHARI (North Eastern Hydraulic and Allied Research Institute) on behalf of the Brahmaputra Board. These data and materials were studied and analyzed to determine the HFL (High Flood Level), LWL (Low Water Level), Maximum discharge, and other necessary parameters. Various simulations were carried out using the US Army Corps of Engineers (USACE) Hydraulic Engineering Centre’s River Analysis System (HEC-RAS).



Source: DPR

Figure 6-9: Riverbed Topography around the Dhubri Bridge

Building structures in a river may cause erosion of the bank and riverbed. There are two kinds of erosions: contraction scour and local scour. The contraction scour occurs due to a reduction in the flow area of the river when it approaches a bridge. Reduction in flow area is followed by an increase in flow velocity which results in the removal of sediments and rocks. The local scour is caused by increased velocity of water around a bridge pier and abutment and due to the formation of vortices and wakes. The contraction scour and the local scour together constitute the total scour around piers. Hydraulic parameters used for the analysis are shown in the table below.

Table 6-10: Hydraulic Parameters

Parameters	Values
High Flood Level (HFL)	30.36 m
Low Water Level (LWL)	23.00 m
Average Riverbed Slope	1/14,700
Maximum discharge for 100 years return period	100,306 m ³ /s

Parameters	Values
Maximum discharge for 10 years return period	71,225 m ³ /s
Maximum water velocity at HFL	4.5 m/s

Source: DPR

The analysis of the impact of the contraction was conducted. The interval of the substructures of the Project Bridge is 125m and there will be no impact due to the contraction of the river width.

6.2.2 Anticipated Impacts and Mitigation Measures

1) Ecology

Impacts

The main impact on flora involves the removal of trees and the grubbing of vegetative cover for construction and a clear zone within the Right of Way (ROW) and for spoil bank. The types of impacts on ecosystem and biodiversity can be as follows:

- Loss of trees;
- Compaction of vegetation, and
- Pollution and dust accumulation on vegetation.
- The construction phase of the bridge will lead to the release of some amount of debris which needs to be managed judiciously in order to maintain ecology of the area and aquatic life.
- During the construction of the proposed dam, there is a high possibility of dolphins and their habitats impacted due to high underwater noise, water quality change, habitat geomorphology changes, prey-base depletion etc.
- The existing Ganges river dolphin population suffers from habitat fragmentation by the development activities such as the construction of dam. It is estimated to be one of the causes of population decrease. In the case of this project, the dolphins and other aquatic species can pass under the bridge and no habitat fragmentation will be caused.
- Several endangered chelonian species are found in Dhubri area. These species can potentially suffer from habitat change by the construction activities, but the main cause of decline of the turtles is illegal hunting by humans for their meat. Therefore, in order to minimize the negative impacts on the turtle species, habitat change should be kept at minimum and hunting activities must be completely prohibited amongst the contractors. Noise from different equipment, vehicles, and human traffic has the potential to disturb migratory birds, which may cause them to leave or change their flight route until the activities are over.
- No direct negative impact is anticipated on other species, but care should be taken to prevent indirect negative impact such as the deterioration of habitat. There will be some temporary physical disturbance to the aquatic environment during construction, but no chemical pollution will be caused and therefore no irreversible damage will be caused for the aquatic species.

Mitigation Measures

The following mitigation measures are recommended.

<Pre-Construction phase>

- No detailed survey has been done on the population of the dolphins in the Dhubri area, so it is suggested that a scientific study is done before the construction begins as a baseline for monitoring.

<Construction phase>

- Land clearing activities at the construction site should be kept at an absolute minimum. Construction vehicles, machinery and equipment will be moved or stationed in the (ROW) to prevent compaction of vegetation. While operating on temporarily acquired land for traffic detours, storage, material handling or any other construction related or incidental activities, it will be ensured that the trampling of soil is avoided.
- Anti-poaching measures during the construction phase should be strengthened to check for any violation of existing regulations. Awareness campaign to be made among the workers to aware them on the endangered and other important species. The species at higher risk of being hunted are the softshell turtles as it is known to be a delicacy. No hunting of any kind will be permitted and vigilant monitoring will be carried out amongst construction workers.
- Regular monitoring of the impacts of construction activities on the Gangetic dolphins and other important species should be done by dedicated wildlife experts and forest officials, so that immediate prevention activities can be undertaken.
- Channels will be kept free at all times for free movement of dolphins.
- To minimize impacts, noisy operations should be avoided during winter (Nov-Feb; when dolphin congregates into the deeper channel and pre-monsoon season (Mar-Jun; dolphin breeding time), thus from November to June, which are also the breeding season for the turtles. Migratory birds also stay around Dhubri area during the winter months, so avoiding noisy operations during these months also reduce the impacts on them.
- Construction activities should be carried out in close supervision of the dolphin ecologist.
- Measures such as the creation and monitoring of an exclusion zone of a 500m radius for at least 30 minutes before the start of construction activities shall be followed. If dolphins are observed in the exclusion zone, construction works should be delayed until they have left the area. If dolphins enter the exclusion zone after construction has commenced, construction works should cease until they have left. The contractors are recommended to adopt these mitigation measures during construction works inside the river. Acoustic deterrents can be tested to keep the dolphin away during from construction zone under the supervision of dolphin ecologist.
- Relevant information (e.g. encounter with vulnerable species during engineering work) shall be shared with the State Environment and Forest Department and concerned regional environmental experts with which the project authority will discuss potential measures to promote conservation and monitoring of the ecosystem.
- If trees are cut down for the labor camps and materials storage sites, the trees shall be replanted after construction. Also, when trees in the ROW are cut down, alternative tree planting should be considered using local native tree species.
- Before construction of piers the construction site must be checked for the presence of threatened turtles, migratory birds, and other threatened species and their nests. If the turtles and/or their nest are found inside or near the construction area the animals and/or the eggs must be physically moved to safer habitat areas under the guidance of the local wildlife experts.
- All boats or ferries transporting construction material and workers will have propeller guards installed to prevent injury and death of dolphins, turtles and other aquatic fauna.
- One of the threats to bird and turtle habitat is conversion of the river edges from natural soft embankments into hard concrete embankments. Therefore the natural bank slope is preserved and location of the bridge piers will avoid such areas. No construction camp, borrow areas or disposal sites will be established within 100m of the shorelines at the highest water level period.
- All avoidance, mitigation and enhancement measures and monitoring plans proposed to address impacts on flora, fauna and the threatened species should be updated during the detailed design stage by conducting detailed studies such as identification of the migrating routes of dolphins and birds, exact locations of turtle nesting grounds, etc.

During the construction, the following endangered species may be encountered in the following locations.

Table 6-11: Distribution of vulnerable and other important species in the project area

Scientific Name	Local /English Name	Location
<i>Trachypitecus pileatus</i>	Capped Langur	Forest, agricultural field, residential area
<i>Platanista gangetica ssp. gangetica</i>	Dolphin	Whole section of Brahmaputra River
<i>Pteropus giganteus</i>	Flying fox	Forest, agricultural field, residential area
<i>Semnopithecus entellus.</i>	Langoor	Forest, agricultural field, residential area
<i>Vulpes bengalensis</i>	Fox	Grassland
<i>Aythya baeri</i>	Baer's pochard	Lakes, ponds, rivers
<i>Gracula religiosa</i>	Hill Myna	Forest
<i>Gyps indicus</i>	Vulture	Agricultural field
<i>Leptoptilos javanicus</i>	Lesser Adjutant	River bank, grassland, agricultural field
<i>L. dubius</i>	Greater Adjutant	River bank, grassland, agricultural field
<i>Otus spilocephalus</i>	Mountain Scops Owl	Forest
<i>Sturnus contra</i>	Grey-headed Myna	Grassland, agricultural field, residential area
<i>Aspideretes gangeticus</i>	Gangetic softshell turtle	Deep rivers, lakes and ponds with sandy or muddy bottom.
<i>Aspideretes hurum</i>	Indian peacock softshell turtle	Rivers, lakes and ponds
<i>Bungarus fasciatus</i>	Common Indian Krait	River bank, grassland, agricultural field
<i>Chitra indica</i>	Narrow-headed softshell turtle	Large rivers with clear water and sandy bottom
<i>Melanochelys tricarinata</i>	Tricarinate turtle	Grassland, river bank
<i>Morenia petersi</i>	Indian eyed turtle	Rivers, wetland
<i>Naja naja</i>	Cobra	River bank, grassland, agricultural field
<i>Pangshura sylhetensis</i>	Assam roofed turtle	rivers and floodplains with muddy bottom and aquatic plants
<i>P. smithii</i>	Brown roofed turtle	Shallow rivers, canals, lakes with maddy bottom
<i>Varanus bengalensis</i>	Common Indian Monitor	River bank, grassland, agricultural field
<i>Hoplobatrachus tigerinus</i>	Indian Bull Frog	Wetland

Source: JICA Study Team

<Operation phase>

- It is suggested that regular monitoring by the forest department and relevant environment and wildlife experts should be done. In keeping view of a likely increase in vehicular emissions

in the future, the monitoring should include the assessment of impact due to increased air pollution;

- A suitable landscaping plan for the project road shall be prepared to enhance the ecological status of the area. It was noticed, that the project road did not have tree cover at a few locations. Tree plantation at these locations will enhance the aesthetics as well as reduce the pollution level of the area.
- It is recommended that the lost trees be compensated at a 1:3 ratio.
- Awareness programmes as training, workshops, seminars, brainstorming, etc., need to be organized to promote responsible consumerism, sustainable economic practices and the protection of endangered species for all the stakeholders. Research on Ganges River Dolphins needs to be conducted to study in details the abundance, distribution, ecology and threats of the Ganges River Dolphin in and around the construction sites. Community engagement and awareness activities regarding the conservation of Gangetic dolphin also need to be done.

2) Hydrology

Impacts

Potential impact on hydrology will be minor, as the project does not involve the diversion or re-routing of existing watercourses. However, the river flows in Brahmatupta and its tributary Jhinjer will be slightly obstructed during the construction of piers of bridge, but for a limited period. There is no other pond/canal that will be affected by the Project. Hence, a change in natural drainage pattern will be very insignificant to the present state of the project. During the operation stage, no impact is envisaged.

Mitigation Measures

The new bridge design is based on hydrological calculation results. Based on the obtained location of water crossings and water discharge, the dimension and locations for drainage system are determined. For cross drainage structure, the appropriate culvert type is selected by taking into account the economy, construction workability, and maintenance ability.

3) Topography and Geology

Impacts

Change in topography (that of the existing) is envisaged to some extent at various places along the entire length of the bridge and approach road while developing a 4-lane standard. The riverbed will be excavated for the construction of substructures. The impact is temporary because the excavation will be filled in after the construction of substructures. The change in topography will also happen due to the operation of borrow areas. The construction of material handling yards and labor camps will also alter the existing topography temporarily.

Mitigation Measures

During construction phase, the existing vegetation including shrubs and grasses along the route (except within the strip directly under embankment or cutting) will be properly maintained. The borrow areas shall be operated and closed as per the specifications for road and bridge construction manual of MORTH. The borrow areas shall be filled with the rejected waste/material, spoil and then finally a layer of topsoil shall be spread over it before carrying out plantation and turfing. For turfing, plant species that are native to the area will be used. Temporary structures such as borrow areas, material handling yards, and labor camps should be returned to their original states after construction finishes. During the operation phase, maintenance of the embankment will be carried out to avoid soil erosion. The slope protection/ retaining wall, if damaged due to land slide, will be repaired promptly. The slope protection will also be established / strengthened regularly through the plantation of shrubs and vegetation.

6.3 Major Impacts on Social Environment

(1) Involuntary Resettlement

As per the ROW design, the project will affect 761 households and 3,043 people. Out of which, 633 households (2,538 people) will be affected by their land only, and 127 households (500 people) will be affected by the structure, meaning physically displaced households. One commercial shop will be affected and one public structure (the government office) will be affected. No schools or religious facilities will be affected.

Table 6-12: Summary of Households Affected

Item	PAHs	PAPs
Total project-affected household	761	3,043
Household whose residential land will be affected (physically displaced)	127	500
Household whose agricultural land will be affected	633	2,538
Household whose commercial land will be affected	1	5

Source: JICA Study Team

Mitigation Measures

Affected households will be provided with adequate compensation and assistance. Based on the census survey, the majority of affected households requested cash compensation and self-relocation. However, if they request land compensation, the respective DCs in consultation with local communities shall secure the land in the vicinity of the original place of residence to the extent possible.

(2) The Poor

It should be noted that the poor are less exposed to big development projects and hence may feel intimidated and unable to voice concerns, grievances and suggestions. The baseline survey has identified the gap between official poverty level and poverty level as reported by the people. Their income level is low and illiteracy rate is high, especially in Char land. Therefore, impact mitigation measures and assistances shall be well considered recognizing the local situation.

Mitigation Measures

During the course of land acquisition and resettlement activities, adequate information sharing is a must to include the poor in the process and it should be ensured that their grievances are heard and redressed. A resettlement and restoration plan should be prepared considering their limited coping capacity, as well as develop measures that lead to sustainable income generation for the affected people rather than a one-off payment of compensation and assistance. Skill development shall be also planned and implemented in a livelihood restoration program.

(3) Local Economy and Livelihood

Economic activities and livelihoods in the project area are mainly agriculture, animal rearing, fishing and boat operation. People whose livelihoods that are likely to be affected by the project are as follows.

1) Agriculture labours

In the project area, major crops are paddy and pulses and vegetables are the second crop. In Char land, jute is also a common crop along with paddy and pulses. The land acquisition will not only affect land owners but also agriculture laborers who are hired by the land owners on a temporary basis during cultivation and harvest season. Those labourers are either relatives of the land owners

or villagers in the same or neighboring villages. Due to the land acquisition, loss of livelihood associated with those agricultural lands is expected.

2) Boat operators

Based on the information provided by the boat operators association, a total of 2,000 boat operators are registered in the Dhubri District and out of which around 250-300 operators are directly serving between Dhubri and Phulbari. Others are operating to and from other parts of the district and islands (Char lands) in the Brahmaputra River. According to Inland Waterway Transportation (IWT), daily operations of direct boat services between Dhubri to Phulbari are 20 passenger boats and 30-50 goods transportation boats.

Boat operators who are providing the service between Dhubri and Phulbari may experience loss of business opportunities by the project. Considering that the continued demand is expected for the passengers and goods transportation to and between the Char lands, boat operators servicing those routes will not have a negative impact from the project. The impact on the loss of assets was also pointed out by the boat owners. The project will consider compensation for those boats.

3) Fishermen

According to the meeting with fishermen in the project area, normally households engaging in fishery also have agricultural land and their primary income source is agriculture. On the other hand, there are around 100 fishermen along the alignment whose livelihood depends primarily on fishery activities. Fishing activities usually take place at night and they sell them to licensed traders in the area. Fishermen are having their own boats without engines and their fishing ranges are normally 4-5km radius upstream, downstream and across the Brahmaputra River, and thus fishing locations are not fixed. Most fishermen are from the villages along the Brahmaputra River and Char land and only during the rainy season when the river becomes wider, will the people from other villages also come for fishing.

Since there is no particular fishing ground mentioned along the alignment, permanent impact will not be anticipated. During the construction stage, based on the fact that the fishermen move freely in the Brahmaputra River and that their activities take place at night when the construction work is finished, the impact may not be significant. However, during the construction stage, considering there will be vibration around pier construction areas and that the construction section will be restricted during the construction period, travel distance may increase for fishermen and they may face difficulty compared to during the pre-construction stage.

Mitigation Measures

In R&R, a combination of compensation and assistance will be prepared for those likely affected. Since the project entails large scale construction, significant job opportunities will be generated. Especially for the affected people in the project area, necessary trainings will be provided to meet the eligibility of employment criteria. Moreover, the improvement of the transportation network is expected to enhance accessibility to market, goods, increase employment opportunities and bring a positive impact to the local economy. Necessary training will be also included in R&R to take advantage of those opportunities.

(4) Land Use

Change of the land use will be expected along the alignment, most of which is agricultural land. Although most of PAPs requested cash compensation over land compensation, if requested, DC shall be responsible for identifying land for relocation. In this case, the development of a resettlement site is required, which causes changes in land use pattern. In the case of the construction of workers' camp, land use will change in the short term.

Mitigation Measures

If land compensation were requested as a resettlement option, a resettlement site should be identified by the DC as close to the existing village area as possible, and should ensure a proper supply of basic utilities. As for the workers' camp, the contractor should make lease agreements with the land owners in consultation with the local community assisted by the DC. Prior to the development of such sites, EIA should be carried out.

(5) Utilization of Local Resources

Excessive use of local resources especially the construction materials is expected. Assam and Meghalaya State produces large amount of construction materials including crushed stones. In this project, those materials will be procured from the existing public and private quarries. Aggregate and landfill sand are also available from the surrounding areas of the project site. Local resources should be procured in consultation and in agreement with the owners.

Mitigation Measures

If the excessive use of construction materials causes a price hike for local usage, although the impact will be short-term, the source of construction materials should be coordinated accordingly.

(6) Social Infrastructure and Service / Sensitive Facilities

With the change of the starting point in the Dhubri District, there will be no impact on schools that were initially a subject for relocation.

(7) Unequal Distribution of Benefits and Damages

Land acquisition and involuntary resettlement may lead unequal distribution of benefits between those who are directly affected by the project and those who are not. Due to the nature of the bridge, there is a possibility of an uneven distribution of benefits between the bridge connection site and Char lands. However, people in Char lands will also benefit from the improved logistics network in terms of easy access to materials, daily necessities and improved access to a market for their produce.

Mitigation Measures

R&R will be designed and implemented to mitigate unequal distribution of benefits by providing preferential opportunities to those who are directly affected. The project will pay special attention to the people in Char lands to ensure that they will get benefits from the project. For this purpose, an income restoration program will be prepared by taking into consideration their socio-economic condition assisted by the external expert.

(8) Gender

There are a number of women headed households identified in the project site. Considering that the target areas are Muslim communities, women may not be able to articulate their issues and demands in the same way that the men can. It is also possible that participation in economic activities and travelling distances may be limited for women.

Mitigation Measures

In order to reflect women's needs, which may be different from those of men, the involvement of women should be ensured in various stages of the project. Therefore, during RAP implementation, a women representative should be invited and consulted with necessary assistance from village chiefs and NGOs. If required, assistance would be provided to open accounts and receiving compensation under their names. During the construction period, equal employment opportunities should be sought for women and also preference should be given to women in choosing light loaded work and day time work, if necessary.

(9) Children’s Rights

Although child labor is unlawful according to Article 24 of the Indian Constitution, it should be ensured that child labor will be strictly prohibited.

Mitigation Measures

In order to ensure that only adults are eligible for potential employment opportunities created by the project, the contract agreement with contractor should include the condition in its clause.

(10) Public Health and Occupational Health and Safety (OHS)

The health and safety measures at the design, construction, and operation phases are outlined in Table below.

Table 6-13: Health and Safety Measures

Stage	Health and Safety Measures
Construction Stage	
Health hazards at workplace	<ul style="list-style-type: none"> • Good and sufficient potable water (as per Indian Standard (IS) codes) shall be provided to avoid water-borne diseases and to ensure the health of workers. • Adequate provision for drainage, sanitation and waste disposal shall be provided. • Preventive medical care shall be provided to workers.
Hygiene at construction camps	<ul style="list-style-type: none"> • The contractor will provide and maintain temporary accommodation and ancillary facilities for workers that meet standards and scales approved by the resident engineer. • Drinking water, latrines and urinals shall be provided within the precincts of accommodation, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act. • Garbage bins must be provided, regularly emptied and disposed of at landfill sites.
Health/social hazards	<ul style="list-style-type: none"> • Provide training on transmitted diseases to workers and villagers. • Segregation of male and female areas in the construction camp.
Risk from operations	<ul style="list-style-type: none"> • The contractor is required to comply with all the precautions as required for the safety of the workmen as far as those applicable to this project. • The contractor shall supply all necessary safety appliances such as safety goggles, gloves, helmets, masks, etc., to the workers and staff. • The contractor must comply with all regulations regarding safe scaffolding, ladders, working platforms, gangways, stairwells, excavations, trenches and safe means of entry and egress. • Fences are recommended between the road and quarry places.
Malaria risks	<ul style="list-style-type: none"> • The contractor shall, at their own expense, conform to all anti-malarial instructions given to them by the engineer including filling up any borrow pits that may have been dug.
Operation Phase	
Traffic accidents	<ul style="list-style-type: none"> • Establish traffic signs and enforce traffic control measures including speed limits in the vicinity of schools and residential area. • A traffic management plan shall be developed especially along congested locations. • Sidewalks and shoulders will be constructed at the congested locations to ensure safety of pedestrians • Conduct traffic safety education by giving guidance to neighbors and schools for the safe way of walking along the roads, crossing the roads and consider safe route to school. To ensure the above, the physical facilities will be installed by contractors. Safety education shall be continued in coordination with the schools and the police in the neighborhood. These conditions will be included in the TOR of contractors.

Source: JICA Study Team

(11) Accidents

During the construction stage, traffic volume of heavy equipment and construction vehicles will increase. During the operation stage, increase of traffic volume and speed might increase the risk of accidents.

Mitigation Measures

During the construction stage, the construction section should be properly demarcated and signages should be placed. Notice and necessary information shall be shared amongst surrounding villagers prior to the construction activities. During the operation stage, traffic signs shall be installed, especially in the built-up areas as well as at the junction of the existing road and approach road to avoid traffic accidents. Sidewalks and pedestrian crossings will be equipped to ensure the safety and movement of pedestrians.

6.4 Impact Analysis

Comparison between the scoping and survey results is shown below.

Table 6-14: Scoping and Survey Result

Item	Impact Assessments of Scoping			Impact Assessments of Study Result			Rational of the Impact Assessment
	Pre-construction	Construction Stage	Operation Stage	Pre-construction	Construction Stage	Operation Stage	
Pollution							
Air Pollution	D	B-	B-	D	B-	B-	P: No impact is expected. C: Some negative impacts are expected due to the operation of construction equipment and vehicles. One example is dust incidental to earthwork especially during the dry season. O: Air pollution is expected to increase due to increase in traffic volume on the road.
Water Pollution	D	B-	D	D	B-	D	P: No impact is expected. C: Turbid water due to the earthworks, bridge pier construction work and wastewater effluents from construction workers' camps / yards are expected to pollute the Brahmaputra river to some extent. O: No impact is expected.
Wastes / Hazardous Materials	D	B-	D	D	B-	D	P: No impact is expected. C: Waste will be generated from construction workers' camps. Waste generated from construction and demolition work may include hazardous materials that must be treated before final disposal. O: No impact is expected.
Soil Contamination	D	B-	D	D	B-	D	P: No impact is expected. C: Impacts on soil from deposition of pollutants from construction materials in the construction site are expected to be small. Since there is no major

Item	Impact Assessments of Scoping			Impact Assessments of Study Result			Rational of the Impact Assessment
	Pre-construction	Construction Stage	Operation Stage	Pre-construction	Construction Stage	Operation Stage	
							industrial activity along the road, it is unlikely that soil along the road is already polluted. O: No impact is expected.
Noise and Vibration	D	B-	B-	D	B-	B-	P: No impact is expected. C: Noise and vibration are expected to be generated by the operation of construction equipment and vehicles, although temporary. Construction schedule should take into account the location of schools, hospitals and religious facilities that require silence during parts of the day. O: Noise and vibration levels are likely to increase due to greater traffic volume along the road. Specific measures may be required to minimize impacts on schools, hospitals and religious facilities.
Bottom sediment	D	C	C	D	D	D	P: No impact is expected. C/O: The piers may cause slight changes in the hydrodynamics and cause erosion of the bottom sediment.
Natural Environment							
Eco-system/Bio-diversity	D	A-	B-	D	B-	B-	P: No impact is expected. C: During the construction period, ecosystems in the project area, including local flora and fauna, are damaged to some extent. O: No impact is expected.
Topography/Geology	D	B-	D	D	B-	D	P: No impact is expected. C: Changes in topographic conditions over the project area takes place due to the need for cutting and filling work. O: No impact is expected.
Hydrology	D	B-	B-	D	D	D	P: No impact is expected. C: Construction work may cause minor and temporary impacts on hydrology because of pier construction, or the local use of water. O: No impact is expected.
Social Environment							
Involuntary Resettlement	A-	D	D	A-	D	D	P: The project requires approximately 94ha land and a Total of 761 PAHs will be affected by the project, out of which 30% need to be resettled. C/O: Resettlement will be completed before construction begins and thus no resettlement is expected during construction and operation.
Land Use	B-	B-	D	B-	B-	D	P: Land acquisition and involuntary resettlement are likely to cause changes in the existing land use patterns along the alignment.

Item	Impact Assessments of Scoping			Impact Assessments of Study Result			Rational of the Impact Assessment
	Pre-construction	Construction Stage	Operation Stage	Pre-construction	Construction Stage	Operation Stage	
							<p>C: Construction yards and workers' camps will have an impact on the land use, however the impact will be short term.</p> <p>O: Land usage of the approach road section will be permanently changed, however no significant negative impact is expected. Construction yard will be restored to its original condition by the contractors.</p>
Utilization of Local Resources	D	B-	D	D	B-	D	<p>P: No impact is expected.</p> <p>C: Procurement of large quantities of local resources for the construction materials may have impact on the price hike.</p> <p>O: No impact is expected as use of local resources is not expected during operation.</p>
General, Regional / City Plans	D	D	B+	D	D	B+	<p>P/C: No impact is expected.</p> <p>O: Better infrastructure network may trigger an influx of outsiders and economic development in the region.</p>
Social Infrastructure and Services	B-	B-	B+/B-	D	D	B+	<p>P/C: Due to the change of the alignment, there will be no impact on school which was assumed in the beginning</p> <p>O: Improved connectivity contributes to better accessibility to social infrastructure and services.</p>
Local Economy and Livelihood	A-	B+ /B-	B+ /B-	A-	B+/B-	B+/B-	<p>P: Loss of income source and livelihood due to involuntary resettlement and change in land usage are expected to negatively affect the local economy and livelihood.</p> <p>C: Construction work may have a negative impact on the fishery activities to some extent. On the other hand, construction work will have a positive impact on local economy by creating employment and business opportunities in the project area. Due to the increase of construction workers, business opportunities such as small shops are expected to increase in the area.</p> <p>O: The bridge will have impacts on the boat operators who operate directly between Dhubri and Phulbari. On the other hand, improvement of logistic network will increase accessibility to market, goods and generate employment opportunities and bring positive effect on regional economy. Although the Char area will not be directly connected by the bridge, accessibility to the markets and other necessities is expected to be improved.</p>
Unequal Distribution	B-	B-	B-	B-	B+/B-	B+/B-	<p>P: Land acquisition and involuntary resettlement will lead to an unequal distribution of benefits and</p>

Item	Impact Assessments of Scoping			Impact Assessments of Study Result			Rational of the Impact Assessment
	Pre-construction	Construction Stage	Operation Stage	Pre-construction	Construction Stage	Operation Stage	
of Benefit and Damage							<p>damage between those who are directly affected by the project and those who are not.</p> <p>C: Those who are affected by Land acquisition and resettlement should have preference in access to employment opportunities in the construction work.</p> <p>O: There is a possibility of uneven distribution of benefits between the bridge connection site and Char land. In the long term, the whole area is expected to have economic benefits from improved logistics networks including access to markets as well as employment opportunities.</p>
Local Conflict of Interest	B-	B-	B-	B-	B-	B-	P/C/O: There is a possibility that unequal distribution of benefits and loss will cause local conflict of interests
Water Usage, Water Rights and Communal Rights	D	B-	D	D	B-	D	<p>P: No impact is expected.</p> <p>C: There is a possibility that the residents who use rivers as living water may be affected in the short term</p> <p>O: No impact is expected.</p>
Sensitive Facilities (e.g. hospital, school)	B-	D	B-	D	D	D	P/C/O: Due to the change of the alignment, there will be no impact on school which was assumed in the beginning
Poor People	A-	B+	B+/B-	A-	B+/B-	B+/B-	<p>P: The ratio of illiterates and the poor is high in the Char area. Given the limited coping capacity of the poor, appropriate mitigation measures will be considered in the RAP.</p> <p>C: The poor may bear a higher burden due to their limited capacity to cope. However, they can benefit from employment opportunities during construction work.</p> <p>P: The poor may fail to benefit from the project due to lack of skills and coping capacity, therefore assistance to improve their skills and capacity will be considered in the RAP. With that assistance, the poor can also gain benefit from improved market access and business opportunities in the long run.</p>
Ethnic Minorities/ Indigenous People	C	C	C	D	D	D	P/C/O: Ethnic minority and Scheduled Tribes were not identified in PAH/PAPs.
Gender	B-	B-	D	B-	B+/B-	D	P: Numbers of women-headed households were identified. Involvement of women should be ensured during the course of the land acquisition and resettlement process.

Item	Impact Assessments of Scoping			Impact Assessments of Study Result			Rational of the Impact Assessment
	Pre-construction	Construction Stage	Operation Stage	Pre-construction	Construction Stage	Operation Stage	
							<p>C: Equal opportunity in construction work should be sought for women and job training should be provided as necessary.</p> <p>O: No impact is expected</p>
Children's Rights	B-	D	D	D	D	D	<p>P: Due to the change of the alignment, there will be no impact on school which was assumed in the beginning</p> <p>C: Child labor is unlawful according to Article 24 of the Indian Constitution. Only adults are eligible for potential employment opportunities created by the project. As for the precaution, the contract with the contractors should include the clause to prohibit hiring children for the construction works.</p> <p>O: No impact is expected</p>
Public Health (sanitation and infectious diseases)	D	B-	D	D	B-	D	<p>P: No impact is expected.</p> <p>C: Influx of construction workers is likely to increase the health risk, particularly that of STD / STI and HIV / AIDS.</p> <p>O: No impact is expected</p>
Occupational Health and Safety (OHS)	D	B-	B-	D	B-	B-	<p>P: No impact is expected.</p> <p>C: Occupational health and safety of construction work should be properly managed through adequate EMP.</p> <p>O: Hygiene and safety of workers should be considered for those in charge of maintenance and repair work.</p>
Others							
Accidents	D	B-	B-	D	B-	B-	<p>P: No impact is expected.</p> <p>C: An increased risk of accidents associated with construction activities is expected due to the operation of heavy equipment and vehicles.</p> <p>O: Risks of accidents is expected to increase due to greater traffic volume and speed. Traffic measures shall be taken especially in the village area.</p>

Source: JICA Study Team

CHAPTER 7 Environmental Management Plan and Monitoring Plan

7.1 Environmental Management Plan

Descriptions of the environment management measures during different stages of the project are provided in the tables below. Regarding measures to mitigate impacts on aquatic organisms such as Ganges dolphins, reference was made to experts on the ecology of Ganges dolphin and other similar projects.

Table 7-1: Environmental Management Plan for Pre-Construction Stage

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
P1	Bottom sediment	<ul style="list-style-type: none"> Mobilization of bottom sediments will require Contractor to install turbidity curtains. 	Brahmaputra River	During boring survey	Contractor	Project Implementation Unit (PIU)
P2	Resettlement of Project Affected Persons (PAP) / Local Economy and livelihood	<ul style="list-style-type: none"> All requirements of the RAP as applicable shall be complete before start of construction stage. 	All areas	Before construction begins	Government of Assam / Meghalaya, District Revenue authorities and District Authorities, NGO/Consultant	PIU, SC
P3	Land use / Identify and prepare relocation sites	<ul style="list-style-type: none"> The identification and selection of land use, land acquisition and/or lease during construction work shall be carried out with the assistance from respective DCs and in consultation with local residents. In case of preparing relocation sites, necessary utilities such as water and electricity shall be provided. 	Near the original villages	Before construction stage	District Authorities/ Contractor	PIU
P4	Unequal distribution of benefit and damage	<ul style="list-style-type: none"> Support measures shall be implemented based on RAP including the preferential provision of employment opportunities to those directly affected. Support measures for the char people will be planned with the assistance from NGO and other experts so that they can receive maximum benefit from the project. 	Within ROW	Before construction stage	District Authorities, NHIDCL, NGO	PIU
P5	Local conflicts of interest	<ul style="list-style-type: none"> Carry out close monitoring of RAP process to detect and resolve the local conflicts at earlier stage. 	All areas	Before construction stage	District Authorities, NHIDCL, NGO	PIU

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
P6	Poor people / Gender	<ul style="list-style-type: none"> Ensure the participation of the poor and women in the process of land acquisition and resettlement. Livelihood restoration plan will be considered taking in to account the limited skills of the poor people including illiterate population and different needs of women. Information shall be shared to women and representatives of women with the assistance from the village heads and NGOs. 	Within ROW	Before construction stage	District Authorities, NHIDCL, NGO	PIU

Source: JICA Study Team

Table 7-2: Environmental Management Plan for Construction Stage

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
Soil						
C1	Soil Erosion in Borrow Pits (Impact on topography/geology)	<ul style="list-style-type: none"> The depth of borrow pits shall be Restricted so that sides of the excavation shall have a slope not steeper than 1:4, from the edge of the final section of the bank. After construction, excavated land shall be filled back to the original condition. 	On approved locations of borrow pits.	Construction Stage	Contractor and Supervision Consultant	Project Implementation Unit (PIU)
C2	Loss of top soil in Borrow pits (Impact on topography/geology)	<ul style="list-style-type: none"> Agricultural fields or productive land shall be avoided for borrowing earth. Top soil shall be preserved as instructed by the state government and used for tree plantation. 	On approved locations of borrow pits.	Construction Stage	Contractor and Supervision Consultant	PIU
C3	Compaction of Soil (Impact on topography/geology)	<ul style="list-style-type: none"> Construction equipment and vehicles shall be restricted to move only within designated area to avoid compaction of productive soil. 	Throughout corridor.	Construction Stage	Contractor and Supervision Consultant	PIU
C4	Soil erosion in embankments (Impact on topography/geology)	<ul style="list-style-type: none"> Pitching shall be done for slope stabilization as per the IRC guidelines 	At the embankments	Construction Stage	Contractor and Supervision Consultant	PIU

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
C5	Soil Pollution	<ul style="list-style-type: none"> Construction vehicles and equipment shall be operated and maintained in such a manner so that soil contamination due to its spillage shall be at a minimum. Fuel storage shall only be done on wasteland and will be kept away from drainage channels and natural water bodies. All spills and discharged petroleum products shall be disposed of in accordance to the Hazardous Waste Management and Handling Rules. 	Near Labor camp and Sites of installation of Construction machineries.	Construction Stage	Contractor and Supervision Consultant	PIU
C6	Soil Pollution from construction waste	<ul style="list-style-type: none"> Debris generated due to unused / waste material shall be suitably reused in the proposed construction, such as for filling materials for embankments. All spoils shall be disposed of as desired and the site shall be fully cleaned before handing over. Construction waste including non-bituminous and bituminous waste shall be dumped in an approved landfill site identified by State Pollution Control Board (SPCB) or competent authority. All spoils shall be disposed of as desired and the site shall be fully cleaned before handing over. 	Solid waste dump Site identified and approved by SPCB or competent authority.	Construction Stage	Contractor and Supervision Consultant	PIU
C7	Loss of top soil	<ul style="list-style-type: none"> Topsoil shall be stripped, stored and laid on ground for landscaping purposes. 	Throughout the area	Construction Stage	Contractor and Supervision Consultant	PIU
Water						
C8	Water pollution	<ul style="list-style-type: none"> Construction vehicles / equipment shall be operated and maintained in such a manner to avoid contamination of water bodies due to oil spillage. Fuel storage shall only be done on wasteland and will be kept away from drainage channels and natural water bodies. Oil and grease traps will be provided at fueling locations 	Near labor camp and sites of the installation of Construction machineries.	Construction Stage	Contractor and Supervision Consultant	PIU
C9	Water pollution from labor camp.	<ul style="list-style-type: none"> Labor camp shall not be allowed near any of the water bodies. The proper sanitation facilities shall be provided. 	Preapproved locations away from the water bodies.	Construction Stage	Contractor and Supervision Consultant	PIU
C10	Deposition of dust in open wells near construction site	<ul style="list-style-type: none"> The mouth/opening of the well shall be covered with suitable material during any of the construction activity so as to prevent dust from entering in the well. 	All the wells along the project corridor.	Construction Stage	Contractor and Supervision Consultant	PIU
C11	Impact on Surface water quality due to eroded soils	<ul style="list-style-type: none"> Construction work close to the watercourses or other water bodies will be avoided, especially during the monsoon period. 	All the respective locations	Construction Stage	Contractor and Supervision Consultant	PIU

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
		<ul style="list-style-type: none"> Increase coverage of open surface area by planting grass and creepers so that the washing away of materials from sloped surfaces would be reduced by a significant extent. Silt curtain should be used for all underwater works. 				
Air						
C12	Emission from construction vehicles and machinery.	<ul style="list-style-type: none"> All vehicles, equipment and machinery shall be selected to meet recognized international and national standards for emissions and shall be maintained and operated in a manner that ensures relevant air, noise and discharge rules. Only unleaded petrol and low sulphur diesel or sulphur-free diesel shall be used as fuel for vehicles, equipment and machinery. Air quality monitoring shall be conducted. 	Wherever the hot mix plant and batching plant is setup.	Construction Stage	Contractor and Supervision Consultant	PIU
C13	Air pollution from various plants affecting settlements	<ul style="list-style-type: none"> The asphalt plants, crushers and batching plants shall not be sited within at least 500m in leeward direction from the nearest human settlement. Particulate Filters shall be installed. 	Locations near Settlement	Construction Stage	Contractor and Supervision Consultant	PIU
C14	Dust	<ul style="list-style-type: none"> The dust generated by vehicles on site shall be arrested using a water tanker fitted with a sprinkler capable of applying water uniformly with a controllable rate of flow to variable widths of surface but without any flooding. Trucks shall be covered by the sheet. 	Wherever the plants are Set up and sensitive locations as suggested in the monitoring plan.	Construction Stage	Contractor and Supervision Consultant	PIU
Waste						
C15	Waste disposal	<ul style="list-style-type: none"> Debris generated due to unused / waste material shall be suitably reused in the proposed construction, such as for filling materials for embankments. Construction waste including non-bituminous and bituminous waste shall be dumped in an approved landfill site identified by State Pollution Control Board (SPCB) or 	Solid waste dump Site identified and approved by SPCB or competent authority. Throughout the	Construction Stage	Contractor and Supervision Consultant	PIU

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
		competent authority. All spoils shall be disposed of as desired and the site shall be fully cleaned before handing over.	area			
Noise						
C16	Noise levels from vehicles. Asphalt plants and equipment	<ul style="list-style-type: none"> The plants and equipment used for construction will strictly conform to Central Pollution Control Board (CPCB) noise standards. Vehicles, equipment and construction machinery shall be monitored regularly with particular attention to silencers and mufflers to maintain noise levels to a minimum; Workers in the vicinity of high noise levels must wear ear plugs and helmets and should be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 90 dB(A); In construction sites within 150 m of human settlements, noisy construction will be stopped between 10 PM and 6 AM. Hot mix plants, batching or aggregate plants shall not be located within 500m of sensitive land use for schools and hospitals; For places close to the sensitive receptors such as hospitals and schools, noise barriers such as earth, concrete, wood, metal or double-glazing of windows for façade insulation shall be used; Phase demolition, earthmoving, and ground-impacting operations are not to occur in the same time period. Unlike noise, the total vibration level produced could be significantly less when each vibration source operates separately; Construction machinery will be located away from the settlements; Careful planning of machinery operation and scheduling of operations can reduce the noise levels. Noise monitoring shall be conducted to check if the noise level is within the environmental standards. 	Throughout the project area	Construction Stage	Contractor and Supervision Consultant	PIU
Bottom Sediment						

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
C17		<ul style="list-style-type: none"> Slit curtain shall be installed to prevent move of the sediment. Construction works shall be suspended when flood warning is issued. 				
Ecology						
C18	Tree cutting in ROW	<ul style="list-style-type: none"> Land clearing activities at the construction site should be kept at an absolute minimum. Construction vehicles, machinery and equipment will be moved or stationed in the (ROW) to prevent compaction of vegetation. Water shall be sprinkled to prevent dust generation. 	Throughout the project area	Construction Stage	Contractor and Supervision Consultant Forest Dept.	PIU
C19	Endangered species	<ul style="list-style-type: none"> Relevant information (e.g. encounter with vulnerable species during engineering work) shall be shared with the State Environment and Forest Department and concerned regional environmental experts. Anti-poaching measures during the construction phase should be strengthened to check for any violation of existing regulations. Awareness campaign to be made among the workers to aware them on the endangered and other important species. Construction vehicles must be operated at safe speed to avoid collision with wildlife. Training should be provided for the vehicle operators and warning signs should be installed. Change of geology and topography should be kept minimum. Avoid constructing labor camps and construction yards near the river banks. To minimize impacts, noisy operations should be avoided during breeding season of the dolphins (February-July). River flow should not be blocked at all times for free movement of dolphins. 	Throughout the project area	Construction Stage	Contractor and Supervision Consultant	PIU

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
		<ul style="list-style-type: none"> Measures such as the creation and monitoring of an exclusion zone of a 500m radius for at least 30 minutes before the start of construction activities shall be followed. If dolphins are observed in the exclusion zone, construction works should be delayed until they have left the area. If dolphins enter the exclusion zone after construction has commenced, construction works should cease until they have left. 				
C19	Endangered species (continued)	<ul style="list-style-type: none"> All activities that increase soil erosion or contribute to nutrients and pollutants to water need be minimized both on-site and off-site by using measures such as silt curtain. Construction activities should be carried out in close supervision of the dolphin ecologist. Construction works should be avoided or kept minimum in vicinity of the dolphins' favorable microhabitats (downstream of shallow areas/sandbars, tributary junctions) Dolphins are likely to prefer water depth range between 4.1 to 6 m. Therefore, movement of sediment and influx of soil/silt etc. should be avoided to keep the favorable depth range. In case rare birds of prey are observed near the construction area, the construction work will be avoided during their breeding season. Before construction of piers the construction site must be checked for the presence of threatened turtles, migratory birds, and other threatened species and their nests. If the turtles and/or their nest are found inside or near the construction area the animals and/or the eggs must be physically moved to safer habitat areas under the guidance of the local wildlife experts. All boats or ferries transporting construction material and workers will have propeller guards installed to prevent injury and death of dolphins, turtles and other aquatic fauna. One of the threats to bird and turtle habitat is conversion of the river edges from natural soft embankments into hard concrete embankments. Therefore the natural bank slope is preserved 	Throughout the project area	Construction Stage	Contractor and Supervision Consultant	PIU

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
		<p>and location of the bridge piers will avoid such areas. No construction camp, borrow areas or disposal sites will be established within 100m of the shorelines at the highest water level period.</p> <ul style="list-style-type: none"> All avoidance, mitigation and enhancement measures and monitoring plans proposed to address impacts on flora, fauna and the threatened species should be updated during the detailed design stage by conducting detailed studies such as identification of the migrating routes of dolphins and birds, exact locations of turtle nesting grounds, etc. 				
C20	Underwater noise impacts on aquatic species.	<ul style="list-style-type: none"> Use vibratory hammer. Under conditions where impact hammers are required for reasons of seismic stability or substrate type, it is recommended that the pile be driven as deep as possible with a vibratory hammer prior to the use of the impact hammer. Monitor sound levels during pile driving to ensure that they do not exceed the NOAA (National Oceanic and Atmospheric Administration, USA) or any other international recognized criteria. Implement measures to attenuate the sound when sound pressure levels exceed the NOAA or any other international recognized criteria. Methods to reduce the sound pressure levels include but are not limited to: Installation of underwater enclosures to minimize sound Surrounding the pile with an air bubble curtain system or air-filled coffer dam. Using a smaller hammer to reduce the sound pressure. The sound produced in pile driving has a direct relationship to the force used to drive the pile. A smaller hammer will have less force on the pile therefore producing less sound. Construction works should be ceased when the dolphins are observed near the work area. 				
Social Environment						

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
C21	Land Use	<ul style="list-style-type: none"> When the workers' camp was to be developed, the contractor should make lease agreements with the land owners in consultation with the local community assisted by the DC. Prior to the development of such sites, EIA should be carried out. 	At respective planned construction sites	Construction Stage	Contractor and Supervision Consultant	PIU
C22	Utilization of Local Resources	<ul style="list-style-type: none"> If the excessive use of construction materials causes a price hike for local usage, the source of construction materials should be coordinated accordingly. 	At respective planned construction sites	Construction Stage	Contractor and Supervision Consultant	PIU
C23	Local Economy and Livelihood / Unequal Distribution of Benefit and Damage / Local Conflict of Interest	<ul style="list-style-type: none"> PAP (including women and the poor) will be given priority to be employed in the construction work. Information will be widely shared to local residents for them to understand and take advantages of the employment opportunities. Provide vocational training that allows local residents to satisfy the conditions to become workers. 	Throughout the project area	Construction Stage	Contractor and Supervision Consultant, NHIDCL, NGO	PIU
C24	Water use	<ul style="list-style-type: none"> The contractor shall make arrangements for water required for construction in such a way that water availability and supply to nearby community is unaffected. Wastage of water shall be kept to a minimum during construction. To minimize the river pollution during construction, mitigation measures will be applied such as installing a silt fence in places close to the residential area. 	At respective planned construction sites	Construction Stage	Contractor and Supervision Consultant	PIU
C25	Gender	<ul style="list-style-type: none"> Equal employment opportunities should be sought for women and also preference should be given to women in choosing light loaded work and day time work, if necessary. 	Throughout the project area	Construction Stage	Contractor and Supervision Consultant	PIU
Health and Hygiene						
C26	Health hazard at Construction work sites	<ul style="list-style-type: none"> At every workplace, good and sufficient potable water (as per IS 10500) supply shall be ensured to avoid water-borne diseases and to secure the health of workers. Adequate drainage, sanitation and waste disposal shall be provided at workplaces. Preventive Medical care shall be provided to workers. 	Wherever labor camp is set up	Construction Stage	Contractor and Supervision Consultant	PIU

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
C27	Health hazard during construction work	<ul style="list-style-type: none"> Personal protective equipment shall be provided to workers as per the Factories Act. 	Construction work	Construction Stage	Contractor and Supervision Consultant	PIU
C28	Hygiene at Construction Camps	<ul style="list-style-type: none"> The Contractor during the progress of work will provide, erect and maintain necessary (temporary) living accommodation and ancillary facilities for labor to appropriate standards and scale approved by the resident engineer These shall be provided within the precincts of every workplace, latrines and urinals in an accessible place, and the accommodation, separately for each for these, as per standards set by the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996. There shall be adequate supply of water, close to latrines and urinals. All temporary accommodation shall be constructed and maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. The sewage system for the camp must be properly designed, built and operated. Compliance with the relevant legislation must be strictly adhered to. Garbage bins shall be provided in the camp and regularly emptied and the garbage disposed of in a lined landfill sites. 	Wherever labor camp is set up	Construction Stage	Contractor and Supervision Consultant	PIU
C29	Health/ social hazard, sexual harassment to female workers	<ul style="list-style-type: none"> Segregation of male and female areas in labor camp shall be executed. 	Wherever labor camp is set up	Construction Stage	Contractor and Supervision Consultant	PIU
C30	Construction Camps	<ul style="list-style-type: none"> Upon completion of the works, the entirety of such temporary structures shall be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the entirety of the site left clean and tidy, at the Contractor's expense, to the entire satisfaction of the Engineer. 	Wherever labor camp is set up	Construction Stage	Contractor and Supervision Consultant	PIU
C31	Quarry site will accumulate water and act as a breeding ground	<ul style="list-style-type: none"> Reclamation measures shall be adopted with a garland of trees around the periphery. The quarry dust and waste shall be used for refilling. The remaining portion should be covered with trees. 	All quarry locations	Construction Stage	Contractor and Supervision Consultant	PIU

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
	for disease vectors.					
Safety						
C32	Workers' safety	<ul style="list-style-type: none"> The contractor shall supply all necessary safety appliances such as safety goggles, helmets, masks, etc. to the workers and staff. Especially all workers employed in mixing Asphaltic material, welding works, stone breakers, and paint should be provided with appropriate personal protected equipment. The contractor has to comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and a safe means of entry and egress. All necessary fencing and lights will be provided to protect the public. All machines to be used in the construction will conform to the relevant Indian Standards' (IS) codes, will be free from patent defect, will be kept in good working order, will be regularly inspected and properly maintained as per IS provisions and to the satisfaction of the Engineer. 	All construction sites	Construction stage	Contractor and Supervision Consultant	PIU
C33	Unexpected disasters and accidents	<ul style="list-style-type: none"> All reasonable precautions will be taken to prevent danger for the workers and the public such as fire, flood, drowning, etc. All necessary steps will be taken for prompt first aid treatment of all injuries likely to be sustained during the course of work. At every workplace, a readily available first aid unit including an adequate supply of sterilized dressing material and appliances will be provided. 	All construction sites	Construction stage	Contractor and Supervision Consultant	PIU
C34	Workers' health	<ul style="list-style-type: none"> The Contractor shall, at his own expense, conform to all anti-malarial instructions given to him by the Engineer, including filling up any borrow pits which may have been dug by him 	All construction sites	Construction stage	Contractor and Supervision Consultant	PIU
C35	Accidents	<ul style="list-style-type: none"> The construction section should be properly demarcated and signage should be placed. Notice and necessary information shall be shared amongst surrounding villagers prior to the construction activities. Carry out traffic safety awareness program for road side communities. 	All construction sites	Construction stage	Contractor and Supervision Consultant	PIU

Sl. No	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
		<ul style="list-style-type: none"> Check and approve the Contractor's method of work, including site organization, program of performance, quality assurance system, safety plan, method statements of safety and environmental monitoring plan. 				

Source: JICA Study Team

Table 7-3 Environmental Management Plan for Operation Stage

	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
O1	Water Pollution	<ul style="list-style-type: none"> Silt fencing, oil & grease traps, etc. shall be provided at sensitive water bodies to ensure that the water quality is not impaired due to contaminants from road run-off Monitoring shall be carried out as specified in the monitoring plan Contingency plans to be in place for cleaning up of spills of oil, fuel and toxic chemicals 	As specified in the Monitoring plan	As per monitoring plan	PIU, SPCB	Project Implementation Unit (PIU)
O2	Soil contamination	<ul style="list-style-type: none"> Contingency plans to be in place for cleaning up of spills of oil, fuel and toxic chemicals Monitoring shall be carried out as specified in the Monitoring Plan 	All area and as specified in the monitoring plan	Plan to be developed at state/district level By early operation stage	PIU, SPCB, Local Government Bodies	PIU
O3	Air quality degradation due to increases in traffic volume	<ul style="list-style-type: none"> Monitoring shall be carried out as specified in the Monitoring plan Share air quality data with SPBC and relevant agencies and discuss options for mitigate air quality degradation associated with greater traffic volume. 	As specified in the monitoring plan	As per monitoring plan	PIU, SPCB	PIU
O4	Increases in noise and vibration due to greater traffic volume	<ul style="list-style-type: none"> Monitoring shall be carried out as specified in the Monitoring plan Install noise barrier (wall etc.) in sensitive areas, if necessary Carry out proper road maintainance to reduce noise and vibration. 	As specified in the monitoring plan	As per monitoring plan	PIU, SPCB	PIU

	Environmental Impacts/Issues	Mitigation Measures	Location	Time Frame	Responsibility	
					Implementation	Supervision
O5	Ecology	<ul style="list-style-type: none"> Monitor the population of endangered species. Enhance research and conservation of Gangatic river dolphins. Littering from the bridge into the river must be prohibited. Roadside greenbelt should be maintained to enhance ecological landscape, using native local tree species. 	As specified in the monitoring plan	As per monitoring plan	PIU, NGO	PIU
O6	Local economy and livelihoods/ Poor people	<ul style="list-style-type: none"> Change of income source and income of PAPs shall be monitored and modify the assistance measures as necessary. 	Within ROW	As per monitoring plan	PIU, NGO	PIU
O7	Unequal Distribution of Benefit and Damage / Local Conflict of Interest	<ul style="list-style-type: none"> Conduct interviews to DCs and village heads about dissatisfaction or conflict of residents of the target area and explain and take measures as necessary. 	All area	When issues are identified	District Authorities, PIU, NGO	PIU
O8	Public Health / Occupational Health and Safety (OHS)	<ul style="list-style-type: none"> Ensure the safety of the workers by providing safety guidance to the maintenance and repair workers. 	Area of maintenance / repair work	At the time of maintenance / repair work	PIU	PIU
O9	Accidents	<ul style="list-style-type: none"> Ensure the safety through traffic rules such as speed limit. Traffic signs shall be installed, especially in the built-up areas as well as at the junction of the existing road and approach road to avoid traffic accidents. Sidewalks and pedestrian crossings will be equipped to ensure the safety and movement of pedestrians. 	All area	As per monitoring plan	PIU	PIU

Source: JICA Study Team

7.2 Environment Monitoring Program

(1) Ambient Air Quality

Ambient air quality parameters recommended for monitoring road transportation developments are PM10, PM2.5, Carbon Monoxide (CO), Oxides of Nitrogen (NOX), and Sulphur Dioxide (SO2). These will be monitored at designated locations starting from the commencement of construction activity. Data should be generated at all identified locations in accordance with the National Ambient Air Quality Standards, 2009. The location, duration and the pollution parameters will be monitored and the responsible institutional arrangements are detailed in the Monitoring Plan.

(2) Water Quality

The physical and chemical parameters recommended for the analysis of water quality relevant to road / bridge development projects are: pH, turbidity, total solids, total dissolved solids, total suspended solids, oil and grease, COD, chloride, lead, zinc and cadmium. The location, duration and the pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan. The monitoring of the water quality is to be carried out at all identified locations in accordance with the Indian Standard Drinking Water Specification – IS 10500: 2012.

(3) Noise

The measurements for monitoring noise levels would be carried out at all designated locations in accordance with the Ambient Noise Standards formulated by the Central Pollution Control Board (CPCB) in 1989. Noise should be recorded at an “A” weighted frequency using a “slow time response mode” of the measuring instrument. The location, duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan.

(4) Biodiversity

The monitoring of ecosystem including the Ganges River Dolphins shall be carried out by subcontracting a competent environmental NGO led by a qualified expert. A detailed dolphin census survey shall be carried out before the onset of construction works, in which the estimated number of the dolphins, demography, geographical distribution, and their behavioral pattern will be studied in the project affected area. Using the data from the initial assessment as a baseline, the monitoring of the dolphin population will be carried out thrice a year following the same survey protocol. At the time of each survey, visual observation of the ecosystem will be also carried out for presence/absence of other rare/endangered species. Detailed monitoring plan and methodologies of the biodiversity monitoring will be developed by the detailed design stage under the guidance of dolphin ecology experts.

The monitoring plan for the various performance indicators of the project in the construction and operation stages is summarized in the table below.

Table 7-4: Environmental Monitoring Plan

Sl. No	Item	Project Stage	Parameters	Guidance	Standards	Location	Frequency	Responsibility	
								Implementatio	Supervision
M1	Air	Construction	PM _{2.5} PM ₁₀ , SO ₂ ,NO _x , CO	<ul style="list-style-type: none"> Dust sampler to be located 50m from the plan in the downwind direction. Use method specified by CPCB for analysis 	Air (P&CP) Rules, CPCB, 1994	Hot mix plant/batching plant, Sampling locations specified in EIA report	Thrice a year For 9 years	Contractor through approved monitoring agency	PIU
M2		Operation	PM ₁₀ , SO ₂ ,NO _x , CO	<ul style="list-style-type: none"> Use method specified by CPCB for analysis 	Air (P&CP) Rules, CPCB, 1994	Sampling locations specified in EIA report	Twice a year for two years	PIU	PIU
M3	Water	Construction	pH, Turbidity, BOD, COD, TDS, TSS, DO, Oil & Grease and Pb	<ul style="list-style-type: none"> Sample collected from source and analyzed as per Standard Methods for Examination of Water and Wastewater 	Water quality standards by CPCB	Sampling locations specified in EIA report	Thrice a year For 9 years	Contractor through approved monitoring agency	PIU
M4		Waste	Construction	Types and amount of generated waste	<ul style="list-style-type: none"> Record the Types and amount of generated waste 	Municipal Solid Waste (Management & Handling) Rules, Hazardous Waste (Management, Handling & Trans boundary Movement) Rules	All designated waste collecting sites for construction works	Thrice a year For 9 years	Contractor

Sl. No	Item	Project Stage	Parameters	Guidance	Standards	Location	Frequency	Responsibility	
								Implementatio	Supervision
M4	Noise	Construction	Noise levels on dB (A) scale	<ul style="list-style-type: none"> Free field 1m from the equipment whose noise levels are being determined. 	Noise Standards by CPCB	At equipment yard / construction site.	Thrice a year For 9 years	Contractor through approved monitoring agency	PIU
M5		Operation	Noise levels on dB (A) scale	<ul style="list-style-type: none"> Equivalent Noise levels using an integrated noise level meter kept at a distance of 15m from edge of Pavement 	Noise standards by CPCB	At maximum 4 sites listed in EIA	Twice a year for 2 years	PIU	PIU
M6	Topography and geology	Construction	Conditions in embankment area	<ul style="list-style-type: none"> Visual survey about stability of embankment 		At equipment yard/ construction site.	Thrice a year For 9 years	Contractor	PIU
M7	Soil contamination	Construction	Presence/absence of oil spillage	<ul style="list-style-type: none"> Visual inspection 		At equipment yard/ construction site.	Thrice a year For 9	Contractor	PIU
M9	Ecology	Construction and operation	Frequency of dolphin sightings, Observation of Vulnerable Species* (name and location of the observed species)	<ul style="list-style-type: none"> Observation from river bank (from sunrise to sunset, 10 days) or other observable places , visual observation, hearing to construction workers/local residents 	Baseline survey will be carried out before construction	Dhubri, Phulbari	Thrice a year for 9 years during construction and twice a year for 2 years during operation	NGO, PIU	PIU
M10	Livelihood	Construction and operation	Change of livelihood	<ul style="list-style-type: none"> Evaluate based on the RAP monitoring results 	Census survey carried out during the RAP preparation	Within ROW	Twice a year	NGO	PIU
M11	Land Use	Construction	Change of land use	<ul style="list-style-type: none"> Visual inspection 	Land use before construction	At construction yard and labour camp	Twice a year	Contractor	PIU

Sl. No	Item	Project Stage	Parameters	Guidance	Standards	Location	Frequency	Responsibility	
								Implementatio	Supervision
M12	Utilization of Local Resources	Construction	Price of construction materials	<ul style="list-style-type: none"> Interview with local construction company 	NA	Dhubri, Phulbari	Twice a year	Contractor	PIU
M13	Unequal Distribution of Benefit and	Construction and operation	Satisfactory level	<ul style="list-style-type: none"> Evaluate based on the RAP monitoring results 	NA	Dhubri, Phulbari	Twice a year	NGO	PIU
M14	Water use	Construction	Use of silt fence	<ul style="list-style-type: none"> Site inspection 	NA	At the construction site near residential area	During construction near residential area	Contractor	PIU
M14	Gender	Construction	Number of women employed	<ul style="list-style-type: none"> Employment record Evaluate based on the RAP monitoring results 	NA	Within ROW and surrounding villages	Twice a year	NGO, Contractor	PIU
M15	Public Health	Construction and operation	Adequate equipment and facilities Number of health issue reported	<ul style="list-style-type: none"> Site inspection Record on health 	NA	At labour camp and construction site.	Twice a year	Contractor	PIU
M16	Occupational Health and Safety	Construction	Adequate equipment and facilities Number of work related accidents	<ul style="list-style-type: none"> Site inspection Accident records 	Factories Act.	At labour camp and construction site.	Twice a year	Contractor	PIU
M17	Accidents	Construction and operation	Number of traffic accidents	<ul style="list-style-type: none"> Accident records 	NA	Within ROW	Twice a year	Contractor	PIU

Source: JICA Study Team

Note:

*Names of the vulnerable species are:

Trachypithecus pileatus(Capped Langur),

Platanista gangetica gangetica(Dolphin)

Pteropus giganteus(Flying fox)

Semnopithecus entellus(Langoor)

Vulpes bengalensis(Fox)

Aythya baeri(Baer's pochard)

Gracula religiosa(common hill myna)

Gyps indicus(Vulture)

Leptoptilos javanicus(The lesser adjutant)

Leptoptilos dubius(The greater adjutant)

Otus spilocephalus(The mountain scops owl)

Sturnus contra(pied myna / Asian pied starling)

Aspideretes gangaticus(Indian softshell turtle)

Aspideretes hurum(Indian peacock softshell turtle)

Bungarus fasciatus(Common Indian Krait)

Chitra indica(Indian narrow-headed softshell turtle)

Melanochelys tricarinata(The Tricarinate hill turtle / three-keeled land turtle)

Morenia petersi(The Indian eyed turtle)

Naja naja(Cobra)

Pangshura sylhetensis(The Assam roofed turtle)

Pangshura smithii(Brown roofed turtle)

Varanus bengalensis(Common Indian Monitor)

Hoplobatrachus tigerinus(Indian Bull Frog)

7.3 Institutional Arrangement

The detailed measures adopted and/or to be adopted during different stages of the project to mitigate negative impacts and enhance positive aspects are shown in Table 7-1 to 7-3. The responsibility for the implementation and supervision of EMPs are vested with three agencies, namely, Contractors, PIU, and Supervision consultants (SC). The Contractors herein mean the agency hired for the execution of the construction works for the respective contract packages. PIU would be the implementation agency with the support of PWD. Figure below indicates the implementation structure of the EMP.

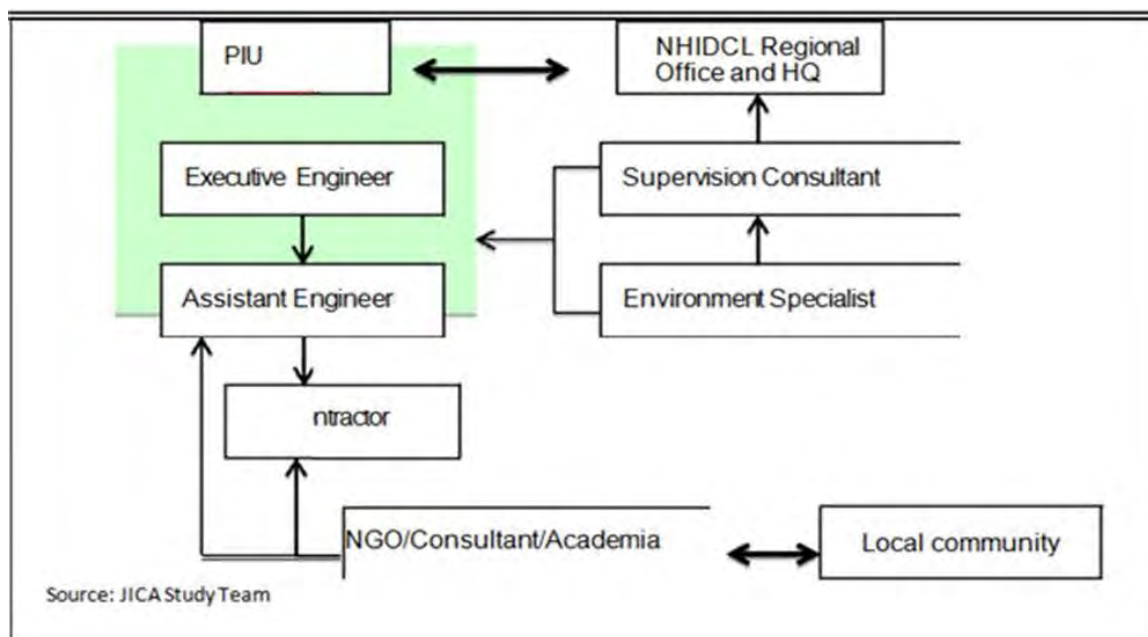


Figure 7-1: Institutional Arrangements for EMP Implementation

It has been proposed that the Executive Engineer (environment) based in Dhubri will be in charge of the implementation of EIA and EMP for this project. Such an engineer will be assisted by the Assistant Engineer (Environment), who will be assisted by a Junior Engineer as well as a Supervision consultant (and Environment Specialist) and contractor.

The construction supervision consultants are expected to have in-house capacity to advise on and supervise the implementation of the EMP including suggesting enhancement design options and modifications, as necessary. For this purpose, the supervision consultant will employ a full-time environmental specialist.

Compensatory plantation, maintenance and protection of vegetation will be required as part of environmental mitigation and enhancement works. Likewise, spoiled soil shall be used, where possible, to create community assets such as playgrounds, as per request of the community. In these types of works, the project may engage NGO, Consultant or experts from local universities to liaise with the local community for effective implementation of the project.

7.4 Grievance Redress Mechanism

An integrated grievance and redress mechanism (GRM) for environmental and social action plans is needed to be established for the project. The GRM provides a system for receiving, evaluating and facilitating the resolution of affected people's concerns, complaints, and grievances about the project's social and environmental performance. Due to the scale of the project with one end of the bridge located in an urbanized section of Dhubri and adverse impacts are anticipated, issues

like poor legal records, voluminous titles and sometimes conflicting holdings, intensive construction activities located near communities, traffic from construction vehicles, and conflict between migrant and host communities are to be expected.

Grievances related to the implementation of the project, will be acknowledged, evaluated, and responded to with corrective action proposed using understandable and transparent processes that are gender responsive, culturally appropriate, and readily accessible to all segments of the affected people. Records of grievances received, corrective actions taken and their outcomes will be properly maintained.

The nature and significance will be evaluated by the receiving party. Any complaint which concerns project construction activity, poses imminent serious risk to life and property, or will result to irreversible damage to wildlife (dolphin) will be immediately forwarded to the PIU- for action within 24-hours from receipt of complaint.

7.5 Monitoring Forms

The following Tables indicate JICA's standardized monitoring form. Monitoring works should be carried out every six months unless otherwise specifically noted.

Table 7-5: Environmental Clearance

During Construction	
Monitoring Item	Conditions During the Reporting Period
Response to State Department's Comments/Guidance for Obtaining Environmental Clearance	
Source: JICA Study Team	

Table 7-6: Air Quality

During Construction					
Item (Unit)	Measured Value of Baseline Data (Max.)	Measured Value of Monitoring (Max. Value)	Indian Standard	Referred International Standard	Remarks (Location, Frequency and Method of Measurement)
SO ₂	11.5 µg/m ³		80µg/m ³	20µg/m ³	Chagal chora (Latitude 26°02'0.32"N & Longitude 89°56'15.67"E)
NO ₂	23.7 µg/m ³		80µg/m ³	200µg/m ³	Katiaralaga (Latitude 25° 57' 49.90" N & Longitude 89° 58' 38.26" E)
CO	780 µg/m ³		2000µg/m ³	-	Bororavatari (Latitude 25° 55' 03.91" N & Longitude 90° 00' 53.50" E)
PM _{2.5}	46.2 µg/m ³		60µg/m ³	-	Phulbari (Latitude 25° 53' 21.04" N & Longitude 90° 02' 13.40" E)
PM ₁₀	88.7 µg/m ³		100µg/m ³	50µg/m ³	Thrice a year, Based on the National Ambient Air Quality Standard: NAAQS

During Operation

Item (Unit)	Measured Value of Baseline Data (Max.)	Measured Value of Monitoring (Max. Value)	Indian Standard	Referred International Standard	Remarks (Location, Frequency and Method of Measurement)
SO ₂	11.5 µg/m ³		80µg/m ³	20µg/m ³	Chagal chora (Latitude 26°02'0.32"N & Longitude 89°56'15.67"E)
NO ₂	23.7 µg/m ³		80µg/m ³	200µg/m ³	
CO	780 µg/m ³		2000µg/m ³	-	Katiaralaga (Latitude 25° 57' 49.90" N & Longitude 89° 58' 38.26" E)
PM _{2.5}	46.2 µg/m ³		60µg/m ³	-	Bororavatari (Latitude 25° 55' 03.91" N & Longitude 90° 00' 53.50" E)
PM ₁₀	88.7 µg/m ³		100µg/m ³	50µg/m ³	Phulbari (Latitude 25° 53' 21.04" N & Longitude 90° 02' 13.40" E) Twice a year, Based on the National Ambient Air Quality Standard: NAAQS

Source: JICA Study Team

Table 7-7: Water Quality

During Construction

Item (Unit)	Measured Value of Baseline Data	Measured Value of Monitoring	Indian Standard	International Standard	Remarks (Location, Frequency and Method of Measurement)
pH	6.02-7.54		6.5-8.5	6-9	Chagal Chora (Latitude 26°02'0.58"N & Longitude 89°56'15.22"E) (Bore well)
Turbidity (NTU)	6.5		10NTU	50mg/L	Chaitarchar (Latitude 25°55'49.65"N& Longitude 89°59'30.77"E)(Brahmaputra River)
BOD/COD (mg/L)	4.2/16.0		-	30/125	
DO (% by mass)	6.0-7.2		10	-	
Heavy Metal	<0.05		-	-	Katiaralaga (Latitude 25° 57' 48.71" N & Longitude 89° 58' 34.52" E) (Hand pump)
Phenol	<0.01		-	-	Bororavatari (Latitude 25° 55' 00.77" N & Longitude 90° 01' 45.56" E) (Jinger River)
Cyanide	BDL		-	-	Phulbari (Latitude 25° 53' 21.04" N & Longitude 90° 02' 13.40" E) (Dug well) Thrice a year, Based on the Indian Standard Drinking Water Specification – IS 10500: 1991

Source: JICA Study Team

Table 7-8: Solid Waste

During Construction

Monitoring Item	Types and amount of generated waste
Reused Debris	
Disposed Debris	

Source: JICA Study Team

Table 7-9: Noise and Vibration

During Construction

Item (Unit)	Measured Value of Baseline Data (Min. Value)	Measured Value of Baseline Data (Max. Value)	Indian Standard	Referred International Standard	Remarks (Location, Frequency and Method of Measurement)
Noise Level (dB)	40.5	62.4	Noise Standard of India 2000		Chagal Chora (Latitude 26°02'0.58"N & Longitude 89°56'15.22"E) Katiaralaga (Latitude 250 57' 48.75" N & Longitude 890 58'34.64" E) Bororavatari (Latitude 250 55' 05.21 N & Longitude 900 00' 54.81" E) Phulbari (Latitude 250 53' 20.91" N & Longitude 900 02' 15.30" E), Thrice a year, , Based on Noise Standard of India 2000
Vibration Level					

During Operation

Item (Unit)	Measured Value of Baseline Data (Min. Value)	Measured Value of Baseline Data (Max. Value)	Indian Standard	Referred International Standard	Remarks (Location, Frequency and Method of Measurement)
Noise Level (dB)	40.5	62.4	Noise Standard of India 2000		Chagal chora (Latitude 26°02'0.58"N & Longitude 89°56'15.22"E) Katiaralaga (Latitude 250 57' 48.75" N & Longitude 890 58'34.64" E) Bororavatari (Latitude 250 55' 05.21 N & Longitude 900 00' 54.81" E) Phulbari (Latitude 250 53' 20.91" N & Longitude 900 02' 15.30" E) Twice a year, Based on Noise Standard of India 2000
Vibration Level					

Source: JICA Study Team

Table 7-10: Topography and Geology

During Construction

Monitoring Location	Condition of embankment, presence/absence of erosion
Construction Camp	
Equipment Yard	
Construction Site	
Others	

Source: JICA Study Team

Table 7-11: Soil Contamination

During Construction

Monitoring Item	Conditions During the Reporting Period
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Presence/absence of oil spillage

Source: JICA Study Team

Table 7-12: Biodiversity

During Construciton

Monitoring Item/Parameter	Conditions During the Reporting Period	Remarks
Observation of Ganges River Dolphin (average number of dolphins/day)		At least 6 locations (2 locations in Dhubri, 2 locations in Phulbari, 2 locations on the sandbar), Thrice a year, 10 days
Observation of Vulnerable Species (average number of observation/day) <i>Trachipithecus pileatus</i> , <i>Pteropus giganteus</i> <i>Semnopithecus entellus</i> . <i>Vulpes bengalensis</i> <i>Aythya baeri</i> <i>Gracula religiosa</i> <i>Gyps indicus</i> <i>Leptoptilos javanicus</i> <i>Leptoptilos dubius</i> <i>Otus spilocephalus</i> <i>Sturnus contra</i> <i>Aspideretes gangaticus</i> <i>Aspideretes hurum</i> <i>Bungarus fasciatus</i> <i>Chitra indica</i> <i>Melanochelys tricarinata</i> <i>Morenia petersi</i> <i>Naja naja</i> <i>Pangshura sylhetensis</i> <i>Pangshura smithii</i> <i>Varanus bengalensis</i> <i>Hoplobatrachus tigerinus</i>	Visual observation and hearing to construction workers/local residents *Detailed monitoring methods will be developed during basic design stage	

Source: JICA Study Team

During Operation

Monitoring Item/Parameter	Conditions During the Reporting Period	Remarks
Observation of Ganges River Dolphin (average number of dolphins/day)		At least 6 locations (2 locations in Dhubri, 2 locations in Phulbari, 2 locations on the sandbar), Thrice a year, 10 days
Observation of Vulnerable Species (average number of observation/day) <i>Trachipithecus pileatus</i> , <i>Pteropus giganteus</i> <i>Semnopithecus entellus</i> .		Visual observation and hearing to construction workers/local residents

Monitoring Item/Parameter	Conditions During the Reporting Period	Remarks
<i>Vulpes bengalensis</i>		*Detailed monitoring methods will be developed during basic design stage
<i>Aythya baeri</i>		
<i>Gracula religiosa</i>		
<i>Gyps indicus</i>		
<i>Leptoptilos javanicus</i>		
<i>Leptoptilos dubius</i>		
<i>Otus spilocephalus</i>		
<i>Sturnus contra</i>		
<i>Aspideretes gangaticus</i>		
<i>Aspideretes hurum</i>		
<i>Bungarus fasciatus</i>		
<i>Chitra indica</i>		
<i>Melanochelys tricarinata</i>		
<i>Morenia petersi</i>		
<i>Naja naja</i>		
<i>Pangshura sylhetensis</i>		
<i>Pangshura smithii</i>		
<i>Varanus bengalensis</i>		
<i>Hoplobatrachus tigerinus</i>		

Source: JICA Study Team

Table 7-13: Land Use

Monitoring Location	Any issues identified due to change of land use
Resettlement site	
Construction yard	
Others	

Source: JICA Study Team

Table 7-14: Utilization of Local Resources

Monitoring Item	Price hike (Yes/No)	If yes, description
Sandy Material		
Granular Material		
Others		

Source: JICA Study Team

Table 7-15: Unequal Distribution of Benefit and Damage

Monitoring Item	No. of samples	No. of unsatisfied PAPs	If unsatisfied, reasons
Satisfaction level			

*Based on RAP monitoring

Source: JICA Study Team

Table 7-16: Gender

Monitoring Item	Description
Number of women employed	

Source: JICA Study Team

Table 7-17: Public Health

Monitoring Item	Description
Number of patients	

Source: JICA Study Team

Table 7-18: Occupational Health and Safety

Monitoring Item	Description
Equipment and facilities	Adequate/Not adequate. If no, describe.
Number and causes of work related accidents	

Source: JICA Study Team

Table 7-19: Accident

Monitoring Item	Remark
Number of Injury/Fatalities	
Location of the accident	
Type and cause of the accident	

Source: JICA Study Team

7.6 Environmental Management Budget

The Proposed Budget for implementation of EMP is estimated below.

Table 7-20: Budget for EMP Implementation

No.	Cost of Environmental / Mitigation Plan Description	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)
A.	Cost During Construction Phase				
1	Environmental Monitoring				
	Air quality monitoring at 5 locations for 3 seasons for 8 consecutive years	Nos.	120	8,000.00	960,000.00
	Surface water quality monitoring at 5 locations for 4 seasons for 8 consecutive years	Nos.	160	6,000.00	960,000.00
	Noise quality monitoring at 10 locations for 3 seasons for 8 consecutive years	Nos.	240	3,000.00	720,000.00
	Flora and Fauna Study for 2 seasons for 8 consecutive years	Nos.	16	2,500,000.00	40,000,000.00
2	Dust suppression at site (2 trips/day for 300 days/year for 8 years)	Nos.	4800	1,500.00	7,200,000.00
3	Development of river funding near bridge area, providing toilets etc.			10,00,000.00	1,000,000.00
	Total cost during construction phase				50,840,000.00
B	Institutional Cost				
1.	Expert Fees	L.S			6,00,000.00
2.	Staff Training	L.S			4,00,000.00
3.	Information Disclosure	L.S			4,00,000.00
	Total				14,00,000.00
C.	Annual cost During Operation Phase				
1	Environmental Monitoring				
	Air quality monitoring at 5 locations for 3 seasons for 2 years	Nos.	30	8,000.00	240,000.00
	Noise quality monitoring at 4 locations twice a year for 2 years	Nos.	16	3,000.00	48,000.00
	Flora and Fauna Study for 2 seasons for 2 consecutive years	Nos.	4	2,500,000.00	10,000,000.00
	Total Cost During Operation Phase				10,288,000.00

No.	Cost of Environmental / Mitigation Plan Description	Unit	Qty	Unit Rate (Rs.)	Amount (Rs.)
Total Cost (A + B + C)					62,528,000.00
Contingency (10%)					6,252,800.00
Total (Rs.)					68,780,800.00

Source: JICA Study Team

CHAPTER 8 Stakeholder Consultation

Public consultations were arranged at the scoping phase and draft final report phase to ensure the participation of the community in the planning process, and to gather issues, comments and suggestions from the relevant stakeholders.

Consultation with the first stakeholder was held in two locations and followed by five community meetings and three focus group discussions, in order to cover project area and to have a comprehensive view on the project. Consultation with the second stakeholder was held in four locations where a majority of the PAPs have easy access.

Information for those who remained un-surveyed due to absence during the census survey period, information of stakeholder meeting and the summary of draft report, was shared by the land acquisition officers of respective districts and assistance from the village chiefs and neighboring residents. The same method will be employed for the information dissemination during the hearing objection period.

8.1 1st Round Consultation

(1) 1st Round Consultation

The purpose of the stakeholders meeting at the scoping stage is to explain the project objective, a summary of the project and scoping results of environmental and social impact from the project in order to obtain comments and concerns from the likely affected communities. The meetings were held in two locations, at the starting point on the Dhubri and Phulbari side.

The main discussion points were as follows.

- 1) Outline and purpose of the Project
- 2) Explanation on the alignment
- 3) Anticipated positive and negative impacts from the project
- 4) Conveyed that the results of the meeting (especially comments and concerns) will be reflected in the project as necessary

The announcements of stakeholder meetings were informed by visiting land acquisition officers, publishing in a local newspaper and distributing pamphlets through village chiefs and local consultants (Enviro Infra Solutions Pvt. Ltd.: EIS). Stakeholder meetings were conducted with the approval from the NHIDCL. Participants include land acquisition officers, village chief, villagers, DPR consultant (AECOM), PWD officers etc. Assamese and Bengali were used in the meeting which are the languages used in the target area. The details are shown below.

The details of 1st Round Consultations with Communities are summarized in Table 8-1 and Table 8-2.

Table 8-1: Location and Dates of Stakeholder meetings

No.	Date	Location	Total	Male	Female	From Char	Coverage
1	24/10/2016	Irrigation IB, Dept. Of Water Resources, Phulbari	68	68	0	2	Phulbari and South Salmara-Mankachar District
2	25/10/2016	EQRA Academy School, Adabari Chomor, Dhubri	119	119	0	23	Dhubri District

Source: JICA Study Team

Table 8-2: Discussion in Stakeholder Meetings

No.	Comments	Answers
1	<ul style="list-style-type: none"> • Compensation of land should be given on the basis of current market price and not by the price that is fixed by the government • Community meetings shall be conducted separately involving all the affected villages and affected families. • Request compensation and income generation method for boat owners and boat operators • Provide proper connectivity of the bridge to National Highway with minimal disturbance in nearby villages 	<ul style="list-style-type: none"> • Amount of compensation will be calculated based on the current market value • Community meetings will be conducted to cover affected villages • Employment opportunities in other modes of transportation (tuktuk, truck etc.) may increase after the project. Thus, income generation method with the provision of trainings will be considered in an income restoration program. • Multiple alignments were considered and the alignment with the least disturbance in the villages was selected. Adequate compensation package will be designed for those affected by the project.
2	<ul style="list-style-type: none"> • Start point of bridge shall be shifted to minimize the impact on local residences. • Local people preferred compensation in terms of land for their acquired land • Community meetings shall be conducted to cover affected villages • Request separate compensation and generation of alternative employment to boat owners and boat operators as proposed bridge will have a major impact on their livelihood. 	<ul style="list-style-type: none"> • The proposed alignment was selected considering the future connection to national roads. However, the proposed starting point is still under discussion and minimization of the impact will be considered. • DC is responsible for finding alternative land, in consultation with the target community • Community meetings will be conducted to cover affected villages • Alternative employment may be expected in other modes of transportation. Assistance for the transition of occupation will be considered in an income restoration program.

Source: JICA Study Team

(2) Community Meeting

For the purpose of gathering comments from the communities in concerned areas, five community meetings were organized. The locations of the meetings were identified based on the concentration of PAPs along the alignment. Participants in the meetings were village chiefs and villagers, including displaced persons and vulnerable groups.

The main points explained and discussed in the meetings were as follows:

- 1) Outline and Purpose of the Project
- 2) Recommended alignment
- 3) Anticipated positive and negative impact from the project
- 4) Socio-economic status of the concerned community

Summary of the results are shown in Table 8-3 and Table 8-4.

Table 8-3: Location and Dates of Community meeting

No.	Date	Location	Total	Male	Female	From Char	Coverage
1	26/10/2016 @12:00	M. E. School, Adabari, Dhubri	22	16	6	15	Starting point of Dhubri
2	26/10/2016 @16:00	Ponchu Ghat in Dhubri	17	17	0	9	Ferry point in Dhubri

No.	Date	Location	Total	Male	Female	From Char	Coverage
3	27/10/2016 @11:00	Phulbari	20	10	10	3	Lower Phulbari
4	27/10/2016 @13:30	South Salmara	15	15	0	5	South Salmara
5	27/10/2016 @16:30	Bauskata and Bororavatari	22	22	0	20	Bauskata, Bororavatari, Phulbari

Source: JICA Study Team

Table 8-4: Discussion in Community meetings

No.	Comments	Answers
1	<ul style="list-style-type: none"> Local people should be informed about compensation packages, valuation methods prior to land acquisition. Preference shall be given to local people to be employed in the construction works. Suggested that the location of start point of the bridge should be shifted to Chandachal Bridge, which is 500m away from the present point to minimize the impact. 	<ul style="list-style-type: none"> Amount of compensation will be determined by DC based on market value (details of the compensation package and the amount will be explained in separate meetings at the end of the survey). Mechanism for employing local people will be proposed for the construction work which requires unskilled labours. The proposed alignment was selected considering the future connection to national roads. However, the proposed starting point is still under discussion and minimization of the impact will be considered.
2	<ul style="list-style-type: none"> Concern that the aquatic biodiversity will be deteriorated and whether fishing environment will be disturbed. Concern that boat operators will become unemployed after completion of the project. New means of livelihood shall be considered for affected people. Preference shall be given to local people for construction work. 	<ul style="list-style-type: none"> The impact on the fishery activities will be assessed and mitigation measures will be implemented if negative impact is to be expected. Boat operation service to Char islands will continue. Regarding the loss of business opportunities, an adequate income restoration program will be considered with input from boat operator communities. Employment in construction work and income restoration program for affected people will be considered and proposed.
3	<ul style="list-style-type: none"> Suggested that end point of the bridge be shifted to Bangshidua Bridge, which is 300m north from the present point for better connection to existing road. Will there be a possible interruption of river corridor isolating habitats with potential decrease in species numbers and local biodiversity. 	<ul style="list-style-type: none"> Affected people will increase as the alignment moves closer to towns. The end point of the bridge was well considered among several alternative alignments and the one with least impact on villages was selected. Impacts on the river flow during the construction period will be well considered and specific construction method will be employed to minimize the disturbance.
4	<ul style="list-style-type: none"> Do not have full information about project affected persons and would like to have clarification about the alignment. Fair and timely compensation shall be paid to the affected people. 	<ul style="list-style-type: none"> Clarification about the alignment will be explained, and affected persons will be identified during census survey. Amount of compensation will be determined based on market value. The consideration will be given to avoid the delay of payment.
5	<ul style="list-style-type: none"> Concern that construction activities could damage their crops. 	<ul style="list-style-type: none"> The land acquisition will be completed before the construction so no damage to crops are expected during construction work.

No.	Comments	Answers
	<ul style="list-style-type: none"> • Compensation shall be paid for standing crops if the land will be acquired before harvesting. • Ensure that individuals and groups have opportunities to participate in the construction of the bridge. 	<ul style="list-style-type: none"> • Standing crops will be subject to compensation. • Mechanism to give preference of employing affected people and local people on construction works will be considered.

Source: JICA Study Team

Starting and ending points, which were pointed out in the stakeholder meetings are as shown in the map below. As for the starting point, the suggested location is the connection point to the proposed NH-27. Final alignment was decided to connect to NH-27 without connecting existing roads which was originally planned. The point mentioned for the ending point is the location where a new bridge was recently built. However, it was explained that it is more reasonable to connect to the existing road, considering the better connectivity.



Source: JICA Study Team

Figure 8-1: Starting location mentioned in the meeting



Source: JICA Study Team

Figure 8-2: Ending location mentioned in the meeting

(3) Focus Group Discussion

In order to understand the issues from women's perspective and concerns from boat operators and fishermen, three focus group discussions were carried out. Participants in the meetings were women in surrounding villages, boat operators from boat operators association, and fishermen in the target area.

The main points explained and discussed in the meetings were as follows.

- 1) Outline and Purpose of the Project
- 2) Recommended alignment
- 3) Anticipated positive and negative impacts from the project
- 4) Socio-economic status of the concerned groups

The details are shown below.

Table 8-5: Location and Dates of Focus Group Discussions

No.	Date	Location	Total	Male	Female	From Char	Coverage
1	26/10/2016 @10.00	M.E. School, Adabari Chomor, Dhubri	9	0	9	2	Womens group
2	26/10/2016 @14.00	Panchu Ghat, Dhubri	13	13	0	7	Boat operators
3	30/06/2017 @10.00	M.E. School, Adabari Chomor, Dhubri	50	50	0	18	Fishermen

Source: JICA Study Team

Table 8-6: Topics in Focus Group Discussions

No.	Comment	Response
1	<ul style="list-style-type: none"> • Amount of compensation for land acquisition and resettlement shall be sufficient for the family, even during the transition period. • Payment shall be made on time. • Preference shall be given to women to be employed in the construction work. 	<ul style="list-style-type: none"> • Amount of compensation will be calculated considering that the affected people will be able to retain their livelihood after the project. • The process will be considered to coordinate with NHIDCL, DC, etc. that payment will not be delayed. • Equal employment opportunities will be sought for women to engage in construction work taking into account their needs, competence and social situations in the area.
2	<ul style="list-style-type: none"> • Preference shall be given to boat operators for construction work. • Request assistance for alternative employments (road transport etc.) after completion of the bridge construction. • Request some form of livelihood programs. 	<ul style="list-style-type: none"> • Mechanism to give preference of employing affected people on construction works will be considered. • Boat operation service to Char lands will continue and demand for the movement of goods and people may increase. Regarding the loss of business opportunities, in addition to the construction work during construction periods, an adequate income restoration program will be considered with input from boat operator communities.
3	<ul style="list-style-type: none"> • Whether the fishing activity will be affected by the project and the impact on the volume of catches expected during the construction stage. 	<ul style="list-style-type: none"> • During the construction work, vibration may have some impact on fish at the location of pier construction. However, vibration it expected during the construction (day-time) and long-term impact is

No.	Comment	Response
	<ul style="list-style-type: none"> If there are employment opportunities in the project, people will be very much interested. 	<p>not anticipated. In case catch volume is impacted, employment options will be provided for fishermen to engage in construction works.</p> <ul style="list-style-type: none"> Mechanism to give preference of employing affected people on construction work will be considered.

Source: JICA Study Team

8.2 2nd Round Consultation

The purpose of second round stakeholder meetings was to inform the results of EIA, and explain anticipated impacts as well as mitigation measures to confirm the consent from stakeholders.

Main discussion points are as follows.

- 1) Outline and objective of the project
- 2) Reason of recommended alignment
- 3) Result of Environmental Assessment (anticipated positive and negative impacts)
- 4) Mitigation measures and monitoring plan

As for RAP, the result of the census survey and compensation policy, as well as rehabilitation and income restoration program were explained to gain consent from PAPs.

Main discussion items are as follows.

- 1) Scale of impact based on result of census survey
- 2) Compensation policy
- 3) Rehabilitation and income restoration program

Information disclosure for the 2nd stakeholder meeting was carried out by visiting land acquisition officers, publishing in a local newspaper, and distributing pamphlets through village chiefs and local consultants (Enviro Infra Solutions Pvt. Ltd.: EIS). The participants include NHIDCL, DPR consultant (AECOM), land acquisition officers from each DC offices, village chiefs, villagers including PAPs, boat operators, fishermen, etc. Assamese and Bengali were used in meetings which are the common languages in the target area.

Summary of the meetings is shown in the table below.

Table 8-7: Details of the Second Round Consultation Meetings

No.	Date	Location	Total	Male	Female	From Char	Coverage
1	2017/7/4 @11:00	M.E. School, Chagalchora II, Dhubri	121	113	8	47	Adabari Part-II, Airanjangla Part-I&II, Bhassanir char Part-I, Chagal chora Part-I&II&III
2	2017/7/4 @15:00	Boat operator office, Jogmaya ghat, Dhubri	56	53	3	18	Kathiar Alga, Bauskata Part-IV&VI, Basir Char, Aminerchar, Chaiter Chor Part-I

No.	Date	Location	Total	Male	Female	From Char	Coverage
3	2017/7/5 @11:00	Phulbari Youth Club, Phulbari	100	94	6	34	Phulbari, Baladoba, Bauskata, Saboratory, Chaiter Chor Part-I, Hatsingwari
4	2017/7/5 @14:00	M.V. School, Bororawatre part-I, Dhubri	28	16	12	21	Bororawatre Part-I&II

Source: JICA Study Team

Table 8-8: Participation Details of the Second Round Consultations

No.	Comment	Answer
1	<ul style="list-style-type: none"> What kind of compensation and assistance will be provided to agriculture labourers? How will the rate for land be calculated? What will be the process of land acquisition and how to identify the land owner? If the new owner's name is not listed, will they get compensation? Will non-title holders get compensation for land, structure and employment opportunities? Are there employment opportunities for graduate students? 	<ul style="list-style-type: none"> Agriculture labours will get at least minimum wage of 200 days. Employment opportunities will also be provided during construction and will be entitled to get training for business opportunity Rate of the land will be calculated as per the latest land revenue records in the area. First, 3A notification will be issued and field verification will be followed based on the government land record. After the 3D notification, there will be a hearing objection period before finalization. Non-title holders will get compensation for structures and standing crops, as well as are entitled for assistance. Training will be provided and possibly issue certificates for employment opportunities. For graduates, there are National Skill Development Programs where they can get special training. Even in the construction work, they may get employed in a position considering their capacity.
2	<ul style="list-style-type: none"> What kind of assistance will be provided to the boat operators and whether boat operators will get employment opportunities? One boat cost nearly Rs. 25-30 Lakh, after completion of this project there will be no use of these boats, will boat owners get any compensation? Will fisherman be affected by this project? Will fisherman get any compensation? 	<ul style="list-style-type: none"> Boat operators are also provided with opportunities to engage in construction work. During the period, vocational training opportunities will be offered to prepare for the transition to new occupations. The construction period is around six years. During this period, the boat can be used for transportation of goods and workers in addition to normal services. However, considering that usage opportunities decrease after the project, the boat will also be considered for compensation. During construction work, there will be impact on fishermen in the project area, but fishing can continue upstream and downstream of the river. Employment opportunities will be provided to fishermen during the construction work.
3	<ul style="list-style-type: none"> When and to whom will employment opportunities be offered. How should I apply? Is there any plan to develop bridge cum railway? When and how will compensation be provided? 	<ul style="list-style-type: none"> Employment opportunities will be offered to residents of the target area when construction work will be carried out. NHIDCL will contract with contractors so the application shall be submitted to the contractors. NHIDCL is considering to state in the contract that priority should be given to local employment as a condition. In this project, railway is not included in the plan.

No.	Comment	Answer
	<ul style="list-style-type: none"> • What is the market rate of the land and buildings to be decided based on? • What should I do if there is a problem with land ownership? • What kind of compensation can be taken if leasing the land and holding the building on that land? 	<ul style="list-style-type: none"> • First of all, DC will conduct a field survey and confirm the affected land, affected people and the price. After the compensation is paid to the affected people, land acquisition will start. • Market rate for the land will be based on the zonal valuation which is set by the land sale price. Buildings are also calculated at market prices. The amount will be decided based on a site investigation. • If there is a land ownership problem, DC office will be the window agency. The land ownership will be reviewed with documents and records. • There will be no compensation for the land, but structures and crops will be compensated and assistances will be provided. If you have been paying the lease fee of land for a long time, the amount after land acquisition will be refunded.
4	<ul style="list-style-type: none"> • In the case the land has been submerged and became government land in the past, can the former owner with the previous land documents claim compensation? • Do residents of affected villages have access to employment opportunities for construction work? 	<ul style="list-style-type: none"> • In principle, land that became government land will not be subject to compensation, but compensation for standing crops and financial support and support for livelihood restoration will be provided. However, during the site verification stage, the current and past land ownership will be properly reviewed. • It is assumed that employment opportunities for construction work will also be provided to residents of target villages.

Source: JICA Study Team



Source: JICA Study Team

Figure 8-3: Stakeholders/Community Meetings

CHAPTER 9 Conclusion and Recommendations

9.1 Key issues / Concerns Identified

Through the above exercise, the following key issues were identified:

- There is no Wildlife Sanctuary along the alignment or within 10 km from the project alignment.
- There is no archeological protected/protected monuments exists along the bridge alignment.
- The area represents flood plain or riparian area of river Brahmaputra between Dhubri and Phulbari and island with human habitations.
- Occurrence of Ganges River Dolphin has been reported in Brahmaputra river.
- Likely effect of land acquisition of approximately 65 Ha land & over the properties/owners and their financial loss.
- Air, Noise & Water pollution may increase during bridge construction and after increase in traffic volume in future.
- Project does not require Environmental Clearances from MoEFCC as per EIA notification 2006 and its amendments till date.
- During stake holder meeting and community survey, local people welcome the project and would like earlier implementation of the project, however asked proper and timely compensation, employment and suggestions regarding connectivity of the bridge with National Highway.

9.2 Summary of Key Benefits from the project

Availability of adequate and quality infrastructure is a pre-requisite for rapid development of any economy.

Improvement in the project road will result in the following benefits:

- Providing better level of service in terms of road connectivity between Dhubri and Phulbari.
- Faster transportation will ultimately lead to massive savings in the form of reduced wear and tear of vehicles, reduced vehicle operating costs (VOCs) and reduction in transportation costs etc.
- Introduction of additional safety measures like crash barrier, road illumination, retro-reflective boards, delineators etc. will result in lesser accidents.
- **Increased passenger comfort** due to proper road connectivity shall be an added benefit.
- It will increase access of the villages and other small settlements to urban areas, thus **providing connectivity** of rural produce to urban markets, thereby enhancing the reach and export of perishable cash crops, leading to better remuneration for the producer.
- The reach and export of perishable cash crops will have quite a positive impact and this will prove to be a boon for the rural agricultural sector.
- Providing connectivity to the urban infrastructure.
- **Rural industrial produce**, whether from Commercial industries, small-scale industries or medium-scale industries will have easy access to the urban markets.
- **Strengthening of rural economies:** The rural sector / economy are sure to get strengthened, though at a gradual pace.
- **Higher education:** Education is considered to be one of the most dominant indicators towards the development of a region. Though primary education facilities are present along the villages, access to high schools, higher secondary schools and colleges is not so easy at present. Provision of easy access to higher education can be directly linked

to the improved educational scenario.

- **Access to medical facilities:** Villages in the project region are not yet well-equipped with all types of medical facilities and services like Public Health Centres (PHCs), dispensaries, hospitals. Due to inaccessibility, reaching even the nearest health centre sometimes becomes a colossal task. Even the doctor's reluctance will be converted into willingness to visit these areas after commissioning of bridge.
- By reducing the transportation costs, it will be more feasible to transfer construction materials which are important for many economic activities (house building, school building, etc) to hinterland. This will in turn, lead to direct as well as indirect strengthening of local economies.
- During the execution of the project, i.e. during the construction period, employment will be provided to workers from the local communities.
- The educated as well as uneducated people from villages will obtain access to new employment centers.
- The proposed bridge will reduce the travel time and also very beneficial from the safety point of view and all weather movements will take place.
- Overall improved quality of life for the lesser developed areas in the neighborhood.

Value Addition

- Aesthetic enhancement
- Over bridges, raised carriageway.
- Road connectivity between Dhubri and Phulbari.
- Reduce travel time.

9.3 Recommendations/conclusion

Keeping in view the general scope for environmental as well as socio-economical parameters and most importantly sustainable environment and economic development, the following conclusions and recommendations have been drawn:

9.3.1 Recommendations

- Proposed bridge is required for overall development of the North east region as it provide connectivity to Dhubri (Assam) and Phulbari (Meghalaya).
- Proper compensation shall be paid to the PAPs as per R&R policy 2013.
- Bridge shall be properly connected at both end through National Highway.
- Mitigation measures shall be undertaken to minimize the impact on aquatic life in Brahmaputra river during construction.
- One of the major issues that surfaced during the public consultation was to generate alternate livelihood / employment program for boat owners.

9.3.2 Conclusion

The proposed bridge shall be commissioned at the earliest with minimum acquisition of agricultural land to minimize the environmental impacts along the RoW. Mitigation Measures shall be undertaken as suggested in EMP shall be implemented in true spirit to minimize the impact on aquatic life in Brahmaputra river during construction. Proper compensation shall be paid to project affected persons.

REFERENCES

- Ahmed, M.F. and Das, A., 2010. Tortoises and Turtles of Northeast India: Saving them from Extinction!.
- Ali, S. 1983. *The Book of Indian Birds*, Oxford University Press, New Delhi.
- Anonymous. 1993. *Assam Forest at a Glance*, Forest Department, Government of Assam.
- Baro, D.C. and Sharma, S., 2014. Ichthyofaunal diversity from Sonkosh river, Assam, India. *The Clarion*, 3(1), pp.18-24.
- Bhabesh Nath and D. K. Sharma. 2016. Inventorization of Chelonian species of Dhubri district of Assam. *Biolife*. 4(3), pp 498-502. doi:10.17812/blj.2016.4314
- Bhattacharjya, B.K. 2005. Ecology and fisheries of cold water resources of Assam. In: B.C. Tyagi, S. Sundar and M. Mohan (eds.) *Coldwater Fisheries Research and Development in North East Region of India*, Directorate of Coldwater Fisheries Research (ICAR), Bhimtal, pp.20-24.
- Bhattacharya, B.K., V.V. Sugunan and M. Choudhary. 2000. Threatened fishes of Assam. In: A.G. Ponniah and U.K. Sarkar (eds.) *Fish Biodiversity of North East India*. NATP Pub.02, ICAR-National Bureau of Fish Genetic Resources, Lucknow, pp.75-79.
- Bhattacharjya, B.K., U. Bhaumik & A. P. Sharma. 2017. Fish habitat and fisheries of Brahmaputra River in Assam, India, *Aquatic Ecosystem Health & Management*, 20:1-2, 102-115
- Boruah, S. and S.P. Biswas. 2002. Ecohydrology and fisheries of the upper Brahmaputra basin. *Environmentalist* 22: 119-131.
- CAMP. 1998. *Report of the Workshop on Conservation Assessment and Management Plan for Freshwater Fishes of India*, Sept. 22-26, 1997, Zoo Outreach Organization, IUCN, Coimbatore and National Bureau of Fish Genetic Resources, Lucknow, 156p.
- Champion, H.G. and S.K. Seth. 1968. *A Revised Survey of Forest Types of India*, Govt. Press, Dehradun.
- Choudhary, M. and B.K. Bhattacharya. 2005. Ecology and fisheries of hill stream of north east India: An overview. In: K.K. Vass, S.A.H. Abidi and V.P. Agarwal (eds.) *Proceedings of National Seminar on Aquatic Resource Management in Hills*, ICAR-National Research Centre on Coldwater Fisheries, Bhimtal and Society of Bioscience, Muzaffarnagar, U.P., pp.29-37.
- CPCB. 2015. *River Stretches for Restoration of Water Quality*, MINARS/37/2014-15, Central Pollution Control Board, New Delhi.
- Dabadghao, P.M. and K.A. Shankar Narayan. 1972. *The Grasscover of India*, ICAR, New Delhi.
- Das, A. N. 2016. Avian Diversity in an Around Dhir Beel in Dhubri District of Assam. *Asian Resonance* 5(4):1-5.
- Das, K.C. & A. Gupta. 2011. Site records of softshell turtles (Chelonia: Trionychidae) from Barak Valley, Assam, northeastern India. *Journal of Threatened Taxa* 3(4): 1722-1726.
- Datta, S., J.M. Datta and M.P. Phukan (eds). 1998. *Chakrashila Wildlife Sanctuary-A Documentation of its Biodiversity*, Nature's Beckon, Dhubri, 45p.
- Datta, S. 1995. *Birds of Dhubri District: A Checklist with Triplist*, Nature's Beckon, Dhubri.
- Gaurab Jyoti Kalita, Swapna Devi Ray. 2015. Studies on the diversity and habitat preference of odonates in Deepor Beel Bird Sanctuary, Kamrup, Assam. *Journal of Entomology and Zoology Studies*; 3 (2): 278-285
- Ghosh, A.K. 1994. *The Red Data Bank of Indian Animals*, Zoological Survey of India, Kolkata.
- Goswami, U.C., W. Vishwanath, K.C. Jayaram and J.S. Datta Munshi. 2007. Fish Fauna of north east India: Natural and anthropogenic hazards. In: U.C. Goswami (ed.) *Natural and Anthropogenic Hazards on Fish and Fisheries*, Narendra Publishing House, Delhi, pp.21-46.
- IUCN. 2014. *The IUCN Red List of "Threatened Species"*, Version 2015.2. <www.iucnredlist.org>.
- Jyotismita Das and Saikia PK. 2011. Species diversity of water birds in Deepor Beel, Assam. *Journal of research in Biology* 5: 363-369.
- Khatun, M., Ali, A & Sarma, S. 2014. Population fluctuation at Indian Flying Fox (Pteropus

- giganteus) colonies in the Kacharighat Roosting Site of Dhubri district of Assam. *Int. J. Pure App. Biosci.* 2 (4): 184-188
- Kour, S.B. and Sharma, D.K., 2016. Conservation status of *Varanus bengalensis* in Kokrajhar district of Assam, India. *International Journal of Fauna and Biological Studies* 3(3): 42-44
- MoEF and ZSI.2011.*Critically Endangered Animal Species of India*, Ministry of Environment and Forests(GOI),New Delhi and Zoological Survey of India, Kolkata.
- Narasimmarajan, K., Chetri, D., Ri, C. and Mathai, M.T., 2013. Bird Species of Conservation Concern along the Brahmaputra River in Assam, Northeast India. Journal homepage: www.wesca.net, 8(2).
- Nayer, M.P. and A.K.Sastry(eds.).1987,*Red Data Book of Indian Plants*, Vol I, Botanical Survey of India, Kolkata.
- Nayer,M.P. and A.K. Sastry.(eds).1988. *Red Data Bank of Indian Plants, Vol II*, Botanical Survey of India, Kolkata.
- Nayer,M.P. and A.K. Sastry.(eds.).1990. *Red Data Bank of Indian Plants,Vol.III*,Botanical Survey of India, Kolkata.
- Negi, P.S. and P.K. Hazra.2007.Alien flora of Doon valley. *Current Science* 92(7):968-978.
- Paul, M.G. and Ali, A., 2013. Ichthyofaunal Resources Of Dhubri District Of Assam, India. *International Journal of Innovative Research and Development*, 2(10): 224-226.
- Phukan,M.P.2006.*Banabani*, Year 2005-2006,Nature's Beckon,Dhubri.
- Sharma, D,A.K. Singh and M.S. Akhtar.2016.*Mahseer in India;Resources,Breeding,Propagation, Consevation, Policies and Issues*, ICAR-Directorate of Coldwater Fisheries Research,Bhimal,168p.
- Singh,A.2011. Exotic flora of Banaras Hindu University main campus,India. *Journal of Ecology and the Natural Environment* 3(10):337-343.
- Tikadar,B.K.1983.*Threatened Animals of India*, Zoological Survey of India, Kolkata.
- Tomar,A.H.Singh and V.Singh.2008.Exotic element in the flora of Bagpat District. *Indian Journal of Forestry* 31(3):463-471.
- Sarma, D., Das, J., Bhattacharyya, R.C. and Dutta, A., 2012. Ichthyofaunal diversity of lower reaches of the Brahmaputra River, Assam. *International Journal of Applied Biology and Pharmaceutical Technology* 3(2): 126-130.
- Sengupta, S., Hussain, B., Gogoi, J., Choudhury, P.K., Kalita, J. and Baruah, B.K., 2010. Amphibians of some protected landscape of Assam, Northeastern India. *Hamadryad*, 35(1), pp.28-36.
- Sinha, A., Talukdar, S., Das, G.C., Sarma, P.K., & Singha ,H., 2015. Diversity of winter avifauna in Dheer beel, Assam, India. *Indian BIRDS*. 10 (3&4): 99–103.
- Sinha, R.K., Kedia, D.K. and Kumari, A., 2014. Overview of higher vertebrates in the Ganges-Brahmaputra-Meghna River Basin: their status, threats and conservation. In *Rivers for Life- Proceedings of the International symposium on River Biodiversity: Ganges-Brahmaputra-Meghna River system* (pp. 105-123). *Ecosystems for life, A Bangladesh-India Initiative*, IUCN, International Union for Conservation of Nature: Delhi, India.

添付資料-7

RAP (Resettlement Action Plan, 住民移転実施計画)

**MINISTRY OF ROAD TRANSPORT AND HIGHWAYS
NATIONAL HIGHWAY AND INFRASTRUCTURE
DEVELOPMENT CORPORATION**

**PREPARATORY STUDY FOR NORTH EAST ROAD NETWORK
CONNECTIVITY IMPROVEMENT PROJECT (PHASE-2)**

RESETTLEMENT ACTION PLAN

February 2018

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

PADECO CO. LTD.

NIPPON ENGINEERING CONSULTANTS CO., LTD.

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Table of Contents

EXECUTIVE SUMMARY	vi
CHAPTER 1 Introduction	1
1.1 Background	1
1.1 Project Background	1
1.2 Project Proponent	1
1.3 Description of the Project.....	1
1.4 Necessity of the RAP	3
1.5 Project Component and Area.....	3
1.6 Scope of Work	3
1.7 Minimization of Resettlement.....	4
CHAPTER 2 Policy and Legal Framework	6
2.1 Legal Framework for Land Acquisition and Resettlement.....	6
2.1.1 Acts / Policies / Notifications for Land Acquisition and Resettlement	6
2.1.2 Main Laws and Provisions Applicable for the Project	6
2.1.3 Applicable Acts and Guidelines	10
2.1.4 Key Gap between Indian Acts and JICA Guidelines Applied to This Project	11
CHAPTER 3 Baseline Data of the Project Area	16
3.1 Socio-economic Environment	16
3.1.1 Assam State	16
3.1.2 Meghalaya State	20
CHAPTER 4 Survey Result of the Project Area	24
4.1 Methodology	24
4.2 Census Survey	25
4.3 Asset and Land Survey.....	28
4.4 Livelihood Survey	31
CHAPTER 5 Stakeholders Consultation.....	34
5.1 1 st Round Consultation	34
5.2 Community Meeting	35
5.3 Focus Group Discussion.....	37
5.4 2 nd Round Consultation	39
CHAPTER 6 Resettlement and Rehabilitation Policy	43
6.1 Cut-off-date	43
6.2 Eligibility.....	43
6.3 Compensation Policy.....	43
6.4 Income Restoration Program.....	44

CHAPTER 7 Grievance Redress Mechanism	48
CHAPTER 8 Institutional arrangement.....	50
CHAPTER 9 Resettlement Schedule	52
9.1 Preparation phase	52
9.2 Implementation phase	52
9.3 Monitoring phase.....	52
CHAPTER 10 Resettlement Budget.....	54
CHAPTER 11 Monitoring and Evaluation	55
11.1 Internal Monitoring	55
11.2 External Monitoring	56
11.3 Stakeholder Consultation	57
ANNEX.....	58
Annex 1: TOR for RAP Implementation Agency.....	58
Annex 2: TOR for External Monitoring Agency.....	62

Figures

Figure 1-1: Photos of Affected Area.....	2
Figure 1-2: Change of Starting Point of Dhubri-Phulbari Bridge Approach Road	5
Figure 3-1: Map of Assam State.....	17
Figure 3-2: Map of West Garo Hills District.....	21
Figure 5-1: Starting location mentioned in the meeting.....	37
Figure 5-2: Ending location mentioned in the meeting.....	37
Figure 5-3: Stakeholders/Community Meetings	42
Figure 7-1: Grievance Redress Mechanism	49
Figure 8-1: Institutional Arrangements for RAP Implementation.....	51
Figure 8-2: Support Arrangement for RAP Implementation.....	51

Tables

Table 1-1: Project Component and Area	3
Table 1-2: Alternatives of Initial Design	4
Table 2-1: Acts / Policies / Notifications & Their Relevance to the Project	6
Table 2-2: Land Acquisition Procedure in Assam	10
Table 2-3: Land Acquisition Procedure in Meghalaya	11
Table 2-4: Key Gap between JICA and Indian Regulations.....	12
Table 3-1: Demographics of Assam State and Districts in the Project Site.....	18
Table 3-2: Scheduled Caste and Scheduled Tribe in Assam State.....	18
Table 3-3: Economic Trend in Assam State	19
Table 3-4: Workers Ratio in Assam State.....	19
Table 3-5: Demographics of Char Area in Dhubri / South Salmara-Mankachar district.....	19
Table 3-6: Demographic Situation of Meghalaya State	21
Table 3-7: Population Ratio of Scheduled Caste and Scheduled Tribes	22
Table 3-8: Economic Trend of Meghalaya State.....	22
Table 3-9: Workers Composition in Meghalaya State.....	23
Table 4-1: List of Surveyed Villages and Land Pieces.....	24
Table 4-2: Summary of the Survey.....	25
Table 4-3: Number of PAH and PAP	25
Table 4-4: Village wise PAHs and PAPs	26
Table 4-5: Movement of Location.....	26
Table 4-6: Socio-Demographic profile.....	27
Table 4-7: Composition of Affected Households	27
Table 4-8: Religious Composition.....	27
Table 4-9: Classification of Titleholders and Non-titleholders	28
Table 4-10: Land ownership status of PAHs	28
Table 4-11: Legal status of PAHs of each construction section	29
Table 4-12: Loss of Land by Usage and Number of PAH/PAPs	29
Table 4-13: Loss of Land by District and Usage.....	29
Table 4-14: Severeness of Land Impact	29
Table 4-15: Loss of Private Structures in the Project.....	30
Table 4-16: Type of Affected Private Structures	30
Table 4-17: Affected Trees	30
Table 4-18: Crops Cultivated by PAHs	31
Table 4-19: Education Level of PAPs	31
Table 4-20: Literacy Rate of PAPs	32
Table 4-21: Occupation	32
Table 4-22: Total Monthly Household Income (Rs/Month).....	32
Table 4-23: Vulnerability.....	33

Table 5-1: Location and Dates of Stakeholder meetings.....	34
Table 5-2: Discussion in Stakeholder Meetings.....	34
Table 5-3: Location and Dates of Community meeting.....	35
Table 5-4: Discussion in Community meetings.....	36
Table 5-5: Location and Dates of Focus Group Discussions.....	38
Table 5-6: Topics in Focus Group Discussions.....	38
Table 5-7: Details of the Second Round Consultation Meetings.....	39
Table 5-8: Participation Details of the Second Round Consultations.....	40
Table 6-1: Entitlement Matrix.....	46
Table 8-1: Implementation Institute and Their Roles.....	50
Table 9-1: Resettlement Schedule.....	53
Table 10-1: R&R Budget.....	54
Table 11-1: Internal Monitoring Form.....	55
Table 11-2: External Monitoring Form.....	56

List of Abbreviations and Acronyms

ADC	Autonomous District Council
DC	Deputy Commissioner
EA	Executing Agency
GHG	Green House Gas
GRC	Grievance Redressal Committee
GRM	Grievance Redressal Mechanism
LAO	Land Acquisition Officer
KVK	Krishi Vigyan Kendras
MIG	Meghalaya Institute of Governance
NOC	No Objection Certificate
NGO	Non-Governmental Organization
PAH	Project Affected Household
PAP	Project Affected People
PIU	Project Implementation Unit
PWD	Provincial Works Department
RAP	Resettlement Action Plan
ROW	Right of Way
SC	Scheduled Caste
SIA	Social Impact Assessment
SHM	Stakeholder Meeting
ST	Scheduled Tribe
STD	Sexually Transmitted Disease

EXECUTIVE SUMMARY

1. Project Background

Ministry of Road Transport and Highways (MORT&H) has decided to construct Two / Four lane bridge including approaches over River Brahmaputra between Dhubri on North Bank via newly formed South Salmara-Mankachar district villages, and Phulbari on South Bank in the state of Assam/Meghalaya on NH-127B (Length: 20 km) on EPC Mode under JICA. Construction of Two lane/Four Lane Bridge including approaches over River Brahmaputra strengthening of National Highways. The work would be taken up for in order to have a better facility in a long continuous stretch. The Dhubri – Phulbari section of NH- 127B road is in the state of Assam/Meghalaya. The total length of this section is about 20 km.

2. Policy and Legal Framework

The legal framework and principles adopted for addressing resettlement issues in the project have been guided by the existing legislation and policies of the Government of India (GOI), the State Government of Assam and Meghalaya. Assam State follows National Highway Act 1956 for land acquisition and Assam LARR Rules 2015 as well as LARR Act 2013 for compensation procedures. Meghalaya State follows LARR Act 2013 for the land acquisition as well as compensation procedures. Prior to the preparation of the Resettlement Action Plan (RAP), a detailed analysis of the existing national and state policies was undertaken and the section below provides details of the various national and state level legislations studied and their applicability for the project. This RP is prepared based on the review and analysis of all applicable legal and policy frameworks of the country and World Bank/JICA policy requirements.

3. Baseline Data of the Project Area

Dhubri district has a population of 1,949,258 persons and population density is 896 persons per sq km significantly higher than the state average (398 persons per sq km). South Salmara-Mankachar is also highly populated district with 528,952 people and 977 persons per sq.km. Over 80% of the population in both districts are Muslims and area is primarily dependent on agriculture and fishing owing to the river Brahmaputra flows through the district. The literacy rates are low in both district, 58.34% in Dhubri and 40.0% in South Salmara-Mankachar against 72.19% of the state average.

West Garo Hills district has population density of 175 persons per sq.km and majority of population (61%) belongs to Christian community and high rate of scheduled tribes (73.7%). Phulbari village, on the other hand, has only 1.3% of schedule tribe (1.3%). The economy of West Garo Hills district is basically agrarian in nature with about 80 percent of the population dependent on agriculture and people also practice dairy farming. The literacy rate is lower (67.58%) than the state average (74.43%).

4. Survey Result of the Project Area

The affected area is a part of Dhubri on North bank, South Salmara-Mankachar, the Char areas (sandbar) in the Brahmaputra River in Assam State and also Phulbari on South bank of Brahmaputra River in Meghalaya State. Total affected households (PAHs) will be 761 majority of which belong to Muslim religion. Out of 761 PAHs, there are 45 women headed households. Majority of them are illiterate and almost all the PAHs are dependent on agriculture, fishing and unskilled labour and that is the major livelihood source. Very few are running small business like grocery etc.

There will be likely impact on residential structures, commercial structures, agricultural land both irrigated and non-irrigated. Some of the identified likely PAHs will lose residential structures as well as agricultural land. Most of likely PAHs have their residential structure along with their agricultural land within bank of Brahmaputra in Assam and Jinjiram rivers in Phulbari town.

Table: Summary of Project Impacts

Sl. No.	Impacts	Number
1	Total Area of Land required (in Hectares)	94.3
2	Area of private land to be acquired (in Hectares)	56.2
3	Total number of PAHs	761
4	Total number of PAPs	3,043
5	Total number of private structures affected	273
6	Total number of physically displaced households	127
7	Total number of physically displaced persons	500

5. Stakeholders Consultation

All the affected people will be fully informed and closely consulted on resettlement and compensation options. Participation of affected people in planning and managing resettlement will reduce their fears and will give them an opportunity in key decisions that will affect their lives. It is also essential to identify stakeholders who have direct interest in project development and who will be involved in consultative process. This report elaborates the situation specific participation mechanisms. During SIA, two stakeholder meeting, four community meeting and two focus group discussion were arranged in affected area.

6. Resettlement and Rehabilitation Policy

Relocation will be considered for all the directly likely affected people by construction of Two/Four lane bridges including approaches over river Brahmaputra between Dhubri on north bank and Phulbari on south bank in the state of Assam/Meghalaya. Due to land acquisition and design of the bridge, it is not possible for the existing residential and commercial structures to stay at the same location. In this case resettlement of existing residential structures within ROW involving physical relocation of all the residential structures likely affected by the project will follow following components:

- Site selection or approval to selected site
- Relocation schedule and assistance
- Replacement of services and enterprises
- Restoration of livelihood
- Special assistance for vulnerable groups

The project will have three types of PAPs as follows. The involuntary resettlement requirements apply to all three types of displaced persons and the RP describes provision for all type of PAPs and accordingly formulated the entitlement matrix.

- (i) persons with formal legal rights to land lost in its entirety or in part;
- (ii) persons who lost the land they occupy in its entirety or in part who have no formal legal rights to such land, but who have claims to such lands that are recognized or recognizable under national laws; and

- (iii) persons who lost the land they occupy in its entirety or in part who have neither formal legal rights nor recognized or recognizable claims to such land.

7. Grievance Redress Mechanisms

In the project RP implementation there is a need for an efficient grievance redress mechanism that will assist the PAPs in resolving their queries and complaints. Therefore, formation of Grievance Redress Committee (GRC) will be most important for grievance redress and it is anticipated that most, if not all grievances, would be settled by the GRC.

8. Institutional Arrangements

For implementation of RP there will be a set of institutions involve at various levels and stages of the project. For successful implementation of the RP the proposed institutional arrangement with their role and responsibility has been outlined in this section.

9. Resettlement Schedule

The proposed land acquisition and resettlement and rehabilitation activities are divided into three broad categories; preparation phase, implementation phase and monitoring phase based on the stages of work. Details are mentioned in this section.

10. Resettlement Budget

The resettlement cost estimate for this project includes eligible compensation, resettlement assistance, and support cost for RP implementation. The support cost, which includes staffing requirement, monitoring and reporting, involvement of NGO in project implementation and other administrative expenses are part of the overall project cost. The unit cost for land and other assets in this budget has been derived through field survey, consultation with affected families, relevant local authorities, and reference from old practices. Contingency provisions have also been made to take into account variations from this estimate. Based on the survey, the resettlement budget comes out to be Rs. 51,82,50,000.

CHAPTER 1 Introduction

1.1 Background

1.1 Project Background

Ministry of Road Transport and Highways (MORT&H), has decided to construct Two / Four lane bridge including approaches over River Brahmaputra between Dhubri on North Bank via newly formed South Salmara-Mankachar district villages, and Phulbari on South Bank in the state of Assam/Meghalaya (Length: 20 km) on EPC Mode under JICA. Construction of Two lane/Four Lane Bridge including approaches over River Brahmaputra strengthening of National Highways. The work would be taken up for in order to have a better facility in a long continuous stretch. The Dhubri – Phulbari section of NH- 127B road is in the state of Assam/Meghalaya. The total length of this section is about 20 km.

1.2 Project Proponent

The project proponent is Ministry of Road Transport and Highways (MORT&H) / National Highways and Infrastructure Development Corporation (NHIDCL) having its headquarters address at Parivahan Bhavan, 1, Parliament Street, New Delhi entrusted AECOM Asia Company Limited having its registered office at 9/F, Infinity Tower C,DLF Cyber city, DLF Phase 2, Gurgaon, Haryana for the preparation of EIA, SIA & RAP for proposed of Two / Four lane bridge including approaches over River Brahmaputra between Dhubri on North Bank and Phulbari on South Bank in the state of Assam/Meghalaya on NH-127B (Length: 20km).

1.3 Description of the Project

The proposed project is the construction of Two/Four lane bridges including approaches over River Brahmaputra between Dhubri on North Bank via and Phulbari on South Bank in the state of Assam/Meghalaya on NH-127B (Length: 20km) on EPC Mode under JICA.

The proposed project is transverse at 89°58'16.99"E & 26°1'34.63"N at Dhubri on North Bank and Phulbari on South bank transverse at 90°1'49.99"E & 25°52'12.03"N at an Elevation of 35 to 42 m above Sea level.

The climate along the proposed project is subtropical humid climate. The average annual rainfall in Dhubri District is 2,363 mm and 3,300 mm in West Garo District. The variation in the rainfall from year to year is not large. The climate of the district is largely controlled by South West monsoon activates from May and continues up to September-October with about 65% rainfall occurring during the monsoon. The monthly evapo-transpiration is about 40% of the rainfall, the highest in August and lowest in January. July/August is the hottest month when the maximum temperature is about 30°C. December/January is the coldest month, as the mean daily minimum temperature is recorded at 10 °C.

The likely affected area is predominantly agricultural land and settlements scatter along the proposed alignment. Photos of Affected Area are given in **Figure 1-1** below.

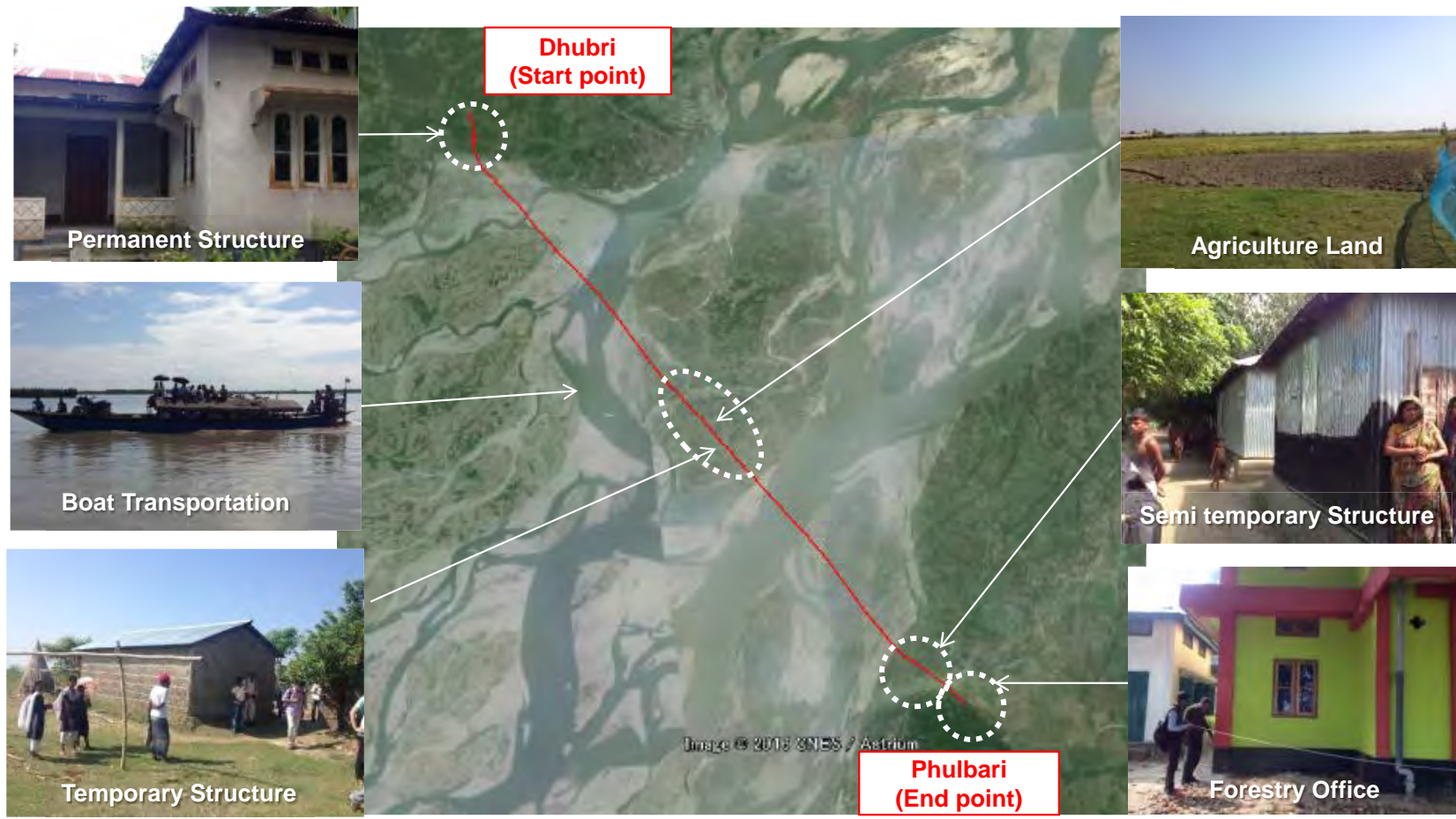


Figure 1-1: Photos of Affected Area

1.4 Necessity of the RAP

The project is a 19,282km bridge with approach road that stretches over the Bramaphtra River from the Dhubri and South Salmara-Manchakar District in Assam State, to the West Garo Hills District in Meghalaya State. The proposed alignment of this bridge will be a part of newly designated highway (NH-127B) connecting Dhubri to Phulbari. This NH-127B will continue on to connect Srirampur in Assam state and Nongstoin in Meghalaya state. The bridge will have four lanes. According to Indian standard and specification (IRC:SP:84-2014), the ROW for four lane highway is set as 60m as shown below. Thus, ROW for this project is planned as 60m.

IRC:SP:84-2014	A minimum Right of Way of 60m should be available for development of 4-lane highway. The authority would acquire the additional land required, if any.
----------------	--

This ROW along the bridge and approach road passes 18 villages in total. There are title holding and non-title holding land owners who will be affected by the land acquisition and will require involuntary resettlement. In this survey, a Resettlement Action Plan (RAP) was prepared with the assistance from district land acquisition officers and village chiefs of the target area, and the district autonomous council in the West Garo Hills in accordance with Indian laws and regulations, as well as the JICA Guideline.

1.5 Project Component and Area

The project component and area encompassing the land acquisition and resettlement will be the entire alignment of bridges, including approaches over the Brahmaputra between Dhubri and Phulbari. The Project affected area is the whole stretch of the bridge under 60m ROW which includes land and structures, such as residential and common properties.

Table 1-1: Project Component and Area

Length	19.282km
ROW	60 m (four lane)
Affected Areas	18 villages (Dhubri-13, South Salmara-Mankachar-4, West Garo Hills-1)

Source: JICA Study Team

Land use and land acquisition required during the construction work will be under the responsibility of contractors. The identification and selection of the land will be carried out with the assistance from respective DCs and in consultation with local residents. The land will be leased out or acquired at market rates. Land that is leased shall be returned in the same condition it was before the use. Those conditions will be included in the contract agreement between the contractors. The actual process should be included in the resettlement monitoring plan.

1.6 Scope of Work

(1) Legal Framework Related to the Project

The legal framework and principles adopted for the project have been guided by the existing legislation and policies of the Government of India (GOI), the State Government of Assam and Meghalaya. Since the project is considering getting assistance from JICA, the regulatory/legal framework should be consistent with the national, state, local, as well as JICA Guidelines for Environmental and Social Considerations.

(2) Scope of Resettlement

This project extends to two states, the Assam and Meghalaya states, across the Brahmaputra River. The Char lands (sand bars) in the Brahmaputra River which belong to the Assam state will also be within the scope of land acquisition and resettlement. The Char lands are unique in that the shapes change according to the changes in water level. The area of the Char lands becomes smaller due to a rise in water level during the rainy season (May to October) and expands in dry season (November to April). In this survey, a census survey was carried out based on the list of villages and land plots prepared by the district governments from the land acquisition map produced by DPR consultant (prepared in June 2016). A Resettlement Action Plan (RAP) will be prepared in accordance with relevant Indian laws and regulations, World Bank’s safeguard policy and JICA guidelines.

1.7 Minimization of Resettlement

(1) Alternatives of Initial Design

Alternatives to minimize the resettlement at the initial design stage are described in section 7.4. the following table shows social components, including land acquisition and resettlement considered in the alternative analysis. The affected structures were estimated from the site survey. Option 1, the alignment selected in DPR, is the option with minimum number of affected structures, impact on agricultural/ Char land, and area necessary for the land acquisition. The following three options were analysed in section “7.4.3 Result of the Analysis of Alternatives”.

Table 1-2: Alternatives of Initial Design

	Option 1 (DPR, recommended)	Option 2	Option 3
Structures affected (no.)	122	170	187
Agricultural land affected (km)	2.00	2.95	5.86
Built up area affected (km)	0.90	0.85	1.00
Char land affected (km)	6.30	6.70	5.10
Land to be acquired (ha)	55.20	63.00	71.76

Source: JICA Study Team based on Inception Report, July 2015 prepared by AECOM

(2) Method for Minimizing Resettlement

The original alignment was planned to connect to the existing road where residential structures are concentrated. However, in order to minimize the scale of resettlement, the connection point was changed to connect to another road upgrading project NH-27 (old NH31C); connecting to Srirampur, which is now in preparation by the Public Works Department of Assam State. The alignment was modified to bypass existing roads, and the starting point (connection point) of the bridge at Dhubri District was shifted about 300m south as indicated in Figure 7-24. Due to this shift, a number of physically displaced households were reduced and the displacement of 1 school facility was avoided.



Source: JICA Study Team

Figure 1-2: Change of Starting Point of Dhubri-Phulbari Bridge Approach Road

CHAPTER 2 Policy and Legal Framework

2.1 Legal Framework for Land Acquisition and Resettlement

2.1.1 Acts / Policies / Notifications for Land Acquisition and Resettlement

The development projects are mandated to be consistent with the existing acts and policies of the respective national, state, local governments, and also the guidelines and policies of JICA. An outline of the various acts and policies that are in place in the country are as follows:

Table 2-1: Acts / Policies / Notifications & Their Relevance to the Project

No	Acts and Policies	Relevance to the project
1	The Right to Fair Compensation and Transparency in Land Acquisition Rehabilitation and Resettlement Act, 2013	This Act came into force on 1 January, 2014, and extends to the whole of India except the state of Jammu and Kashmir. The provisions of this Act relating to land acquisition, compensation, rehabilitation and resettlement, shall apply when the appropriate government acquires land for its own use, hold and control, including for public sector undertakings and for public purposes.
2	The Assam Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2015	This Rule came into force on 31 July, 2015, and extends to the whole state of Assam. This Rule is based on the basic provision of the LARR Act (2013), and detailed descriptions covering requirement of consent, condition of compensations, etc. are provided.
3	National Highway Act 1956	It extends countrywide. If the Central Government deems any land required for the building, maintenance, management or operation of a national highway; the intension to acquire such land will be declared by notification in the official Gazette.
4	Meghalaya Transfer of Land (Regulation) Act, 1971.	It extends to the tribal areas within the state of Meghalaya. Providing the government of Meghalaya may prohibit any transfer of land by notifications issued by the competent authority under the provision of this Act. However, this act is only applicable mainly for land transfers from government to private companies or between private individuals, and is not applicable for land acquisition by public sectors.
5	Right to Information Act 2005	Provided for the citizens to have access to information under the control of public authorities, in order to promote transparency and accountability in every public authority.
6	World Bank OP 4.12 – Involuntary Resettlement	Provided that all affected lands or structures under the project, irrespective of valid certificates or legal documents, shall be supported under the project to improve their quality of life, or at least restore to pre-project standards.
7	JICA Guidelines for Environmental and Social Considerations 2010	See (3) below.

Source: JICA Study Team

2.1.2 Main Laws and Provisions Applicable for the Project

1) Right to fair compensation and Transparency in Land Acquisition, Rehabilitation, and Resettlement Act (LARR), 2013

The LARR Act (2013) was passed by the Parliament on 5 September, 2013, and came into force on 1 January, 2014, replacing the previous Land Acquisition Act (1984). The aim and objectives of this Act are:

- To ensure, in consultation with local institutions established under the Constitution, a humane, participative, informed and transparent process for land acquisition.
- To provide just and fair compensation to the families whose land has been acquired, or affected by such acquisition.
- To make adequate provisions for such affected persons, and their rehabilitation and resettlement.
- To ensure that the outcome of acquisition should be that affected persons become partners in development leading to an improvement in their post-acquisition social and economic status, and for matters connected therewith or incidental thereto.

At the beginning of the enforcement of the LARR Act (2013), the National Highway Act 1956 was included in the 13 enactments under Fourth Schedule, which exempted the application of the LARR Act (2013). However, under Order from Ministry of Road Development dated 28 August, 2015, named as “Removal of Difficulties” extended the provisions of compensation and rehabilitation & resettlement to the Fourth Schedule. The LARR Act 2013 provision will apply when:

- Government acquires land for its own use, hold and control for strategic purposes and infrastructure development
- Government acquires land with the ultimate purpose to transfer it for use of private companies for stated public purpose (including PPP projects, but excluding state or national highway projects)
- Government acquires land for immediate and declared use by private companies for public purpose

In Meghalaya, this Act was challenged on grounds that the State falls under the Sixth Schedule of the Constitution, since Land in the State belongs to individuals and not the Government. Nevertheless, the provisions of this Act relating to land acquisition, compensation, rehabilitation and resettlement, shall apply when the appropriate Government acquires land for its own use, hold and control, including for public sector undertakings, and for public purposes.

2) The Assam Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2015

The Assam Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2015 (Assam LARR Rules 2015) has been in effect since 31 July, 2015. This Rule extends to the whole state of Assam. LARR 2013 allows states to set detailed procedures and specifications based on the Act. Basic provisions of LARR 2013 applies to Assam LARR 2015, and detailed descriptions are provided including the following sections.

- Requirement of consent from the affected persons
- Update of government’s land records before the acquisition
- Details in compensation amount (multiplier, etc.)

3) National Highway Act 1956 by Ministry of Shipping, Transport and Highways

The National Highway Act (1956) extends to the whole of India where the central government deems for public purpose that land is required for the building, maintenance, management or operation of a national highway. The definition of highway includes the following.

- All lands appurtenant thereto, whether demarcated or not
- All bridges, culverts, tunnels, causeways, carriageways and other structures constructed on or across such highways
- All fences, trees, posts and boundary, furlong and milestones of such highways or any land appurtenant to such highways

The act provides the process of land acquisition for highway projects. The local government appointed by the central government will be the implementation agency for land acquisition. The amount of compensation will be calculated at market value based on the tax record of land transaction owned by the concerned agency. The final decision will be made upon confirmation from the land owner, and subsequent compensation and land acquisition will follow.

4) Right to Information Act 2005

The basic objective of the Right to Information Act is to empower the citizens, promote transparency and accountability in the workings of the Government. The Right to Information Act (2005) mandates timely response to citizen requests for government information. It was enacted on 15 June, 2005, and came into force on 12 October, 2005. The Act extends to the whole of India except Jammu and Kashmir, and is non-applicable to Intelligence and Security organizations.

5) World Bank Safeguard Policy OP 4.12 Involuntary Resettlement

The overall objectives of the Bank's policy on involuntary resettlement are that it should be avoided where feasible, or minimized, exploring all viable alternative project designs. When resettlement is not avoidable, the project should assist displaced persons to improve their livelihoods and standards of living, or at least to restore them to the prior state. It also states that displaced persons should be consulted and should have opportunities to participate in planning and implementing resettlement programs.

Definition of displaced persons in this policy is categorized as followings (including those who have no legal rights).

- Those who have formal legal rights to land (including customary and traditional rights recognized under the laws of the country);
- Those who do not have formal legal rights to land at the time the census begins, but have a claim to such land or assets, provided that such claims are recognized under the laws of the country or become recognized through a process identified in the resettlement plan;
- Those who have no recognizable legal right or claim to the land they are occupying.

This policy covers direct economic and social impacts from the projects such as (i) relocation or loss of shelter; (ii) loss of assets or access to assets; or (iii) loss of income sources or means of livelihood, irregardless if the affected persons must move to another location.

6) JICA Guidelines for Environmental and Social Considerations

The key principles of JICA policies on involuntary resettlement are summarized below.

- I. Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.
- II. When population displacement is unavoidable, effective measures to minimize the impact

and to compensate for losses should be taken.

- III. People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.
- IV. Compensation must be based on the full replacement cost as much as possible.
- V. Compensation and other kinds of assistance must be provided prior to displacement.
- VI. For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan includes elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.
- VII. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.
- VIII. Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.
- IX. Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

The above principles are complemented by World Bank OP 4.12. Since it is stated in the JICA Guideline that “JICA confirms that projects do not deviate significantly from the World Bank’s Safeguard Policies”. Additional key principles based on World Bank OP 4.12 is as follows.

- X. Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers or others who wish to take advantage of such benefits.
- XI. Eligibility of Benefits include, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who do not have formal legal rights to land at the time of census but have a claim to such land or assets, and the PAPs who have no recognizable legal right to the land they are occupying.
- XII. Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.
- XIII. Provide support for the transition period between displacement and livelihood restoration.
- XIV. Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc.

In addition to the above core principles in the JICA policy, it also laid emphasis on a detailed resettlement policy inclusive of all the above points; project specific resettlement plan; institutional framework for implementation; monitoring and evaluation mechanism; time schedule for implementation; and, detailed financial plan etc.

2.1.3 Applicable Acts and Guidelines

1) Assam State

According to the DCs of Dhubri District and South Salmara-Mankachar District of Assam State, the land acquisition process will follow the National Highway Act (1956). The compensation and resettlement procedures, including the calculation of the R&R budget, as well as the consideration of livelihood restoration programme will follow Assam LARR Rules (2015), which is based on LARR Act (2013).

The main gaps between NH Act 1956 and Assam LARR Rule 2015 in the land acquisition process are as follows.

- Implementation of SIA by the agency appointed by the district government. In practice, DRP consultants prepare SIA/RAP report together with DPR, which is in line with an international donor agency in the case of a donor funded project.
- Public consultation duration is 21 days, which is shorter than the Assam LARR 2015/LARR 2013 of 60 days.

The land acquisition procedure for this project will be as follows. The status as of 4 July, 2017, was at the draft 3A Notification stage.

Table 2-2: Land Acquisition Procedure in Assam

Procedures	Responsible Agencies
Submission of requisition for land acquisition	Project proponent
Notification of affected area (3A) (target village and land area)	District government (DC)
Hearing of objections	District government (Land acquisition officer)
Census survey for valuation	District government (Land acquisition officer)
Compensation budget calculation	District government (DC)
Preparation of R&R Scheme	District government (Land acquisition officer)
Notification of compensation (3D) (affected people, compensation amount)	District government (DC)
Hearing of objections	District government (DC)
Declaration of final award	District government (DC)
Payment of full amount of compensation	Project proponent to affected families through State and District government
Land transfer	District government (DC)
Displacement of affected families	District government (DC)

Source: JICA Study Team

2) Meghalaya State

In the West Garo Hills District of Meghalaya State, according to the DC, the LARR Act 2013 will be applied in the process of land acquisition, compensation and resettlement. However, since Meghalaya state falls under the Sixth Schedule of the Constitution, the land belongs to communities and not the government. Therefore, an additional step in the process is required to obtain a NOC (No Objection Certificate) from the district autonomous council, which is essentially the approval of the project itself before the land acquisition process.

The process for land acquisition in this project will be as follows. As of 4 July, 2017, the NOC was already obtained and undergoing SIA notification.

Table 2-3: Land Acquisition Procedure in Meghalaya

Procedures	Responsible Agencies
Submission of requisition for land acquisition	Project proponent
No objection certificate (NOC)	West Garo Hills Autonomous Council
SIA notification	District government (DC)
SIA implementation	Assigned agency (MIG)
SIA appraisal	Assigned experts group (District level)
Preliminary notification	State government
Hearing objections	District government (DC)
Compensation budget calculation	District government (DC)
Preparation of R&R Scheme	District government (DC)
Hearing of objections	District government (DC)
Declaration of final award	District government (DC)
Payment of full amount of compensation	Project proponent to affected families through State and District government
Land transfer	District government (DC) / State government
Displacement of affected families	District government (DC)

Source: JICA Study Team

2.1.4 Key Gap between Indian Acts and JICA Guidelines Applied to This Project

Table 2-4 summarizes the key differences between JICA guideline and Indian LARR Act 2013, Assam LARR Rules 2015 and NH Act 1956 relevant to this project. The recommendations for measures to fill the gaps, and policy applied for this project are also given in the table.

Table 2-4: Key Gap between JICA and Indian Regulations

SL. No.	JICA Guidelines (2010)	India LARR 2013/ Assam LARR 2015	India NH Act 1956	Gaps Identified	Proposed Gap Filling Measures
1	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	The government shall ensure minimum displacement of people, disturbance to the infrastructure, ecology and minimum adverse impact on the individuals affected. (Ch.2)	No specific provision	LARR: N/A NH: Yes	Conduct alternative analysis
2	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	When the government intends to acquire land for public purposes, it shall consult with the people concerned and carry out a Social Impact Assessment (SIA). (Ch.2)	No specific provision	LARR: N/A NH: Yes	Include an appropriate compensation and livelihood restoration policy to RAP
3	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost, must be sufficiently compensated and supported so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	RAP will be prepared based on the census survey (including compensation and livelihood restoration assistance. (Ch.4, The 2 nd Schedule)	Amount of compensation shall be determined with consideration on the damages caused by the loss of the land, change of residence, earnings, etc. (3G)	LARR: No NH: No provision for the livelihood restoration assistance	Same as above
4	Compensation must be based on the full replacement cost as much as possible. (JICA GL) Valuation and compensation for losses shall be determined by the replacement cost. (WB OP4.12 Para 10)	Amount of compensation shall be determined by the competent authority based on the market value of the land (2x the market price in urban areas and up to 4x in rural areas). Building shall also be based on the market value. Stamp duty and other fees payable for registration of the	Amount of compensation shall be determined by the competent authority based on the market value of the land (3G)	LARR: Replacement cost for land will be 2-4 times of the market price which satisfies WB guideline (land price, cost for land preparation). Likewise, replacement cost for structure will be 2 times of the market price which also satisfies WB guideline	Amount of compensation shall be determined based on the replacement cost identified through market value survey. Also, the calculation of the replacement cost should not take into account the depreciation of the assets.

SL. No.	JICA Guidelines (2010)	India LARR 2013/ Assam LARR 2015	India NH Act 1956	Gaps Identified	Proposed Gap Filling Measures
		land or house will borne by the government. (Ch.4,8, The 1 st Schedule)		(materials, transportation of materials, cost of labour and transfer tax) However, depreciation of the asset will be considered. NH: The amount determined by the competent authority may be lower than the actual market price.	
5	Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)	The Collector shall take possession of land after ensuring that full payment of compensation, rehabilitation and resettlement are paid to entitled persons (Ch.5)	The amount of compensation shall be deposited by the government before taking possession of the land. (3H)	LARR: No NH: No	N/A
6	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)	SIA report and SIA management plan will be prepared by the concerned government, and made available to local institutions in local languages (Ch.2)	Concerned government shall have newspapers publish information of the land to be acquired. (3A,3G)	LARR: No NH: No	N/A
7	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	The government shall give adequate publicity of date and venue of the public hearing, and results of discussions shall be indicated in the SIA. SIA shall be made available to local institutions. (Ch.2)	Public hearings will be conducted in two stages, intention of land acquisition and the information of land owner list and compensation amount (3A, 3C,3G)	LARR: No NH: Possibility of insufficient information disclosure	Need consideration for information disclosure. Stakeholder consultation shall be conducted with the participation of residents, and the result shall be incorporated in the project.
8	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected	Same as above	Same as above	LARR: No NH: Possibility of insufficient information disclosure	Same as above

SL. No.	JICA Guidelines (2010)	India LARR 2013/ Assam LARR 2015	India NH Act 1956	Gaps Identified	Proposed Gap Filling Measures
	people. (JICA GL)				
9	Appropriate participation of affected people must be promoted in the planning, implementation, and monitoring of resettlement action plans. (JICA GL)	Monitoring committee in the central and provincial level shall be established. Experts in the concerned field can be employed to implement the monitoring (Ch.7)	No specific provision	LARR: No NH: Yes	Establish an appropriate monitoring system to ensure participation of the community
10	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	An objection hearing will be conducted within 60 days from the date of the notification indicating the information of the land to be acquired (Ch.4)	Public hearing will be conducted after the information of land owner list and compensation amount are made available (3C,3G)	LARR: Yes NH: Yes	Establishment of grievance redress mechanism shall be mentioned in the RAP and district gov't shall be responsible for its implementation.
11	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey, preferably at the project identification stage, to prevent a subsequent influx of encroachers who wish to take advance of such benefits. (WB OP4.12 Para.6)	Affected households, land and property will be identified through site investigation (Ch.2)	Affected households, land and property will be identified through site investigation (3B)	LARR: No NH: No	N/A
12	Eligibility of benefits includes; the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets, and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15)	Title holders include those who have the legal rights and those who do not have legal rights but whose primary source of livelihood for three years prior to the acquisition of the land. (Ch.1)	Land users shall receive 10% of the amount determined by the competent authority (3G)	LARR: Non-titleholders need to be residing continuously or drawing livelihood from the affected area for a period of not less than 3 years. NH: Non-titleholders are not entitled for compensation	Recognize claims of non-titleholders (irrespective of their residing period status).

SL. No.	JICA Guidelines (2010)	India LARR 2013/ Assam LARR 2015	India NH Act 1956	Gaps Identified	Proposed Gap Filling Measures
13	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	In case of an irrigation project, land-based resettlement will be considered. SC/ST shall be provided land equivalent to the land acquired (The 2 nd Schedule)	No specific provision	LARR: No NH: Yes	If land compensation is requested, advise will be provided to the district collector to give priority for possible land compensation.
14	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6)	The government shall provide the choice of 1) suitable training for the jobs created through the project, 2) a one-time payment per affected family, 3) certain amount of monthly payment for 20 years (The 2 nd Schedule)	Amount of compensation shall be determined with consideration of the damages caused by the loss of the land, change of residence, earnings, etc.(3G)	LARR: No NH: No provision for the livelihood restoration assistance	Livelihood restoration programme shall be included in the RAP.
15	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8)	Additional assistances to vulnerable groups, SC/ST are mentioned in the provision (Ch.5, The 2 nd Schedule)	No specific provision	LARR: No NH: Yes	Vulnerable groups, SC/ST shall be identified during the census survey and special assistance shall be included in the RAP.

Source: JICA study team

CHAPTER 3 Baseline Data of the Project Area

3.1 Socio-economic Environment

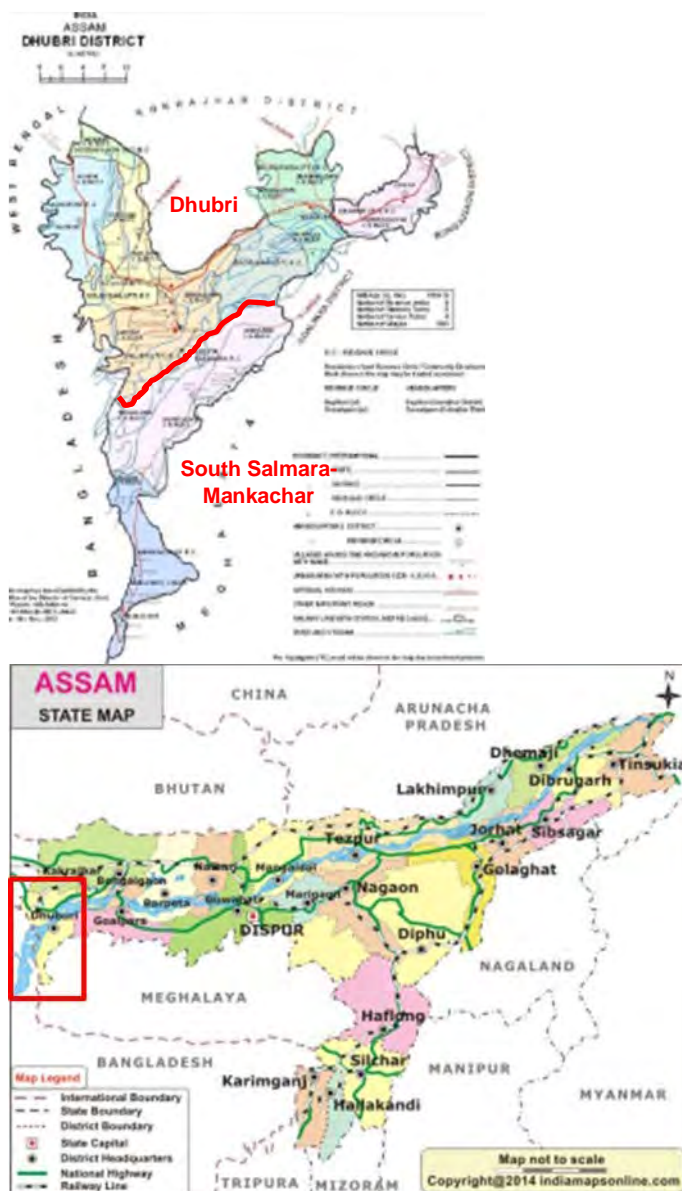
This project is located in the Dhubri District and South Salmara-Mankachar District of Assam State and the West Garo Hills District in Meghalaya State. The western end of the bridge is at Dhubri and it goes across the Brahmaputra River and ends at Phulbari in the north of West Garo Hills. There are Char lands formed in the Brahmaputra River by the sand/silt from the upper stream. This Char land also belongs to the Dhubri and South Salmara-Mankachar Districts.

3.1.1 Assam State

1) Administrative Division

Assam State is located in the northeastern part of India and is bounded on the north by Bhutan and the west by Bangladesh. The Dhubri and South Salmara-Mankachar Districts are situated in the extreme western corner of Assam State. Administratively, the Dhubri District has two sub-divisions namely Dhubri and Bilasipara along with eight revenue circles and seven tehsils. The South Salmara-Mankachar District is a newly formed district carved out from the Dhubri District in 2015 and officially became an administrative district in February 2016. It was formerly a sub-division of the Dhubri District. The South Salmara-Mankachar District has 2 revenue circles and 2 tehsils.

The distance from Dhubri town to the capital of Assam State, Dispur is approximately 290km. The distance between Hasingmari town, the capital of South Salmara-Mankachar District located across the Brahmaputra River, and Dispur is approximately 245km by the route through Meghalaya State.



Source: JICA Study Team

Figure 3-1: Map of Assam State

2) Demographic Situation

The total area of the Dhubri District is 2,176km² with the population of 1,949,258. The population density is 896 persons/km², which is more than double compared to the Assam State average (398 people/km²). The population growth during 2001-2010 is 24.4% which is much higher than the Assam State average (17.1%). The literacy rate of the Dhubri District is 58.3% which shows quite a lower rate than that of the state average (72.2%).

The South Salmara-Mankachar District covers 568km², holding a population of 555,114. Out of which, rural population consists of around 95%. The population density of the district is 869 persons/km², which is similar to the Dhubri District. The literacy rate is 39.9%, which is significantly low compared to the state average as mentioned above.

The following Table shows the demographic data of Assam State and two districts in the project sites.

Table 3-1: Demographics of Assam State and Districts in the Project Site

Item	Assam State	Dhubri District	South Salmara-Mankachar District
Area (km ²)	78,438	2,176	568
Population (no.)	31,205,576	1,949,258	555,114
Male-female ratio (no.) (1,000 men)	958	953	—
Population density (ppl/km ²)	398	896	869
Population growth rate (2001-2010)	17.1%	24.4%	—
Urban population	14.1%	10.5%	4.7%
Literacy rate	72.2%	58.3%	39.9%

Source: Census 2011

3) Ethnic Group and Religion

Assam State is home to the Assamese, Bodo and Ahom people. The official languages used in Assam State are Assamese and Bodo. Other than that, Bengali is also used in the project area which is similar to Assamese. The following Table shows the population ratio of the Scheduled Caste (SC)¹ and Scheduled Tribe (ST)². The ratio is lower in the Dhubri District and South Salmara-Mankachar District compared to the Assam state average. Based on the survey, it is confirmed that minority groups, including the Bodo tribes³, are not included in the project affected households.

Table 3-2: Scheduled Caste and Scheduled Tribe in Assam State

Item	India average	Assam State	Dhubri District	South Salmara-Mankachar District
SC population	16.2%	7.2%	3.6%	1.4%
ST population	8.2%	12.5%	0.3%	1.8%

Source: Census 2011

The Dhubri District has a large population of Muslims. Approximately 80% of the population is Muslim and the remaining 20% is Hindu. The South Salmara-Mankachar District is also Muslim dominant, composed of 95% Muslims and 5% Hindu.

4) Economy and Industry

The GSDP of Assam State in 2013-14 accounts for Rs. 885.4 billion and per capita GSDP is Rs. 50,558. The average annual growth rate during the past 10 years was approximately 6%. Industry wise ratio of GSDP in 2013-14 shows that service sector accounts for 60%, agriculture and industry sector shares 20% respectively. The shares of the agriculture and industry sectors have been decreasing over the past 10 years while the contribution of the service sector is increasing. Sector-wise annual growth rate is 3.8% for agriculture, 2.8% for the industry sector and growth of the service sector is the highest at 10.3%.

¹ Scheduled Caste (SC) refers to the group of people formerly known as Dalit (the lowest class in Hindu society) designated by the Indian Constitution.

² Scheduled Tribe (ST) is a group of tribes designated by the Indian Constitution who has a distinctive culture, are geographically isolated and are socio-economically lagging.

³ For a reference, the Bodo tribe is one of the tribes designated in the sixth schedule in India having its roots in Tibeto-burman languages and call themselves "Bodosa". A majority of the Bodo tribe are Hindu. The Bodo tribe continued armed conflict for their political independence, and Bodoland Autonomous Council was established in western Assam in 1993, and Bodoland Territorial Autonomous District was established in 2003.

Table 3-3: Economic Trend in Assam State

Item	2004-05	2008-09	2013-14	Annual growth (10year average)
GSDP (Rs. in billion)	534.0	640.3	885.4	6.6%
Ratio in GSDP Agriculture (%)	25.6	23.4	21.3	3.8%
Industry (%)	27.5	25.9	21.3	2.8%
Service (%)	46.9	58.1	57.5	10.3%

Note: GSDP in Constant Price (2004-05)

Source: Planning Commission, Government of India

The composition of workers shows that majority of the workers in Assam State are engaged in agriculture related work accounts for 56.2% out of which 25.6% are the landless agriculture labours. At the project site, a majority of the population is cultivating paddies along with pulses and vegetables, in the Char land jute is also one of the major crops. In this area, animal husbandry, fishery and boat operation are also the income source for the population.

Table 3-4: Workers Ratio in Assam State

Item	Assam State	Dhubi District
Worker population (%)	38.4	34.4
Cultivator (%)	33.9	30.7
Agriculture worker (%)	15.4	25.6
Domestic worker (%)	4.1	4.2
Other worker (%)	46.6	39.7

Source: Directorate of Census Operations Assam, 2011

5) Char Lands

One of the peculiar features of the Brahmaputra River which flows in Assam State is the presence of riverine silt islands (the Char lands). The geographical spread of the Char lands is over 14 districts of Assam State and the major part of the project area falls under these Char lands.

The landform of the Char lands changes according to the erosion and deposition of silts and sands over the years. The areas also change in size and shape due to the changes of water level in the rainy season (May to October) and dry season (November to April). The origin of the populations in the Char lands dates back to the colonial period when the British administrators induced a large number of agriculture labours from East Bengal (former Bangladesh). Due to this historical background, the majority of the population in the Char lands is Muslim.

The official surveys focused on the Char lands were carried out in 1992-93 and 2003-04. According to the survey in 2003-04⁴, the total population of the Char lands is 2,490,097 and the population in Dhubri and the South Salmara-Mankachar District alone (former the Dhubri District) is 689,909. The result of those surveys shows that the Char lands represents one of the most backwards areas in the state showing high population growth, high poverty level and a low literacy rate. The population of Below Poverty Line (BPL) is 69% and a literacy level is 14.6%; both of which have worsened in 10 years.

Table 3-5: Demographics of Char Area in Dhubri / South Salmara-Mankachar district

Year	Population	Population Growth	Household	BPL Household	Literacy
1992-93	233,206	—	—	54.2%	19.1%
2003-04	689,909	51.1%	109,748	69.0%	14.6%

Source: Socio-Economic Survey Report, 2003-04, Directorate of Char Areas Development, Govt. of Assam

⁴ Socio-Economic Survey Report, 2003-04, Directorate of Char Areas Development, Govt. of Assam.

In some areas, there are land registration records and private lands are allocated to villagers in the Char lands. However, the villagers in the Char lands are living in movable temporary structures so that they're able to shift their locations as necessary. Based on the interview survey conducted during the site visits, villagers who live on the land that will be under water during the rainy season will move their location to a neighboring area or other village in the Char land. During the dry season, some come back to the original place and others continue to stay in the shifted land.



Temporary residents in the Char Land



Erosion of the Char Land

In terms of basic amenities in the villages of the Char lands, hand pumps are introduced in some areas and some areas are sourcing the drinking water from the river. In a majority of the areas, electricity and sewage systems are unavailable. Lower primary and middle schools are established in the villages, however for higher education, the children must go to nearby towns. Medical sub-centres were provided in some areas, however, there are only visiting doctors available. The infrastructures and facilities are very much limited in those areas.



Hand pump in Char land

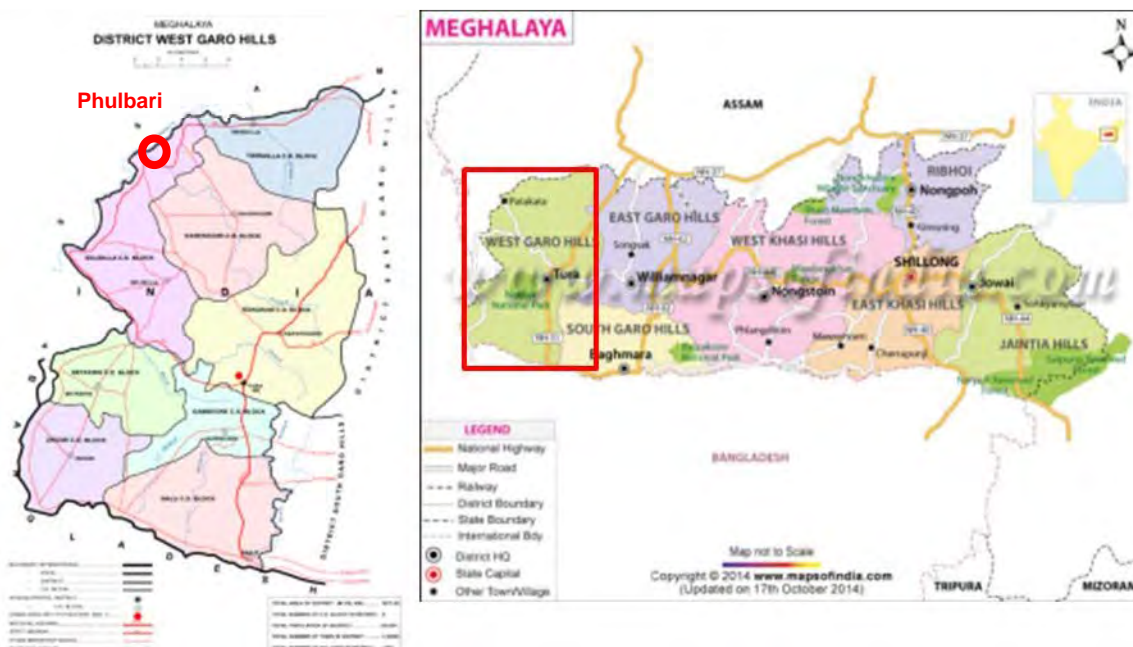


Primary School in Char land

3.1.2 Meghalaya State

1) Administrative Division

Meghalaya State was a part of Assam State before 1970. It was founded as autonomous state in April 1970 and gained its status as an independent State in January 1972. The State shares the border with Assam State in the north and Bangladesh in the south and west. It is composed of 11 Districts. The West Garo Hills District is situated in the western corner of Meghalaya State. The state's capital, Tura, holds the second largest population in the State. The Phulbari village, at the end of the bridge, is located at the north end of the West Garo Hills District. The distance from Phulbari to Tura is approximately 80km, however, due to poor road conditions, it will take 3-4 hours to travel the distance by car.



Source: JICA Study Team

Figure 3-2: Map of West Garo Hills District

2) Demographic Situation

Total area of the West Garo Hills District is 1,650km², which is 7.4% of the total area of Meghalaya State. The district holds a population of 642,923, which is approximately 20% of the state population. The population growth rate of 2001-2010 was 26.7%, which is slightly lower than the state average (28.0%). The literacy rate of the West Garo Hills District is 67.6%, which is lower than the state average of 74.4%. The following Table shows the demographic situation of Meghalaya State and the West Garo Hills District.

Table 3-6: Demographic Situation of Meghalaya State

Item	Meghalaya State	West Garo Hills District
Area (km ²)	22,429	1,650
Population (no.)	2,966,889	642,923
Male-female ratio (no.) (1,000 men)	28.0%	26.7%
Population density (ppl/km ²)	132	173
Population growth rate (2001-2010)	20.0%	11.6%
Urban population	74.4%	67.6%

Source: Census 2011

3) Ethnic Group and Religion

The main tribes in Meghalaya State are Kashi, Garo and Jaintia who reside in the hills of a different area. The official languages in the state are Kashi, Garo and English. Around the project area, Garo tribes are dominant in the hill area. However, since the end of the bridge locates at the border of Assam State and it is plain area along the Brahmaputra River, Muslims are the main residents. Therefore, the common language used in the project area is Bangali.

Meghalaya State holds large populations of Scheduled Tribe (ST) which is a common feature of the states in North Eastern India. The population of ST in Meghalaya State is 86.2% while Scheduled Caste (SC) population is 0.6%, which is significantly low compared to the Indian average. In the case of the West Garo Hills District, ST accounts for 73.7%, out of which 71.2%

is the Garo tribe. However, as described above, Garos are not included in the project affected people.

Table 3-7: Population Ratio of Scheduled Caste and Scheduled Tribes

Item	Phulbari Village	West Garo Hills District	Meghalaya State	India (average)
SC population (%)	11.2%	1.4%	0.6%	16.2%
ST population (%)	1.3%	73.7%	86.2%	8.2%

Source: Census 2011

Owing to the propagation of Christianity under the English colonial era, majority of the population in Meghalaya State is Christians. In the West Garo Hills District, 61% is Christian, 19% is Hindu, 17% is Muslim and other religions such as Buddhist and Shikh constitute 4%.

4) Economy and Industry

The GSDP of Meghalaya State in the 2013-14 accounts for Rs. 65.6 billion and the annual average growth rate in the past 10 years is 10.5%. The industry wise contribution to GSDP in 2013-14 shows that the service sector accounts for 54.1%, industry sector 31.4% and agriculture sector 14.6%. The trend over 10 years demonstrates that the contribution of agriculture sector in GSDP is decreasing while the ratio of the service and industry sectors is increasing.

Table 3-8: Economic Trend of Meghalaya State

Item	2004-05	2008-09	2013-14	Annual growth (10-year average)
GSDP (Rs. in billion)	65.6	90.0	134.7	10.5%
Ratio in GSDP Agriculture (%)	23.3%	18.6%	14.6%	2.9%
Industry (%)	26.1%	30.1%	31.4%	14.6%
Service (%)	50.6%	55.6%	54.1%	11.9%

Note: GDP in Constant Price (2004-05)

Source: Planning Commission, Government of India

The composition of the working population in the West Garo Hills District is 39.8%, which is almost the same as Meghalaya the state average. 62.8% of the workers are engaged in agriculture related work. The agriculture in the West Garo Hills District is predominantly paddy cultivation and animal rearing is the secondary occupation in the area.

Table 3-9: Workers Composition in Meghalaya State

Item	Meghalaya State	West Garo Hills District
Worker population (%)	40.0	39.8
Cultivator (%)	41.7	47.2
Agriculture worker (%)	16.7	15.5
Domestic worker (%)	1.7	3.0
Other worker (%)	39.8	34.3

Source: Directorate of Census Operations Meghalaya, 2011

Since the project area is located at the north western end of Meghalaya state and is distant from the major cities, transportation infrastructures are not properly maintained and economic activities in this area are limited.

CHAPTER 4 Survey Result of the Project Area

4.1 Methodology

The census survey was carried out along the proposed alignment to understand the impact of land acquisition and scale of resettlement from this project. In this survey, questionnaire sheets were used to develop the profiles of Project Affected Households (PAHs) and to prepare an inventory of the affected assets including land and structures. The components of the survey include a population census, asset survey and livelihood survey, and estimate budget for compensation and assistance for rehabilitation as well as livelihood restoration. Duration and target of the census survey is as follows.

- Duration: November 2016 to February 2017
- Target: PAHs whose structure (residential, shops, etc.) and/or land (agricultural, residential, etc.) will be affected

The census survey used the list of villages and land plots under the alignment produced by land acquisition officers in Dhubri and South Salmara-Mankachar Districts based on the land acquisition map produced by DPR consultant (AECOM). The list of land plots indicates land owners, land types and land areas. Since a similar list has not been prepared for the West Garo Hills District, likely PAHs were identified via map and site observation.

Although the survey aimed to cover all the affected areas, 31.4% of the total land plots remained un-surveyed, since the owners could not be identified during the course of the survey period. In the census survey, the survey team sought assistance from village heads and villagers to inform the land owners prior to and during the survey, the owners were contacted by phone calls from relatives and neighbors.

Table 4-1 shows the list of villages, number of plots under the alignment and number of plots un-surveyed. The section marked in gray are the villages in the Char lands.

Table 4-1: List of Surveyed Villages and Land Pieces

District		Village	No. of Dag under alignment	No. of Dag not surveyed
Dhubri	1	Adabari Part-II	62	25
	2	Chagal chora Part-I	19	5
	3	Chagal chora Part-II	67	24
	4	Chagal chora Part-III	70	24
	5	Airanjangla Part-I	85	20
	6	Airanjangle Part-II	80	17
	7	Bhassanir char Part-I	41	14
	8	Kathiar Alga	66	14
	9*	Bauskata IV	1	-
	10*	Bauskata VI	1	-
	11	Bororawatre Part-I	9	4
	12	Bororawatre Part-II	5	2
	13	Aminerchar	13	1
South Salmara-Mankachar	14*	Basir Char	1	-
	15	Chaiter Chor Part-I	168	75
	16	Baladoba	47	6
	17*	Sebaltari	1	-
West Garo	18	Phulbari	1	0
		Total	736	231

Source: JICA study team

Note: Grey section indicates villages of Char land

Note: Villages with * mark are government land so land plots are not allocated to individual owners.

4.2 Census Survey

The survey components include basic information of the PAH including composition of households, ethnicity and religion. Inventory of the loss of assets of lands, structures and other assets, livelihood survey including source of income were also surveyed.

1) Summary of Project Affected Households

Out of 761 PAHs, 633 PAHs (2,538 PAPs) are affected by land only, 127 PAHs (500 PAPs) are affected by structures and lands, while 1 PAH (5 PAPs) is affected by commercial structure. In addition, the Project has impact on the livelihoods of 495 PAHs: 95 agriculture labours, approximately 300 boat operators and 100 fishermen.

Table 4-2: Summary of the Survey

Impacts	No. of PAH		No. of PAP	
	Title holder&Non-titleholder can claim rights	Non-titleholder	Title holder&Non-titleholder can claim rights	Non-titleholder
Total PAHs	671	90	2706	337
Structure to be affected (Physically displaced)	124	3	491	9
Only land to be affected	546	87	2,210	328
Commercial structure to be affected	1	0	5	0
Loss of livelihood	495	-	-	-
Agriculture labour	95	-	-	-
Boat operator	300	-	-	-
Fishermen	100	-	-	-

Source: JICA study team

Detailed results of the census survey are described in the following sections.

2) Project Affected Household and Affected People

District wise PAHs and PAPs identified in this census survey are shown in Table 4-3. The total PAHs are 761 and PAPs are 3,042. The composition of PAPs in the project area is 59.2% in Dhubri, 40.6% in South Salmara-Mankachar and 0.1% in West Garo Hills. Out of the total PAPs, 54.1% are residents in the Char land.

Table 4-3: Number of PAH and PAP

District	PAHs	PAPs	PAPs in Char land
Dhubri	621	2,550	1,109
South Salmara	138	485	485
West Garo Hills	2	8	0
Total	761	3,042	1,858

Source: JICA study team

Village wise number of PAHs and PAPs are shown in Table 4-4.

Table 4-4: Village wise PAHs and PAPs

District	No.	Village	PAHs	PAPs
Dhubri	1	Adabari Part-II	46	171
	2	Chagal chora Part-I	14	60
	3	Chagal chora Part-II	63	290
	4	Chagal chora Part-III	69	279
	5	Airanjangla Part-I	17	87
	6	Airanjangle Part-II	168	701
	7	Bhassanir char Part-I	56	213
	8	Kathiar Alga	93	360
	9	Bauskata IV	58	252
	10	Bauskata VI	2	8
	11	Bororawatre Part-I	16	65
	12	Bororawatre Part-II	5	20
	13	Aminerchar	14	44
South Salmara Mankachar	14	Basir Char	0	0
	15	Chaiter Chor Part-I	63	212
	16	Baladoba	52	196
	17	Sebaltari	23	77
West Garo	18	Phulbari	2	8
		Total	761	3,043

Note: Grey lines indicate villages of Char land
Source: JICA study team

3) Movement of Locations

During the rainy season, due to the rise of water level, Char lands near the river will be submerged. According to the census survey, 18.7% of the total PAH (142 households) shift their location during rainy season and out of which, half resides in Dhubri and half in South Salmara-Mankachar District. Out of those who shift their locations, 26.1% (18 households) in Dhubri and 72.6% (20 households) in South Salmara-Mankachar District answered that they do not return to the original places. Mobile households are more prominent in the South Salmara-Mankachar District. In relation to the land ownership which will be described later, it was reported from DCs that those who have the ownership or land use rights (Patta) of the original land will be entitled to compensation.

Table 4-5: Movement of Location

District	No. of PAH	Move the location during rainy season	Come back to the same location in dry season
Dhubri	621	69	18
South Salmara	138	73	53
West Garo Hills	2	0	0
Total	761	142	71
Percentage	-	18.7%	9.3%

Note: Households who answered that they do not come back to the same location in dry season were in four villages such as; Bororawatre Part-1, Part-2, Baladoba and Chaiter Chor Part-1.

Source: JICA Study Team

4) Population

The census survey identified that the majority of PAHs were male-headed households, while female-headed households were 51 (6.7%). Out of total PAs, 69.0% are male and 31.0% are female.

Table 4-6: Socio-Demographic profile

PAHs			PAs		
Male-headed	Female-headed	Total	Male	Female	Total
710	51	761	2,099	944	3,043
93.3%	6.7%	-	69.0%	31.0%	-

Source: JICA Study Team

5) Composition of Households

The average family size of PAHs is 4. In Dhubri, 3 to 5 family members are the majority, and 3 to 4 are the majority in the South Salmara-Manchakar District.

Table 4-7: Composition of Affected Households

	1	2	3	4	5	6	7+	Total
Dhubri	13	62	145	177	131	63	30	621
South Salmara	1	15	59	45	13	3	2	138
West Garo Hills	0	0	0	2	0	0	0	2
Total	14	77	204	224	144	66	32	761
Percentage	1.8%	10.1%	26.8%	29.4%	18.9%	8.7%	4.2%	-

Source: JICA Study Team

6) Social category

All PAHs identified themselves as a general caste. No scheduled castes or scheduled tribes were identified during the census survey.

7) Ethnicity and Language

The ethnicity of PAHs in the survey area were mixed between Assamese and Bengali due to the historical background mentioned in 7.3.3 (5). Therefore, all the PAHs in the project area use Assamese and Bengali languages⁵.

8) Religion

The religious breakdown of the surveyed PAHs is shown in Table 4-8. Most of the PAHs are Muslims consisting of 99.3% of the total PAH, and the other 0.7% (5 PAHs) are Hindus. No PAHs maintain special cultural and social traditions outside of the mainstream.

Table 4-8: Religious Composition

	Muslim	Hindu	Others
Dhubri	619	2	0
South Salmara	137	1	0
West Garo Hills	0	2	0
Total	756	5	0
Percentage	99.3%	0.7%	-

Source: JICA Study Team

⁵ As Assamese is a language derived from Bengali, there are high similarity between both languages. In the project area, government officials mainly use Assamese language and school education is done in Assamese as well so written documents are usually in Assamese. On the other hand, daily communication and spoken languages are mostly in Bengali.

4.3 Asset and Land Survey

1) Land Ownership Status of PAHs

During the census survey, it was observed that the government records do not match with the current land owners since the records have not been updated. Therefore, those having land registration are classified as (1) Title holder, those who do not have land registration but have documents showing that they have succeeded the land or they had land purchase agreements are classified as (2) Non-title holder but can claim rights. For those who reside on government land without any documents / certificates will be categorized as (3) Non-title holders and cannot confirm rights. Based on the information of land ownership provided during the interview survey, titleholders and non-titleholders in this project are classified as follows.

In this project, (1) Title holder and (2) Non-title holder but can claim rights are considered as “Legal” and (3) Non-title holder and cannot confirm rights as “Illegal”.

Table 4-9: Classification of Titleholders and Non-titleholders

Titleholder as per gov't record	Current Status	Classification	Entitlement
Original owner is the same as current owner	Current owner is the same as in the land record	(1) Title holder	Compensation & Assistance
Original owner is different from current owner	Current owner is son/daughter of the original owner or having purchase record but not registered	(2) Non-title holder but can claim rights	Compensation & Assistance
Government land	Current owner does not have documents and not registered	(3) Non-title holder and cannot confirm rights	Assistance

Source: JICA Study Team

Titleholders and non-titleholders were counted based on the above mentioned classification. Out of 761 respondents, 449 households are legal titleholders (59.0%), whereas 222 respondents are non-titleholders but can claim rights (29.1%). There are 90 respondents who do not have any legal right (non-title holder) and cannot claim rights (11.8%). The majority of non-title holders were identified in Char lands, 71 households (11.4%) in Dhubri and 19 households (13.8%) in South Salmara-Mankachar. Assistance for those non-titleholders shall be adequately provided by the project.

Table 4-10: Land ownership status of PAHs

District	Titleholder	Non-titleholder can claim rights	Non-titleholder cannot claim rights
Dhubri	365	185	71
South Salmara	82	37	19
West Garo Hills	2	0	0
Total	449	222	90
Percentage	59.0%	29.2%	11.8%

Source: JICA Study Team

Legal and illegal status of PAHs of each construction section (bridge and approach road) is as follows

Table 4-11: Legal status of PAHs of each construction section

Items	Title holder & Non-titleholder can claim rights	Non-titleholder
Bridge section	332	81
Access road section	339	9
Total	671	90

Source: JICA study team

2) Loss of Private Land

The majority of land in the project area is agricultural land. PAHs with affected agricultural land are 633 PAHs (83.2%), residential land are 102 PAHs (13.4%), both agricultural and residential land are 25 PAHs (3.3%) and only 1 household uses it for commercial purposes. A total of 127 households (16.7%) will have their structure affected and will be displaced from their original residential land. Table 4-11 presents the number of PAH/PAPs by different use of land and Table 4-12 indicates a district-wise breakdown of the land usage.

Table 4-12: Loss of Land by Usage and Number of PAH/PAPs

Use of Land	PAHs	PAPs	PAP (%)
Agricultural	633	2,538	83.4%
Residential	102	406	13.3%
Agricultural and Residential	25	94	3.1%
Commercial shop	1	5	0.2%
Total	761	3,043	-

Source: JICA Study Team

Table 4-13: Loss of Land by District and Usage

District	Agriculture	Residential	Agricultural & Residential	Commercial
Dhubri	527	69	24	1
South Salmara	106	31	1	0
West Garo Hills	0	2	0	0
Total	633	102	25	1
Percentage	83.2%	13.4%	3.3%	0.1%

Source: JICA Study Team

3) Severeness of Impact on Land Owners

The intensity of their land loss is shown in the Table 4-13. Out of 393 PAHs who responded, 46.1% are losing less than 25% of their land and 30.3% are losing more than 50% of their land. Others who were not aware of the total land area were not included in the figures.

Table 4-14: Severeness of Land Impact

Scale of Impact	PAHs	PAH %
Up to 10%	73	18.6%
Above 10% and Below 25%	108	27.5%
Above 25% and Below 50%	93	23.7%
Above 50% and Below 75%	58	14.8%
Above 75%	61	15.5%
Total	393	-

Note: Other respondents do not have information about their total area.

Source: JICA Study Team

4) Loss of Structures

Due to the project, 273 structures are going to be affected and 127 PAHs and 500 PAPs will be displaced. 72.3% of structures and 71.4% of displaced PAPs are in the Dhubri District.

Table 4-15: Loss of Private Structures in the Project

District	No. of Structure	Displaced PAHs	Displaced PAPs	% of PAPs
Dhubri	200	93	357	71.4%
South Salmara	65	32	135	27.0%
West Garo Hills	8	2	8	1.6%
Total	273	127	500	-

Source: JICA Study Team

5) Type of Affected Structures

The structures to be affected by the project are categorized as temporary, semi-permanent, and permanent structures. Out of 273 affected structures, 32 (11.7%) structures are of permanent nature, 78 (28.6%) are of semi-permanent nature and 163 (59.7%) are of temporary nature. The district-wise breakdown of the affected structures is summarized in Table 4-15.

Table 4-16: Type of Affected Private Structures

District	Permanent	Semi-Permanent	Temporary
Dhubri	23	55	122
South Salmara	1	23	41
West Garo Hills	8	0	0
Total	32	78	163
Percentage	11.7%	28.6%	59.7%

Source: JICA Study Team

6) Loss of Common Property Resources

In terms of common property resources, one forest office in Phulbari will be affected from the project. The relocation of the office will be discussed between DC of West Garo Hills and the forest department. No other education or religious facilities will be affected.

7) Loss of Trees and Crops

Along the path, a total of 2,559 trees may be impacted due to the land acquisition. Out of which 1,897 trees (74.1%) are fruit bearing trees and 662 trees (25.9%) are other trees. Major fruit bearing trees observed were bananas, jackfruits and groundnut, etc. and other trees were bamboo trees.

Table 4-17: Affected Trees

District	Fruit Tree	Other Trees
Dhubri	1,796	594
South Salmara	62	29
West Garo Hills	39	39
Total	1,897	662
Percentage	74.1%	25.9%

Source: JICA Study Team

Major crops cultivated in the areas were a combination of rice paddies (dominant source), pulses, jute and vegetables including tomatoes, potatoes and chili etc. During the census survey, the exact size of cultivated area and areas of each crop could not be identified. Table 4-17 shows the types of crops cultivated by the PAHs. Second and third crops, if any, were counted multiple times. PAHs in Dhubri District cultivate rice (99.6%) together with dal/lentils (74.9%), jute (40.7%) and vegetables (31.4%). In South Salmara-Mankachar District, dal/lentils (84.9%), rice

(49.1%) and jute (3.8%) are cultivated. At the time of the official assessment survey by the valuation committee, the areas and types of standing crops will be assessed in detail.

Table 4-18: Crops Cultivated by PAHs

District	No. of PAH	Paddy	Dal/Lentils	Jute	Vegetables
Dhubri	526	99.6%	74.9%	40.7%	31.4%
South Salmara	106	49.1%	84.9%	3.8%	0.1%
West Garo Hills	0	0	0	0	0

Source: JICA Study Team

8) Loss of Livelihood

Apart from those whose assets are to be affected, agriculture labourers who are employed by the land owners will also negatively impacted from the project. During the census survey, 95 agriculture labourers were identified, a majority which were in the Dhubri District. Most of them are engaged as temporary labours during sowing and harvesting seasons. These agriculture labourers will also be entitled to assistance and participation in the income restoration program.

In addition, current boat operators who are providing the services between Dhubri and Phulbari will also be affected by the project. According to the Inland Waterway Transportation (IWT), 20 passenger boats and 30-50 goods transportation boats per day are in direct operation between Dhubri and Phulbari. Based on the information from the boat operators association in Dhubri and Phulbari, a total of 2,000 boat operators are registered in the area, out of which 250-300 boat operators are directly serving the target area. Their loss of business opportunities will be considered in this project. For the other operators, since demand for boat transportation between Char lands are still expected, their business will not be affected by the project.

Furthermore, based on meetings with fishermen, there are around 100 households engaging in fishing activities along the alignment as their primary income source. Even though they can move freely in and around the river which means that they can continue their activities outside of the alignment during the construction, considering they operate hand-rowing boats, long distance travel may be difficult and there may be a possible reduction of catch during the construction period. Therefore, fishermen shall also be provided with the option to be employed in the construction work.

4.4 Livelihood Survey

1) Education Level of PAHs

The education Level of PAHs is as shown in Table 4-18. Out of total PAHs, 60.7% have had no education at all. 12.2% have lower primary and 9.8% have upper primary education, 9.0% have junior high, 4.1% have high school education and 4.8% have completed collage.

Table 4-19: Education Level of PAPHs

	No education	Lower Primary	Upper Primary	Junior High	High School	College	Total
Dhubri	348	78	69	62	30	33	620
South Salmara	111	13	5	6	1	2	138
West Garo Hills	0	1	0	0	0	1	2
Total	459	92	74	68	31	36	760
Percentage	60.7%	12.2%	9.8%	9.0%	4.1%	4.8%	-

Source: JICA Study Team

2) Literacy

Table 4-19 indicates the literacy rate of the head of households of PAHs. If no education is considered as an illiterate household, then literacy rates of Dhubri and South Salmara-

Mankachar District are 43.9% and 19.6% respectively. Those figures are lower than the average district rates which are 58.3% and 40.0% respectively, especially the rate in South Salmara-Mankachar District is significantly low. In Phulbari, out of 2 PAHs in Phulbari, one has primary education and the other has college education.

Table 4-20: Literacy Rate of PAPs

	Literacy Rate	Baseline Data
Dhubri	43.9%	58.3%
South Salmara	19.6%	40.0%
West Garo Hills	-	67.6%

Source: JICA Study Team

3) Occupation

Table 4-20 presents income source of the responded PAHs. All the respondents are engaged in agriculture followed by unskilled labour (46.3%). Some are self-employed (7.6%) and some are engaged in private services (3.0%) and government services (4.5%). It clearly indicates that the agriculture is the main occupation and unskilled labour is the secondary income source in the project area.

Table 4-21: Occupation

	Agriculture	Dairy	Unskilled Labour	Self Employed	Skilled	Private Service	Government Service	Others	Total
Dhubri	554	11	273	40	4	19	25	68	994
South Salmara	117	1	38	11	3	0	5	5	180
West Garo Hills	0	0	0	0	0	1	0	1	2
Total	671	12	311	51	7	20	30	74	1176
Percentage	100%	1.8%	46.3%	7.6%	1.0%	3.0%	4.5%	11.0%	-

Note: Multiple answers were given

Source: JICA Study Team

4) Monthly household income of households

Monthly household incomes were surveyed between the ranges of below Rs. 1,000 to above 21,000. Only 0.8% earn below Rs. 1,000. The majority 42.2% are earning between Rs. 1,001 to 5,000, followed by 36.8% who earn between Rs. 5,001 to 9,000. Around 3.7% are earning between Rs. 13,001 to 21,000 per month, and 6.1% have a household income that is above Rs. 23,000. Table 4-21 indicates the district-wise total monthly income of the PAHs.

Although it is important to note that the cash income may not reflect the real well-being of PAHs engaged in subsistence agriculture, the figure indicates that people have significantly less capital for savings and investments.

Table 4-22: Total Monthly Household Income (Rs/Month)

	Below 1,000	1,001-5,000	5,001-9,000	9,001-13,000	13,001-17,000	17,001-21,000	Above 21,001	Total
Dhubri	6	260	207	72	14	11	42	612
South Salmara	0	57	70	5	1	1	4	138
West Garo Hills	0	0	0	1	1	0	0	2
Total	6	317	277	78	16	12	46	752
Percentage (%)	0.8%	42.2%	36.8%	10.4%	2.1%	1.6%	6.1%	-

Source: JICA Study Team

5) Vulnerability

The census survey has identified 51 female-headed households (6.7%), 8 household with physically challenged members (1.1%), 1 elderly household with no immediate support member (0.1%) and 414 households who consider themselves as a BPL household (54.4%). Although

this number of BPL households is self-reported without cross-checking with actual income data, this shows that those households may have low coping ability against possible negative impacts.

Table 4-23: Vulnerability

	Female-headed HH	HH with physically challenged member	Elderly with no immediate support member	Below Poverty Line*	Total HHs
Dhubri	47	8	1	363	419
South Salmara	4	0	0	51	55
West Garo Hills	0	0	0	0	0
Total	51	8	1	414	474
Percentage	6.7%	1.1%	0.1%	54.4%	

*The figure shows results from self-reported interviews without cross checking actual income.

Source: JICA Study Team

CHAPTER 5 Stakeholders Consultation

5.1 1st Round Consultation

The purpose of the stakeholders meeting at the scoping stage is to explain the project objective, a summary of the project and scoping results of environmental and social impact from the project in order to obtain comments and concerns from the likely affected communities. The meetings were held in two locations, at the starting point on the Dhubri and Phulbari side.

The main discussion points were as follows.

- 1) Outline and purpose of the Project
- 2) Explanation on the alignment
- 3) Anticipated positive and negative impacts from the project
- 4) Conveyed that the results of the meeting (especially comments and concerns) will be reflected in the project as necessary

The announcements of stakeholder meetings were informed by visiting land acquisition officers, publishing in a local newspaper and distributing pamphlets through village chiefs and local consultants (Enviro Infra Solutions Pvt. Ltd.: EIS). Stakeholder meetings were conducted with the approval from the NHIDCL. Participants include land acquisition officers, village chief, villagers, DPR consultant (AECOM), PWD officers etc. Assamese and Bengali were used in the meeting which are the languages used in the target area. The details are shown below.

The details of 1st Round Consultations with Communities are summarized in Table 5-1 and Table 5-2.

Table 5-1: Location and Dates of Stakeholder meetings

No.	Date	Location	Total	Male	Female	From Char	Coverage
1	24/10/2016	Irrigation IB, Dept. Of Water Resources, Phulbari	68	68	0	02	Phulbari and South Salmara-Mankachar District
2	25/10/2016	EQRA Academy School, Adabari Chomor, Dhubri	119	119	0	23	Dhubri District

Source: JICA Study Team

Table 5-2: Discussion in Stakeholder Meetings

No.	Comments	Answers
1	<ul style="list-style-type: none"> • Compensation of land should be given on the basis of current market price and not by the price that is fixed by the government • Community meetings shall be conducted separately involving all the affected villages and affected families. • Request compensation and income generation method for boat owners and boat operators • Provide proper connectivity of the bridge to National Highway with 	<ul style="list-style-type: none"> • Amount of compensation will be calculated based on the current market value • Community meetings will be conducted to cover affected villages • Employment opportunities in other modes of transportation (tuktuk, truck etc.) may increase after the project. Thus, income generation method with the provision of trainings will be considered in an income restoration program. • Multiple alignments were considered and the alignment with the least disturbance in the villages was selected. Adequate compensation package will be designed for those affected by the project.

No.	Comments	Answers
	minimal disturbance in nearby villages	
2	<ul style="list-style-type: none"> Start point of bridge shall be shifted to minimize the impact on local residences. Local people preferred compensation in terms of land for their acquired land Community meetings shall be conducted to cover affected villages Request separate compensation and generation of alternative employment to boat owners and boat operators as proposed bridge will have a major impact on their livelihood. 	<ul style="list-style-type: none"> The proposed alignment was selected considering the future connection to national roads. However, the proposed starting point is still under discussion and minimization of the impact will be considered. DC is responsible for finding alternative land, in consultation with the target community Community meetings will be conducted to cover affected villages Alternative employment may be expected in other modes of transportation. Assistance for the transition of occupation will be considered in an income restoration program.

Source: JICA Study Team

5.2 Community Meeting

For the purpose of gathering comments from the communities in concerned areas, five community meetings were organized. The locations of the meetings were identified based on the concentration of PAPs along the alignment. Participants in the meetings were village chiefs and villagers, including displaced persons and vulnerable groups.

The main points explained and discussed in the meetings were as follows:

- 1) Outline and Purpose of the Project
- 2) Recommended alignment
- 3) Anticipated positive and negative impact from the project
- 4) Socio-economic status of the concerned community

During the community meetings, the comments from local communities regarding the location of starting point and ending point were confirmed. As a result, the starting point was shifted to minimize the impact. As for the ending point, the reason for the selection of the point was explained to the local community which was helpful to gain understanding from the local people.

Summary of the results are shown in Table 5-3 and Table 5-4.

Table 5-3: Location and Dates of Community meeting

No.	Date	Location	Total	Male	Female	From Char	Coverage
1	26/10/2016 @12:00	M. E. School, Adabari, Dhubri	22	16	6	15	Starting point of Dhubri
2	26/10/2016 @16:00	Ponchu Ghat in Dhubri	17	17	0	09	Ferry point in Dhubri
3	27/10/2016 @11:00	Phulbari	20	10	10	03	Lower Phulbari
4	27/10/2016 @13:30	South Salmara	15	15	0	05	South Salmara
5	27/10/2016 @16:30	Bauskata and Bororavatari	22	22	0	20	Bauskata, Bororavatari, Phulbari

Source: JICA Study Team

Table 5-4: Discussion in Community meetings

No.	Comments	Answers
1	<ul style="list-style-type: none"> Local people should be informed about compensation packages, valuation methods prior to land acquisition. Preference shall be given to local people to be employed in the construction works. Suggested that the location of start point of the bridge should be shifted to Chandachal Bridge, which is 500m away from the present point to minimize the impact. 	<ul style="list-style-type: none"> Amount of compensation will be determined by DC based on market value (details of the compensation package and the amount will be explained in separate meetings at the end of the survey). Mechanism for employing local people will be proposed for the construction work which requires unskilled labours. The proposed alignment was selected considering the future connection to national roads. However, the proposed starting point is still under discussion and minimization of the impact will be considered.
2	<ul style="list-style-type: none"> Concern that the aquatic biodiversity will be deteriorated and whether fishing environment will be disturbed. Concern that boat operators will become unemployed after completion of the project. New means of livelihood shall be considered for affected people. Preference shall be given to local people for construction work. 	<ul style="list-style-type: none"> The impact on the fishery activities will be assessed and mitigation measures will be implemented if negative impact is to be expected. Boat operation service to Char islands will continue. Regarding the loss of business opportunities, an adequate income restoration program will be considered with input from boat operator communities. Employment in construction work and income restoration program for affected people will be considered and proposed.
3	<ul style="list-style-type: none"> Suggested that end point of the bridge be shifted to Bangshidua Bridge, which is 300m north from the present point for better connection to existing road. Will there be a possible interruption of river corridor isolating habitats with potential decrease in species numbers and local biodiversity. 	<ul style="list-style-type: none"> Affected people will increase as the alignment moves closer to towns. The end point of the bridge was well considered among several alternative alignments and the one with least impact on villages was selected. Impacts on the river flow during the construction period will be well considered and specific construction method will be employed to minimize the disturbance.
4	<ul style="list-style-type: none"> Do not have full information about project affected persons and would like to have clarification about the alignment. Fair and timely compensation shall be paid to the affected people. 	<ul style="list-style-type: none"> Clarification about the alignment will be explained, and affected persons will be identified during census survey. Amount of compensation will be determined based on market value. The consideration will be given to avoid the delay of payment.
5	<ul style="list-style-type: none"> Concern that construction activities could damage their crops. Compensation shall be paid for standing crops if the land will be acquired before harvesting. Ensure that individuals and groups have opportunities to participate in the construction of the bridge. 	<ul style="list-style-type: none"> The land acquisition will be completed before the construction so no damage to crops are expected during construction work. Standing crops will be subject to compensation. Mechanism to give preference of employing affected people and local people on construction works will be considered.

Source: JICA Study Team

Starting and ending points, which were pointed out in the stakeholder meetings are as shown in the map below. As for the starting point, the suggested location is the connection point to the proposed NH-27. Final alignment was decided to connect to NH-27 without connecting existing roads which was originally planned. The point mentioned for the ending point is the location

where a new bridge was recently built. However, it was explained that it is more reasonable to connect to the existing road, considering the better connectivity.



Source: JICA Study Team

Figure 5-1: Starting location mentioned in the meeting



Source: JICA Study Team

Figure 5-2: Ending location mentioned in the meeting

5.3 Focus Group Discussion

In order to understand the issues from women's perspective and concerns from boat operators and fishermen, three focus group discussions were carried out. Participants in the meetings were women in surrounding villages, boat operators from boat operators association, and fishermen in the target area.

The main points explained and discussed in the meetings were as follows.

- 1) Outline and Purpose of the Project
- 2) Recommended alignment
- 3) Anticipated positive and negative impacts from the project
- 4) Socio-economic status of the concerned groups

As a result, the area of activities, means of livelihoods of boat operators and fishermen and their requests were identified. Based on the findings, they were included in the beneficiaries of compensation and assistance.

The details are shown below.

Table 5-5: Location and Dates of Focus Group Discussions

No.	Date	Location	Total	Male	Female	From Char	Coverage
1	26/10/2016 @10.00	M.E. School, Adabari Chomor, Dhubri	9	0	9	02	Womens group
2	26/10/2016 @14.00	Panchu Ghat, Dhubri	13	13	0	07	Boat operators
3	30/06/2017 @10.00	M.E. School, Adabari Chomor, Dhubri	50	50	0	18	Fishermen

Source: JICA Study Team

Table 5-6: Topics in Focus Group Discussions

No.	Comment	Response
1	<ul style="list-style-type: none"> Amount of compensation for land acquisition and resettlement shall be sufficient for the family, even during the transition period. Payment shall be made on time. Preference shall be given to women to be employed in the construction work. 	<ul style="list-style-type: none"> Amount of compensation will be calculated considering that the affected people will be able to retain their livelihood after the project. The process will be considered to coordinate with NHIDCL, DC, etc. that payment will not be delayed. Equal employment opportunities will be sought for women to engage in construction work taking into account their needs, competence and social situations in the area.
2	<ul style="list-style-type: none"> Preference shall be given to boat operators for construction work. Request assistance for alternative employments (road transport etc.) after completion of the bridge construction. Request some form of livelihood programs. 	<ul style="list-style-type: none"> Mechanism to give preference of employing affected people on construction works will be considered. Boat operation service to Char lands will continue and demand for the movement of goods and people may increase. Regarding the loss of business opportunities, in addition to the construction work during construction periods, an adequate income restoration program will be considered with input from boat operator communities.
3	<ul style="list-style-type: none"> Whether the fishing activity will be affected by the project and the impact on the volume of catches expected during the construction stage. If there are employment opportunities in the project, people will be very much interested. 	<ul style="list-style-type: none"> During the construction work, vibration may have some impact on fish at the location of pier construction. However, vibration it expected during the construction (day-time) and long-term impact is not anticipated. In case catch volume is impacted, employment options will be provided for fishermen to engage in construction works. Mechanism to give preference of employing affected people on construction work will be considered.

Source: JICA Study Team

5.4 2nd Round Consultation

The purpose of second round stakeholder meetings was to inform the results of EIA, and explain anticipated impacts as well as mitigation measures to confirm the consent from stakeholders.

Main discussion points are as follows.

- 1) Outline and objective of the project
- 2) Reason of recommended alignment
- 3) Result of Environmental Assessment (anticipated positive and negative impacts)
- 4) Mitigation measures and monitoring plan

As for RAP, the result of the census survey and compensation policy, as well as rehabilitation and income restoration program were explained to gain consent from PAPs.

Main discussion items are as follows.

- 1) Scale of impact based on result of census survey
- 2) Compensation policy
- 3) Rehabilitation and income restoration program

Information disclosure for the 2nd stakeholder meeting was carried out by visiting land acquisition officers, publishing in a local newspaper, and distributing pamphlets through village chiefs and local consultants (Enviro Infra Solutions Pvt. Ltd.: EIS). The participants include NHIDCL, DPR consultant (AECOM), land acquisition officers from each DC offices, village chiefs, villagers including PAPs, boat operators, fishermen, etc. Assamese and Bengali were used in meetings which are the common languages in the target area.

Summary of the meetings is shown in the table below.

Table 5-7: Details of the Second Round Consultation Meetings

No.	Date	Location	Total	Male	Female	From Char	Coverage
1	2017/7/4 @11:00	M.E. School, Chagalchora II, Dhubri	121	113	8	47	Adabari Part-II, Airanjangla Part-I&II, Bhassanir char Part-I, Chagal chora Part- I&II&III
2	2017/7/4 @15:00	Boat operator office, Jogmaya ghat, Dhubri	56	53	3	18	Kathiar Alga, Bauskata Part-IV&VI, Basir Char, Aminerchar, Chaiter Chor Part-I
3	2017/7/5 @11:00	Phulbari Youth Club, Phulbari	100	94	6	34	Phulbari, Baladoba, Bauskata, Saboratory, Chaiter Chor Part-I, Hatsingwari
4	2017/7/5 @14:00	M.V. School, Bororawatre part-I, Dhubri	28	16	12	21	Bororawatre Part-I&II

Source: JICA Study Team

Table 5-8: Participation Details of the Second Round Consultations

No.	Comment	Answer
1	<ul style="list-style-type: none"> • What kind of compensation and assistance will be provided to agriculture labourers? • How will the rate for land be calculated? • What will be the process of land acquisition and how to identify the land owner? • If the new owner's name is not listed, will they get compensation • Will non-title holders get compensation for land, structure and employment opportunities? • Are there employment opportunities for graduate students? 	<ul style="list-style-type: none"> • Agriculture labours will get at least minimum wage of 200 days. Employment opportunities will also be provided during construction and will be entitled to get training for business opportunity • Rate of the land will be calculated as per the latest land revenue records in the area. • First, 3A notification will be issued and field verification will be followed based on the government land record. After the 3D notification, there will be a hearing objection period before finalization. • Non-title holders will get compensation for structures and standing crops, as well as are entitled for assistance. Training will be provided and possibly issue certificates for employment opportunities. • For graduates, there are National Skill Development Programs where they can get special training. Even in the construction work, they may get employed in a position considering their capacity.
2	<ul style="list-style-type: none"> • What kind of assistance will be provided to the boat operators and whether boat operators will get employment opportunities? • One boat cost nearly Rs. 25-30 Lakh, after completion of this project there will be no use of these boats, will boat owners get any compensation? • Will fisherman be affected by this project? • Will fisherman get any compensation? 	<ul style="list-style-type: none"> • Boat operators are also provided with opportunities to engage in construction work. During the period, vocational training opportunities will be offered to prepare for the transition to new occupations. • The construction period is around six years. During this period, the boat can be used for transportation of goods and workers in addition to normal services. If the needs are confirmed, compensation for the boat may be considered. • During construction work, there will be impact on fishermen in the project area, but fishing can continue upstream and downstream of the river. • Employment opportunities will be provided to fishermen during the construction work.
3	<ul style="list-style-type: none"> • When and to whom will employment opportunities be offered. How should I apply? • Is there any plan to develop bridge cum railway? • When and how will compensation be provided? • What is the market rate of the land and buildings to be decided based on? • What should I do if there is a problem with land ownership? • What kind of compensation can be taken if leasing the land and holding the building on that land? 	<ul style="list-style-type: none"> • Employment opportunities will be offered to residents of the target area when construction work will be carried out. NHIDCL will contract with contractors so the application shall be submitted to the contractors. NHIDCL is considering to state in the contract that priority should be given to local employment as a condition. • In this project, railway is not included in the plan. • First of all, DC will conduct a field survey and confirm the affected land, affected people and the price. After the compensation is paid to the affected people, land acquisition will start. • Market rate for the land will be based on the zonal valuation which is set by the land sale price. Buildings are also calculated at market prices. The amount will be decided based on a site investigation. • If there is a land ownership problem, DC office will be the window agency. The land ownership will be reviewed with documents and records. • There will be no compensation for the land, but structures and crops will be compensated and

No.	Comment	Answer
		<p>assistances will be provided. If you have been paying the lease fee of land for a long time, the amount after land acquisition will be refunded.</p>
4	<ul style="list-style-type: none"> • In the case the land has been submerged and became government land in the past, can the former owner with the previous land documents claim compensation? • Do residents of affected villages have access to employment opportunities for construction work? 	<ul style="list-style-type: none"> • In principle, land that became government land will not be subject to compensation, but compensation for standing crops and financial support and support for livelihood restoration will be provided. However, during the site verification stage, the current and past land ownership will be properly reviewed. • It is assumed that employment opportunities for construction work will also be provided to residents of target villages.

Source: JICA Study Team



Source: JICA Study Team

Figure 5-3: Stakeholders/Community Meetings

CHAPTER 6 Resettlement and Rehabilitation Policy

6.1 Cut-off-date

At the time of this survey, the cut-off-date has not been declared in Assam and Meghalaya State. Therefore, in this survey the cut-off-date is set as the starting date of the census survey. As per respective provisions, Assam State will follow the NH Act 1956, and Meghalaya State the LARR Act 2013. The cut-off-date in Assam State will be the issue date of 3A notification indicating the target villages and land areas which will be prepared by respective DCs approved by NHIDCL. As for Meghalaya State, the issue date of SIA notification from the state government will be recognized as the cut-off-date.

- This Survey: 24 November, 2016
- Dhubri, South Salmara-Mankachar District: expected in July, 2017
- West Garo Hills District: not yet decided

The cut-off date will be officially declared by the respective DCs along with the disclosure of the RAP report, and will be disclosed in the project area through local newspapers. For the purpose of preventing an influx of people into the project area, PAPs who settle in the affected areas after the cut-off date will not be eligible for compensation.

6.2 Eligibility

The status of title holder / non-title holder in the target area can be categorized as follows.

- Private land with periodic patta⁶ (Titleholders)
- Private land with periodic patta or purchase record but not yet registered (Non-titleholder can claim rights)
- Government land without any certificates (Non-titleholder cannot claim rights)

6.3 Compensation Policy

Despite that efforts are made to minimize resettlement impacts, the proposed project will affect land and structures. As a result of which physical displacement will arise and resettlement will be required. The resettlement plan shall furnish fair compensation for displaced households.

1) Land compensation

In case of land compensation, the DC is responsible for identifying land for providing adequate and appropriate replacement land for PAHs who requests land compensation, rather than cash compensation. If PAHs request land compensation, the DC shall secure land as close to the original location as possible. The condition for the relocation site shall be better housing at resettlement sites, with comparable access to employment and production opportunities, and infrastructure with utility and community services.

2) Cash compensation

According to the census survey, most of the PAHs preferred cash compensation and self-relocation over land compensation. Therefore, cash compensation at market rate along with

⁶ A certificate of land use rights which is considered as a land title in the Assam State.

relocation assistance is considered a more practical solution in this case. In case of cash compensation, only titleholders are eligible for compensation for the land. Non-title holders are eligible for structures and crops, if any, excluding the land. Details are given in the entitlement matrix.

3) Basic compensation and assistance

The PAPs will be entitled to the following six types of compensation and assistance packages:

- a) Compensation for the loss of land at replacement cost
- b) Compensation for structures (residential/commercial) at their replacement cost without depreciation
- c) Crops/ trees at their market cost
- d) Assistance in lieu of the loss of business/ wage income and income restoration assistance. In case of boat operators, compensation will be provided if the needs are confirmed.
- e) Assistance for shifting and provision for the relocation site, if required
- f) Rebuilding and/ or restoration of community resources/facilities

6.4 Income Restoration Program

The purpose of restoration of livelihoods is to ensure that the PAPs are able to at least regain their standard of living. In this project, the eligible people for the restoration program include the following;

- PAPs whose assets are affected (land, residential and commercial structures)
- PAPs whose livelihoods associated with loss of assets are affected (agriculture labourers)
- PAPs whose livelihoods are affected from the Project (boat operators, boat owners, fishermen etc.)

To restore and enhance the economic conditions of the PAPs, their present socio-economic status and potential opportunities in and around the affected communities should be considered. An income restoration program will be developed and implemented by the district government, with the assistance from RAP implementation NGO in order to identify suitable options. Inputs and feedbacks from relevant stakeholders and communities must be also incorporated in the program through a series of discussions and workshops.

Possible income restoration programs considered at this stage are as follows.

1) Preference in employment in the Project

Employment opportunities shall be provided to the local community including all the PAPs. Agriculture labourers, boat operators and fishermen whose livelihoods are likely to be affected from the project are also provided with the opportunities to engage in the construction work of the project. The vulnerable PAPs and women should have equal opportunities to be employed in the project, taking into account their needs, competence and social situation of the area. For those who do not have the skills in construction work and other related works, job training shall be provided prior to the employment in the project in order to provide equal opportunities to other potential candidates.

The NHIDCL local office, with the assistance from NGO will liaise with the contractor to seek employment opportunities in construction related activities for PAPs. Especially with regard to women's employment, it is considered necessary for NGOs to confirm the needs of women who

need to take care of children and elderly. Based on the identified needs, NHIDCL shall propose the contractor to consider employment method for women such as working palces and time zones. In addition, preferably a mandatory clause in the contract with the contractor should be added to give preference to local labour, as a measure of corporate responsibility of the contractor.

2) Skill improvement training

Contents of job training will be considered based on the current local economic activities and occupational opportunities in the target area. Interviews with the applicants on their interest, and the demand for those occupations and skill improvement are necessary to identify the training contents. At the same time, possible collaboration with vocational training centers, and programs in the surrounding area and with existing training courses should also be explored.

Vocational training programs that could be considered at this stage are as follows.

- Considering that agriculture is the major source of income, it may be useful to provide guidance from Krishi Vigyan Kendras (KVK⁷) for increasing productivity and introducing suitable breeds of crops.
- Based on the fact that land transportation needs will increase in addition to river transportation, driver training on tricycles and trucks together with the support for their license registration may be useful.
- Improved distribution network will increase access to the (local) market, so guidance on the trading and marketing of produce is considered to be effective.

3) Assistance for starting up new businesses

New business opportunities shall be surveyed with the assistance from experts by reviewing the market situation in the target area. Assistance should be provided to get access to local banks with lower interest rates. More specifically, introduce local banking programs, coordinate with banks for the relaxation of conditions, and provide training on how to utilize microfinance which can be done through NGOs.

The following new business initiative can be supported.

- The launch of small stores and establishment of bases for selling products and trading goods may be new business opportunities.
- Credit schemes can be applied to procure funding for the initial investments, including purchasing new means of transportation as described above.

4) Additional Support from On-going Poverty Reduction Programs

In India, governments at the village and district levels are now responsible for the planning and implementation of all anti-poverty programs funded by the central and state governments. The National Skill Development Program, the initiative of the central government and Swarnjayanti Gram Swarajgar Yojna (SGSY⁸), specially catered for those below the poverty line are examples. The implementing NGO will work with the panchayat governments to make those

⁷ Krishi Vigyan Kendras (KVK) is the Agricultural Technology Dissemination center of the India Agricultural Research Council (ICAR) and has several regional centers in each state. The trainings provided by KVK Dhubri include provision of technical information and trainings on agriculture, livestock and fisheries.

⁸ Swarnjayanti Gram Swarajgar Yojna (SGSY) is a program that provides support for private entrepreneurs with the aim of improving livelihoods for the poor. The support includes organizing self-help group, providing training, loan and marketing support, etc.

programs available to PAPs, and also play a proactive role to mobilize PAPs to get benefits from various ongoing pro-poor programs.

5) Provision of subsistence allowance to PAHs

People living in the project area are having low literacy rate and low income level and considered to be vulnerable to the change of environment. Therefore, all PAHs should be entitled for monthly allowance regardless of their displacement requirements (according to Acts and Rules of India, monthly allowance is only for displaced families).

Table 6-1: Entitlement Matrix

Type	Affected People	Entitlement	Details
Loss of land	Title holder	Compensation, Assistance	a) Minimum 60 days advance notice b) Compensation at replacement cost ^{(*)2} c) One-time resettlement allowance Rs. 50,000/PAH d) Monthly subsistence allowance Rs.3,000/PAH×12months ^{(*)1}
	Non-title holder	Assistance	a) Minimum 60 days advance notice b) One-time resettlement allowance Rs. 50,000/PAH c) Monthly subsistence allowance Rs.3,000/PAH×12months ^{(*)1}
Loss of structure	All PAH	Compensation, Assistance	a) Minimum 60 days advance notice b) Compensation based on replacement cost ^{(*)2} c) Right to salvage materials d) One-time resettlement allowance Rs.50,000/PAH e) One time shifting allowance Rs.50,000/PAH f) Monthly subsistence allowance Rs.3,000/PAH×12months ^{(*)1}
Loss of tree and crops	All PAH	Compensation	a) Minimum 60 days advance notice b) Harvest before acquisition. Compensation based on market price for standing crop, if advanced notice was not provided
Loss of shops	Title holder	Compensation, Assistance	a) Minimum 60 days advance notice b) Compensation based on market price ^{(*)2} c) Right to salvage materials
Loss of livelihood	All PAHs	Assistance	a) Financial assistance Rs. 25,000/PAH b) Preference in employment under the project ^{(*)3} c) Training and assistance for business opportunity ^{(*)3}
	Agriculture Labourer	Assistance	a) Minimum wage for 200 days b) Preference in employment under the project ^{(*)3} c) Training and assistance for business opportunity ^{(*)3}
	Boat operator	Compensation, Assistance	a) Preference in employment under the project ^{(*)3} b) Training and assistance for business opportunity ^{(*)3}
	Fishermen	Assistance	a) Preference in employment under the project ^{(*)3} b) Training and assistance for business opportunity ^{(*)3}
Vulnerable people	Vulnerable people	Assistance	a) Additional assistance of Rs.25,000/PAH over above b) Preference in employment under the project ^{(*)3} c) Training and assistance for business opportunity ^{(*)3}
Loss of public property	District government	Replacement or Restoration	a) Based on the request of affected villages or districts
Impact during construction	Title holder	Compensation, Assistance	a) Land: Rental based on market price during occupied period. Hand back the land in the original condition b) Structure: Compensation based on market price c) Livelihood: Rs.3,000/PAH /month during occupied period
	Non-title	Assistance	a) Livelihood: Rs.3,000/PAH /month during occupied period

Type	Affected People	Entitlement	Details
	holder		
Unanticipated impact	All PAPs	Assistance	a) Take appropriate measures by utilizing GRM based on the resettlement policy GRM

Source: JICA Study Team

(^{*1}) Amounts of allowances are based on the LARR Act 2013. For agriculture labours, the Assam LARR Rule 2015 will be applied having more detailed regulation. Also, since the people living in the project area are considered to be vulnerable to the changes of environment, all PAHs will be also included as beneficiaries of the subsistence allowance. The conditions of recipients of financial support are as follows.

- Resettlement allowance (Rs.50,000): All PAHs
- Shifting allowance (Rs. 50,000): Displaced family
- Subsistence allowance (Rs. 3,000×12 months): All PAHs
- Assistance for loss of livelihoods (Rs. 25,000): All PAHs whose livelihoods are lost
- Assistance for vulnerable HH (Rs. 25,000) PAHs with vulnerable people

(^{*2}) As per Assam LARR Rule 2015 and LARR Act 2013, replacement cost for land and structures will be calculated as follows, based on the market price notified by the district government. Also, stamp duty and other fees payable for registration of the land or house will borne by the government.

- Land price will be calculated by multiplier (depends on rural or urban) and solatium.
 - Rural areas = $A(\text{Market price} \times \text{Multiplier}(1.5-2.0)) + A \times 100\% \text{Solatium} + A \times 12\%$
 - Urban areas = $A(\text{Market price} \times \text{Multiplier}(1.0)) + A \times 100\% \text{Solatium} + A \times 12\%$
- Structure price will be based on market price without depreciation
 - $\text{Market price} \times 100\% \text{Solatium}$

The definition of the replacement cost by World Bank Guideline (WB OP4.12) indicates that calculation of the replacement cost should not take into account depreciation of the asset. The same provision shall be followed to determine the cost.

(^{*3}) According to LARR Act 2013, the appropriate Government shall ensure that all PAHs are provided with the following options. At this stage, provision of the option for employment opportunities and appropriate trainings will be assumed.

- Provision of employment oportunities and appropriate trainings
- Rs. 5,00,000/family
- Rs. 2,000/family×20years

CHAPTER 7 Grievance Redress Mechanism

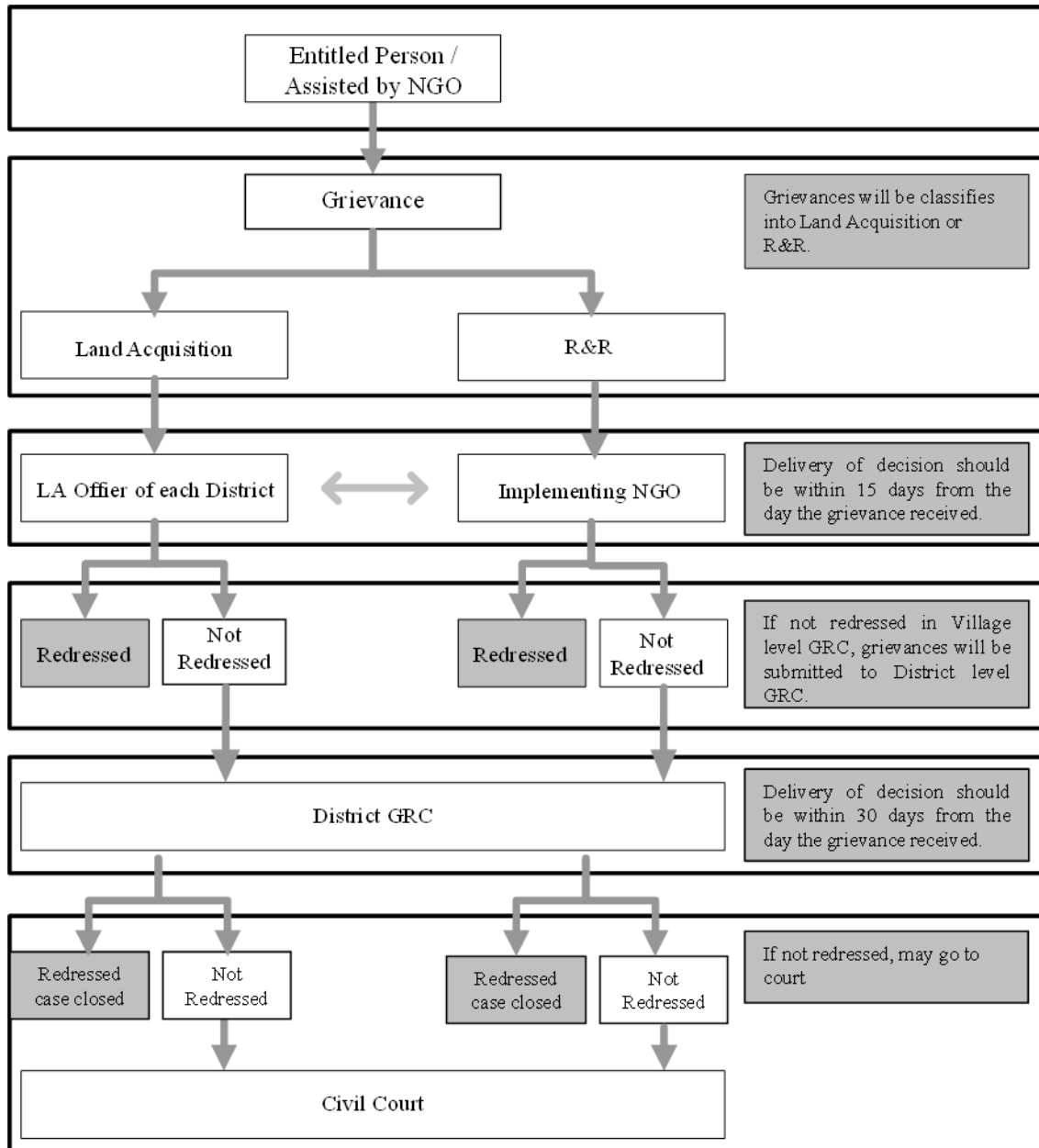
In the RAP implementation, there is a need for an efficient grievance redress mechanism (GRM) that will assist the PAPs in raising their issues and concerns, and resolving queries and complaints. For this purpose, a Grievance Redress Committee (GRC) will be established to resolve most grievances, if not all in the project.

Grievances will be redressed at the local and district level for this project. At the local level, PAPs, NGO, and land acquisition officers of respective districts will be involved and if needed, village leaders will also be invited for resolving issues. At the district level, the GRC will be headed by the DC or his designated representative; while representatives from NHIDCL local office, representatives of PAPs, village leaders, and NGOs will be the members. In the West Garo Hills District, the Autonomous District Council will also join in the GRC. Representatives of PAPs should include representatives from women groups, non-titleholders and vulnerable PAPs.

It is proposed that GRC will meet regularly, at least twice a month, on a pre-fixed date. The committee will look into grievances of the PAPs, assign responsibilities to resolve the issues, and deliver decisions within the due date. The claims will be reviewed and resolved within 15 days at the village level and 30 days at the district level, from the date of submission to the committee. PAPs can call upon the support of the NGO to assist them in presenting their grievances or queries to the GRC.

PAPs, who would not be satisfied with the decision of the GRC, will have the right to take the grievance to the EA head office for its redress. Failing the redressal of grievance at NHIDCL, the PAPs may take the case to Judiciary. Taking grievances to Judiciary will be avoided as much as possible and the NGO will make utmost efforts at reconciliation at the GRC level. All grievances received (written or oral) and their redress will be recorded and documented properly. The NHIDCL will ensure that such records will be made available to the external monitor.

The procedure and role of the GRM is as shown below;



Source: JICA Study Team

Figure 7-1: Grievance Redress Mechanism

CHAPTER 8 Institutional arrangement

For the implementation of RAP, there will be a set of institutions involved at various levels and stages of the project. As per Indian acts and regulations, land acquisition, resettlement and rehabilitation activities must be executed by the state government. In practice, the state government entrusts tasks to the district government headed by the DC. Therefore, all activities will be implemented by the district government and the decision-making power lies within the DC. For Meghalaya state, being under jurisdiction of the sixth schedule of the constitution, Autonomous District Councils (ADC) will also be involved in the approval of project.

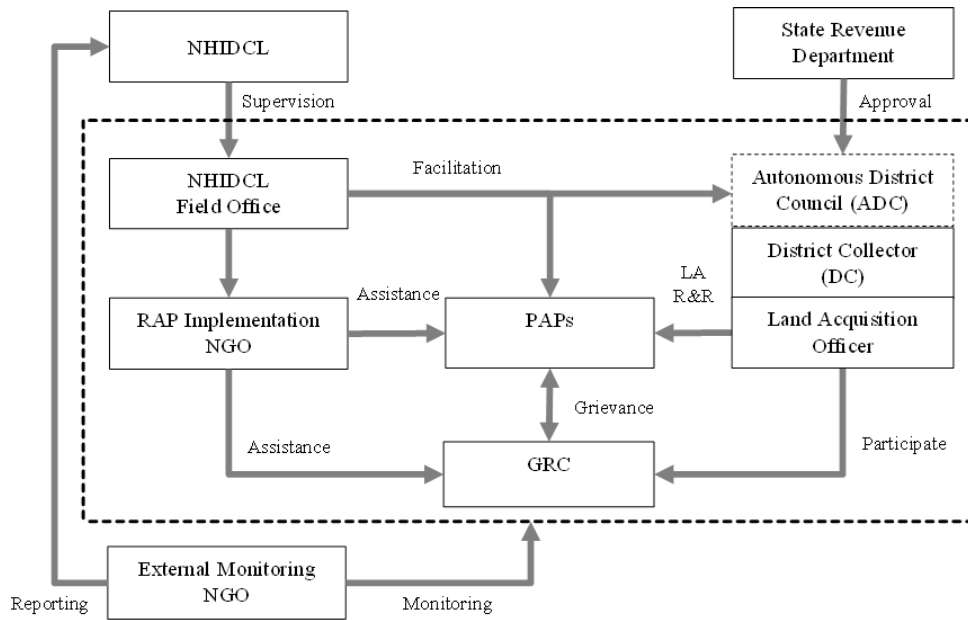
The primary institutions who will be involved in this implementation process are follows. The proposed institutional arrangement with their roles and responsibilities are shown in Table 8-1.

- National Highway and Infrastructure Development Corporation Ltd (NHIDCL)
- NHIDCL Regional Office
- Autonomous District Councils (ADC)
- Deputy Commissioner / District Collector (DC)
- Non-Government Organization (NGO)
- Grievance Redress Committee (GRC)

Table 8-1: Implementation Institute and Their Roles

Name	Members and Roles
Central Level Institution	
NHIDCL	<ul style="list-style-type: none"> • Project Implementation Agency • Ensure availability of budget for R&R activities • Responsible for coordination and monitoring of overall processes
State Government	
Revenue and Disaster Management Department	<ul style="list-style-type: none"> • Confirm notification of procedure for Land Acquisition
Meghalaya Institute of Governance (MIG)	<ul style="list-style-type: none"> • SIA Implementation agency for Meghalaya
District Government	
West Garo Hills Autonomous District Council (ADC)	<ul style="list-style-type: none"> • Issue No Objection Certificate for Land Acquisition
District Collector / Deputy Commissioner (DC) of each District	<ul style="list-style-type: none"> • Responsible for Land Acquisition, Resettlement and Rehabilitation
Land Acquisition Officers of each District	<ul style="list-style-type: none"> • Implementation land acquisition and resettlement
Other Implementation Agencies	
NHIDCL Local Office	<ul style="list-style-type: none"> • Oversee and monitor R&R activities implemented by district governments, assisted by NGO • Conduct internal monitoring
Non-Governmental Organization (NGO)	<ul style="list-style-type: none"> • Act as a representative of PAPs in communicating with district governments and NHIDCL local office • Assist PAPs through Land Acquisition, Resettlement and Rehabilitation activities • Conduct external monitoring
Grievance Redress Committee (GRC)	<ul style="list-style-type: none"> • Coordinate and resolve grievances submitted by PAPs
Project affected persons (PAP)	<ul style="list-style-type: none"> • Participation in the process of PAP activities
Contractor	<ul style="list-style-type: none"> • Consult with DC and community regarding location of construction camps • Restore the land to equal or better condition upon completion

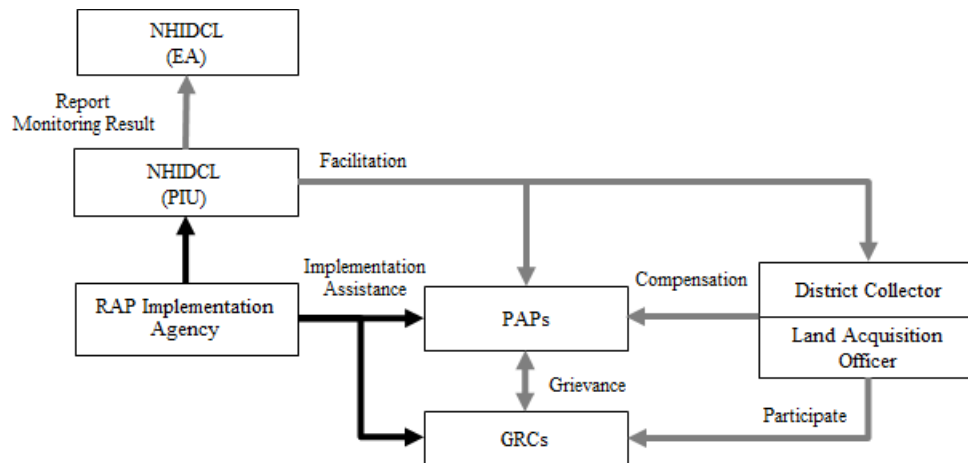
Source: JICA Study Team



Source: JICA Study Team

Figure 8-1: Institutional Arrangements for RAP Implementation

Implementation of RAP will be supported by RAP Implementation agency as shown below.



Source: JICA Study Team

Figure 8-2: Support Arrangement for RAP Implementation

CHAPTER 9 Resettlement Schedule

The proposed land acquisition and resettlement and rehabilitation activities are divided into three broad categories based on the stages of work, and process of implementation. The details of activities involved in these three phases are discussed below.

9.1 Preparation phase

The major activities to be performed in this period include preparation of RAP, submission of RAP for a government approval, appointment of NGO, establishment of NHIDCL Field Office and GRC etc. The information campaign and community consultation will be initiated from this stage, and will continue until the end of the project. Information will be disseminated using brochures and leaflets that will inform the community about the resettlement policy, entitlements, and any other necessary information deemed relevant for the effective implementation of the project.

9.2 Implementation phase

In the RAP implementation phase, land acquisition, payment of compensation and provision of all eligible assistances will be carried out by the DCs, assisted by NGOs using the GRM, and in consultation with PAPs wherever necessary. Activities including relocation of PAPs and initiation of income restoration program will follow. After the acquisition of lands, notice for the start of civil work will be issued.

9.3 Monitoring phase

The monitoring will be under the responsibility of the NHIDCL field office, and carried out by the RAP implementing NGO from project start to complementation. Recognizing that the project will have an impact on a relatively large number of PAPs, an external monitoring and reporting expert will be hired for the project.

The Resettlement Schedule is shown below. It will be implemented in accordance with principal activities as below, however, the sequence may change or delays may occur due to circumstances beyond the control of the project, and accordingly, the time shall be adjusted for the implementation of the plan.

Table 9-1: Resettlement Schedule

N o.	Activity	2015		2016				2017				2018				2019				2020				Responsible Agency		
		3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	Management	Implementation	
Preparation Stage																										
1	Preparation, finalization of alignment																								NHIDCL	AECOM
2	Issue No Objection Certificate (NOC)																								NHIDCL	ADC
3	Conduct census survey																								NHIDCL	AECOM
4	Preparation of RAP																								NHIDCL	AECOM
5	Declaration of cut-off-date																								DC	DC
6	Identification of PAP and compensation																								DC	DC
7	Disclosure of RAP																								NHIDCL/DC	DC
8	Consultations with PAPs																								NHIDCL	DC
9	Procurement of NGO																								NHIDCL	NHIDCL local
10	Review RAP																								NHIDCL	NGO
11	Establishment of GRC																								NHIDCL	DC/NGO
Implementation Stage																										
12	Land Acquisition																								DC	DC
13	Payment of Compensation																								NHIDCL	DC
14	Relocate houses, shops, businesses																								DC	DC
15	Grievance Redressing																								DC	NGO
16	Consultations with PAPs																								DC	NGO
17	Clear the ROW																								DC	DC
18	Income Restoration																								NHIDCL	NGO
19	Issue notice for start of civil works																								NHIDCL	DC
20	Civil works																								NHIDCL	Contractor
Monitoring Stage																										
21	Management Information System																								NHIDCL	NGO
22	Internal Monitoring ^(*)																								NHIDCL	NHIDCL local
23	External Monitoring ^(*)																								NHIDCL	NGO

NHIDCL: National Highways and Infrastructure Development Corporation Limited, AECOM: DPR Consultant, ADC: Autonomous District Councils, DC: Deputy Commissioner and/or District Collector

^(*) Internal monitoring will be carried out every month ^(*) External monitoring will be carried out every 6 months

Source: JICA Study Team

CHAPTER 10 Resettlement Budget

The cost estimation for land acquisition and resettlement includes the cost for affected lands, structures, trees, resettlement assistances and support cost for RAP implementation. In this survey, the budget estimation is only limited to those covered in the census survey which is around 70% of the total land plot numbers. Thus, the budget shall be revised at the time of land acquisition. Tentative budget calculated in this survey comes out to be Rs. 51 crores, 82 Lakhs and 50 thousands.

The budget will be secured by MORTH from the national budget based on an application from NHIDCL. The budget will be transferred from MORTH to DC through NHIDCL, and disbursed to entitled households.

Table 10-1: R&R Budget

Item	Unit	Unit Cost (Rs. In Lakh)	Quantity	Total (Rs. In Lakh)
I. Compensation				
Land (Rural)*	Acre	7.73	95.13	735.15
Land (Urban)*	Acre	36.06	42.30	1,525.63
Structure (Permanent)	Sq. m	0.15	1296	194.40
Structure (Semi Permanent)	Sq. m	0.1	3024	302.40
Structure (Temporary)	Sq. m	0.05	4100	205.00
Public / Govt. building	No.	Lump sum	1	12.00
Trees (Fruit)	No.	0.15	1897	284.55
Trees (Other)	No.	0.1	662	66.20
Crops		Lump sum		22.00
Sub-Total (I)				3,347.34
II. Allowance				
Resettlement allowance	Household	0.5	761	380.50
Shifting assistance	Household	0.5	127	63.50
Subsistence allowance	Household	0.36	761	273.96
Assistance for livelihood loss	Household	0.25	761	190.25
Assistance for agriculture labours	Household	0.5	95	47.50
Assistance to vulnerable HH	Household	0.25	468	118.50
Training fee	Household	0.2	1256	251.20
Sub-Total (II)				1,325.41
III. Implementation				
NGO fees	Per year	3	5 years	15.00
Staff training	Lump sum			3.00
Information disclosure / GRM	Lump sum	2	5 years	10.00
Livelihood restoration	Lump sum			10.00
Sub-Total (III)				38.00
Sub-Total (I+II+III)				4,710.75
Contingency				471.75
Total				5,182.50

Note: Villages in Char lands are considered "Rural", and villages elsewhere are considered "Urban".

Note: The details of the recipients of the allowances and assistances under the items of "II.Allowance" are as follows.

- Resettlement allowance: All PAHs
- Shifting allowance: Displaced family
- Subsistence allowance: All PAHs
- Assistance for loss of livelihoods: All PAHs
- Assistance to vulnerable HH: PAHs with vulnerable people
- Training fees: All PAHs

Source: JICA Study Team

CHAPTER 11 Monitoring and Evaluation

Monitoring is a periodic assessment of planned activities providing midway inputs, and gives necessary feedback of activities and the directions on which they are going. Whereas evaluation is a summing up activity at the end of the project, assessing whether the activities actually achieved their intended goals and purposes or not. The Project will adopt a two-tier monitoring system; internal monitoring and external monitoring and evaluation.

11.1 Internal Monitoring

Internal monitoring will be carried out by the NHIDCL field office with the assistance from a RAP Implementation NGO. RAP implementation agency will submit monthly report to the NHIDCL field office. The NHIDCL field office will review and assess the progress and results of RAP implementation by visiting the project site, preferably biannually, to monitor the current status and adjust the work program where necessary, in case of delays or any implementation problems as identified.

The objectives of internal monitoring are as follows.

- (i) To measure progress against the RAP implementation plan.
- (ii) To confirm if all entitlements agreed upon are delivered to PAPs.
- (iii) To identify critical issues that impedes the project or people, and suggests measures.
- (iv) To monitor the efficiency of the GRM.
- (v) To appraise the satisfaction of PAPs with the activities of the project.

The design of the Monitoring Form is shown below:

Table 11-1: Internal Monitoring Form

Major items of action	Specific action steps (sub-items)	Progress in quantity	Progress in %	Expected Date of Completion
Recruitment, training and deployment	Deployment of consultants and resettlement workers (MM)			
	Training and mobilization (No. of trained personnel)			
Review of Resettlement Action Plan	Review of RAP (%)			
	Finalization of PAPs (%)			
	Approval of RP with corrections (%)			
Socio-economic Survey	Field Survey, data collection, data analysis (%)			
	Valuation of affected property and collection of data (%)			
	Produce data for comparison/evaluation (%)			
Information campaign	Distribute information brochure (No. distributed)			
	Public consultation meetings/FGD (Times)			
Identification of PAPs	Assigning ID numbers (No. of Person)			
Payment	Opening bank account (No. of Person)			
	Assist PAPs to collect cash compensation (No. of Person)			
	Confirm payment transfers (No. of Person)			
Resettlement	Coordinate resettlement site with DC (No. of HH)			
	Assist relocation and resettlement (No. of HH)			

Major items of action	Specific action steps (sub-items)	Progress in quantity	Progress in %	Expected Date of Completion
Income restoration program	Training program, Assistant activities (No. of case)			
	Field Survey, data collection, data comparison (%)			
Grievance Redress	Formation of GRC (%)			
	Receiving complaints / claims from PAPs (No. of case)			
	Resolved complaints / claims from PAPs (No. of case)			
Supervision and Management	Supply of manpower (MM)			
	Number of meetings with relevant agencies (No. of meetings)			
Reporting	Inception / Monthly progress / Draft final report			

11.2 External Monitoring

External monitoring of RAP will be undertaken by the independent agency, a third party, to assess the implementation of resettlement, assistances and their impacts, and suggest any adjustments of delivery mechanisms and procedures as required. A post-resettlement evaluation will be carried out to confirm the effectiveness of the resettlement and assistance programmes in comparison with the baseline data.

The fundamental objectives of external monitoring are as follows.

- (i) To monitor the overall compliance of RAP in the project
- (ii) To monitor delivery of entitlement according to RAP
- (iii) To assess the resettlement outcomes in comparison with the baseline conditions
- (iv) To assess whether the livelihoods and living standards have been restored

Table 11-2: External Monitoring Form

Major Items in Actions	Details (Sub-items)	Answer	Remark
Review RAP	• Is the content of the RAP efficient and entitlements sufficient?	Yes/No	
	• Is the time frame and budget sufficient to meet objectives?	Yes/No	
Monitor operational process	• Has the census and asset verification/quantification procedures been implemented?	Yes/No	
	• Is the timing and duration of the hearing objections procedures adequate?	Yes/No	
	• Is the coordination between NGO, NHIDCL, and other line agencies effective in addressing the issues identified?	Yes/No	
Stakeholder consultation and participation	• Implementation of information dissemination and its adequacy	No. of cases	
	• Consultations and meetings with community, PAPs, vulnerable people, women, etc. are implemented.	No. of cases	
	• Number of GRC conducted, and participation of appropriate stakeholders including government officials, NHIDCL, PAPs.	No. of cases	
	• Types of complaints/grievances raised and resolved and time taken for the resolution of complaints/grievances	Describe	
Land and asset	• Agreement and consent received before the acquisition and change of official registration after the acquisition.	Progress	

Major Items in Actions	Details (Sub-items)	Answer	Remark
acquisition	• Land acquired (private and government owned land, land use by agricultural, residential, commercial etc.);	Progress	
	• Structures acquired (private buildings, government buildings and infrastructure etc.);	Progress	
	• Trees and crops acquired	Progress	
Delivery of entitlements	• Payment of compensation and assistance including the timing.	Progress	
	• Has the resettlement sites adequately prepared, when required?	Yes/No	
	• Has the compensation paid for temporary impact and has the site restored after construction?	Yes/No	
	• Level of satisfaction	Positive %	
Restoration of livelihoods	• Has the employment been provided to compensate the loss of earnings?	Yes/No	
	• Has job trainings and other assistance programs been provided and are they adequate to restore livelihoods?	Yes/No	
	• Monetary and technical assistances sufficient for livelihood restoration	Positive %	
	• Level of satisfaction	Positive %	
Economic activities of PAPs	• Employment status	Positive %	
	• Change in occupation and stability of income source	Positive %	
	• Change in income of households	Positive %	
	• Change in skill levels	Positive %	
Access to Infrastructure and networks	• Change in access to transport and mode of transportation	Positive %	
	• Change in access to markets	Positive %	
	• Change in access to health care, education facilities and other community facilities etc.	Positive %	

11.3 Stakeholder Consultation

Public consultations were arranged at the scoping phase and draft final report phase to ensure the participation of the community in the planning process, and to gather issues, comments and suggestions from the relevant stakeholders.

Consultation with the first stakeholder was held in two locations and followed by five community meetings and three focus group discussions, in order to cover project area and to have a comprehensive view on the project. Consultation with the second stakeholder was held in four locations where a majority of the PAPs have easy access.

Information for those who remained un-surveyed due to absence during the census survey period, information of stakeholder meeting and the summary of draft report, was shared by the land acquisition officers of respective districts and assistance from the village chiefs and neighboring residents. The same method will be employed for the information dissemination during the hearing objection period.

ANNEX

Annex 1: TOR for RAP Implementation Agency

1. Project Background

Ministry of Road Transport and Highways (MORT&H) plans to construct Two / Four lane bridge including approaches over River Brahmaputra between Dhubri on North Bank via newly formed South Salmara-Mankachar district villages, and Phulbari on South Bank in the state of Assam/Meghalaya on NH-127B under JICA loan. The bridge will be constructed approximately 20 km to provide better connection in a long continuous stretch.

NHIDCL has prepared Resettlement Action Plan (RAP) in compliance with State Government, Government of India and JICA Guideline for Environmental and Social Consideration which is in line with World Bank's OP 4.12.

The NGO shall be responsible for assisting NHIDCL in facilitating land acquisition and Resettlement Plan (RP) implementation in an efficient and transparent manner.

The proposed bridge traverses along 18 villages in Dhubri, South Salmara-Mankachar, West Garo Hills Districts. According to census survey in RAP report, the details of impacted land and displacement have been provided below.

Table 1: Summary of Impacts

Sl. No.	Impacts	Number
1	Total Area of Land required (in Hectares)	94.3
2	Area of private land to be acquired (in Hectares)	56.2
3	Total number of PAHs	761
4	Total number of PAPs	3,043
5	Total number of private structures affected	273
6	Total number of physically displaced households	127
7	Total number of physically displaced persons	500

2. Scope of Work

2.0 Coordination with Appropriate Government Agencies

Land acquisition and resettlement shall be implemented in close coordination and cooperation with respective government agencies as listed below. Current status of land acquisition process shall be confirmed prior to the Work.

- Dhubri District Collector and Land Acquisition Officer
- South Salmara-Mankachar District Collector and Land Acquisition Officer
- West Garo Hills District Collector (for Phulbari)

2.1 Update the Census Survey

- Confirm the validity of the information on affected and eligible families including loss of assets and loss of livelihoods (agricultural labours, boat operators, etc.) from the Project. Special attention shall be paid to land ownership in the project area as it is often divided into several families who do not appear on the government records and families who live on the

government land without legal documents. Those who are not covered in the census survey shall also be surveyed.

- Based on the above, prepare the list of eligible PAPs and their entitlement and benefits as per the entitlement framework (as described in the RAP).

2.2 Assistance on Land Acquisition

- Inform PIU about the shifting dates agreed with the PAPs in consultation with the PAPs.
- Assist the PAPs in opening bank accounts explaining the implications, the rules, and the obligations of a bank account and how they can access the resources they are entitled to.
- Assistance in Payment of Resettlement Benefits to PAPs in coordination with district administrators.
- Prepare Public Information Booklet” and circulate among PAPs and affected communities and provide information to PAPs about the respective entitlements as proposed under the RAP, and distribute entitlement cum ID Cards to the eligible PAPs.

2.3 Facilitate the Grievance Redress Mechanism

- Nominate a suitable person from the staff of the NGO⁹ to be a member of the Grievance Redress Committees (GRCs) at both local as well as district level.
- Inform PAPs about the function of GRMs/GRCs and how they can utilize the mechanism.
- Record the grievance and bring it to the notice of the GRCs in a timely manner. Assist PAPs to express their grievance in GRC and inform decisions taken by the GRC.
- In addition to receiving grievance, carry out periodic consultation with PAPs.

2.4 Assist PAPs for the Rehabilitation

- Survey alternative method of livelihood using local resources and opportunities¹⁰ available in the project area as well as outside. Consult with the PAPs in finding suitable economic rehabilitation options.
- Carry out exercise of skill mapping¹¹ and training needs assessment before finalization of training schemes and coordinate with the project, training institutions and non-government training agencies.
- Develop good rapport with the local financial institutions and facilitate access to credit at acceptable terms and conditions.
- Liaise with PIU / Contractor for construction related activities and design training program
- Establish linkage with the district administration for ensuring that the PAPs get access to government poverty reduction programs.
- Disseminate information to the PAPs on the possible economic opportunities available with the project.

2.5 Social Responsibility

- Conduct awareness program for HIV/AIDs, health and hygiene, and human trafficking in affected villages.

⁹ Local trusted NGO who can represent the opinions of the local people.

¹⁰ It may include agriculture/fishery products marketing, transportation services, trading goods, starting shops, etc.

¹¹ The process of identifying and understanding the specific knowledge and abilities which may differ according to the region, sex and vulnerability

- Assist PIU to ensure that the contractors are abiding by the applicable laws, concerning issues such as: child labour, discrimination in employment and occupation, minimum wages equal to male and female worker, health and safety measures as per contract.

2.5 Monitoring and Evaluation

- Collect data required on monitoring of RAP implementation and selected impact indicators on monthly basis.

2.6 Reporting

- Monthly progress reports to be submitted to at the end of each month. Shall include weekly progress and work charts as against the scheduled timeframe of RAP implementation.
- Completion Report at the end of the contract period summarizing the actions taken during the project, the methods, and personnel used to carry out the assignment, and a summary of support/assistance given to the PAPs.

3. Staffing requirement

The table below details the required staffing structure and qualification of experts for the assignment.

Table 2: Qualification of Staffs (RAP Implementation NGO)

Staff	Qualification
Team Leader	Minimum: Post graduate degree in social science, Sociology, Economics, Master in Social Work, Masters in Rural Development, Bachelors of law shall be added qualification 10 years of minimum professional experience 10 years of minimum relevant experience in implementing R&R activities. Previous experience in project funded by external donors. Good understanding of land acquisition process and LARR 2013
Social Development Expert	Minimum: Bachelor's degree in social science, Post graduate degree in social science is preferred 10 years of minimum professional experience 10 years of minimum relevant experience in community development and community awareness projects.
Field Coordinator	Minimum: Bachelor's degree in any discipline, Post graduate degree in social science is preferred 10 years of minimum professional experience 5 years of minimum relevant experience in R&R activities. Previous experience in project funded by external donors strongly preferred. Good understanding of land acquisition process and LARR, 2013. Proficient in local language is preferred.
Field Support Staff	Minimum: Bachelor's degree in any discipline. Post graduate degree in social science is added qualification 3 years of minimum professional experience Previous experience in working rural communities required. Proficiency in local language is required. Previous experience in land acquisition activities and working in the region is strongly preferred.

Sample monitoring form is as shown below.

Table 3: Monitoring Form (RAP Implementation NGO)

Major items of action	Specific action steps (sub-items)	Progress in quantity	Progress in %	Expected Date of Completion
Recruitment, training and deployment	Deployment of consultants and resettlement workers (MM)			
	Training and mobilization (No. of trained personnel)			
Review of Resettlement Action Plan	Review of RAP (%)			
	Finalization of PAPs (%)			
	Approval of RP with corrections (%)			
Socio-economic Survey	Field Survey, data collection, data analysis (%)			
	Valuation of affected property and collection of data (%)			
	Produce data for comparison/evaluation (%)			
Information campaign	Distribute information brochure (No. distributed)			
	Public consultation meetings/FGD (Times)			
Identification of PAPs	Assigning ID numbers (No. of Person)			
Payment	Opening bank account (No. of Person)			
	Assist PAPs to collect cash compensation (No. of Person)			
	Confirm payment transfers (No. of Person)			
Resettlement	Coordinate resettlement site with DC (No. of HH)			
	Assist relocation and resettlement (No. of HH)			
Income restoration program	Training program, Assistant activities (No. of case)			
	Field Survey, data collection, data comparison (%)			
Grievance Redress	Formation of GRC (%)			
	Receiving complaints / claims from PAPs (No. of case)			
	Resolved complaints / claims from PAPs (No. of case)			
Supervision and Management	Supply of manpower (MM)			
	Number of meetings with relevant agencies (No. of meetings)			
Reporting	Inception / Monthly progress / Draft final report			

Annex 2: TOR for External Monitoring Agency

1. Project Background

Ministry of Road Transport and Highways (MORT&H) plans to construct Two / Four lane bridge including approaches over River Brahmaputra between Dhubri on North Bank via newly formed South Salmara-Mankachar district villages, and Phulbari on South Bank in the state of Assam/Meghalaya on NH-127B under JICA loan. The bridge will be constructed approximately 20 km to provide better connection in a long continuous stretch.

NHIDCL has prepared Resettlement Action Plan (RAP) in compliance with State Government, Government of India and JICA Guideline for Environmental and Social Consideration which is in line with World Bank's OP 4.12.

The NGO shall be responsible for monitoring the process and evaluate the result of land acquisition and Resettlement Plan (RP) implementation in an efficient and transparent manner.

The proposed bridge traverses along 18 villages in Dhubri, South Salmara-Mankachar, West Garo Hills Districts. According to census survey in RAP report, the details of impacted land and displacement have been provided below.

Table 4: Summary of Impacts

Sl. No.	Impacts	Number
1	Total Area of Land required (in Hectares)	94.3
2	Area of private land to be acquired (in Hectares)	56.2
3	Total number of PAHs	761
4	Total number of PAPs	3,043
5	Total number of private structures affected	273
6	Total number of physically displaced households	127
7	Total number of physically displaced persons	500

2. Scope of Work

2.1 Review RAP

- Review the content of RAP to confirm that the entitlements are sufficient.
- Review the time frame and verify the adequacy of budget to meet the objectives of the RAP.
- Based on the above, provide recommendation for policy changes if required.

2.2 Monitoring of the Processes and Procedures

- Monitor the procedure and progress of the census and asset verification/quantification.
- Monitor the timing and duration of the hearing objections procedures.
- Monitor the effectiveness of the coordination between NGO, NHIDCL, and other line agencies in addressing the issues identified.
- Identify, quantify and qualify the types of conflicts and grievances reported and resolved and describe any outstanding actions that are required.
- Describe further mitigation measures needed to meet the needs of any PAPs if required.
- Review results of internal monitoring and verify claims through sampling check at the field level to assess whether land acquisition/resettlement objectives have been generally met.

2.2 Monitoring of Land Acquisition and Delivery of Entitlements

- Monitor that the agreement and consent were received before the acquisition and change of official registration after the acquisition.
- Monitor the quality, sufficiency of funds and on-time delivery of entitlements according to RAP.
- Monitor the payment of compensation and assistance including its levels and timing.
- Monitor the provision of employment, job trainings, other assistance programmes and their adequacy.
- Monitor that the equal opportunities are provided to women for the employment and no children are employed in construction work. Monitor the preparation and adequacy of resettlement sites, if it is required.
- Monitor the payment of compensation for temporary impact and restoration of site after the construction

2.3 Participation of PAPs in Monitoring and Evaluation

- During monitoring and evaluation activities, participation of all stakeholders shall be ensured, including the method described as follows;
- Community public meetings and Focused Group Discussions (FGD)
- Key informant interviews with select local leaders, village workers or persons with special knowledge or experience about resettlement activities and implementation.
- Informal surveys/interviews: informal surveys of PAPs, workers, resettlement staff, and implementing agency personnel using non-sampled methods.

2.5 Evaluation of Impacts after the Land Acquisition and Resettlement

- Establish by appropriate investigative and analytical techniques, the pre- and post- project socio-economic conditions of the PAPs.
- Approximately 20% census survey of persons who were severely affected by the project and have relocated either to group resettlement sites or preferred to self-relocate.
- Approximately 10% sample survey of persons who had property, assets, incomes and activities marginally affected by Project works and did not relocate.
- Approximately 10% sample survey of those affected by off-site project activities by contractors and subcontractors, including employment, use of land for contractor's camps, pollution, public health etc.
- **Monitoring items shall include the followings.**
 - Level of satisfaction from the livelihood restoration programme.
 - Change in economic activities (employment, occupation, income, skills, etc.)
 - Change in access to infrastructures (transport, markets, schools, hospitals, other social facilities, etc.)
 - Conflict within and among PAPs and non-PAPs due to unequal distribution of benefits and losses.

2.6 Reporting

- Biannual progress reports to be submitted including recommendation of actions if identified.
- Mid-term and final evaluation will be carried out to find out if the R&R objectives have been achieved as against the performance impact indicators.

3. Staffing requirement

The table below details the required staffing structure and qualification of experts for the assignment.

Table 5: Qualification of Staffs (External Monitoring Agency)

Staff	Qualification
Team Leader	Minimum: Post graduate degree in social science, Sociology, Economics, Master in Social Work, Masters in Rural Development shall be added qualification 10 years of minimum professional experience 10 years of minimum relevant experience in planning, implementation and monitoring of involuntary resettlement for infrastructure projects.
Livelihood Restoration Specialist	Minimum: Bachelor's degree in social science 10 years of minimum professional experience in social impact assessment including census and socioeconomic surveys, restoration of livelihood in compliance with safeguard policies of the international development agencies and national legislations. Experience of preparing/monitoring livelihood restoration program is essential.
Gender Specialist	Minimum: Bachelor's degree in social science 10 years of minimum professional experience 5 years of minimum relevant experience in social impact assessment including census and socioeconomic surveys, gender in compliance with safeguard policies of the international development agencies and national legislations. Experience of preparing/monitoring a gender program is essential.
Data Analyst	Minimum: Bachelor's degree in any discipline. 3 years of minimum professional experience. Working experience and knowledge of software, preferably relational, and data analysis are required.

Sample monitoring form is as shown below.

Table 5: Monitoring Form (External Monitoring Agency)

Major Items in Actions	Details (Sub-items)	Answer	Remark
Review RAP	• Is the content of the RAP efficient and entitlements sufficient?	Yes/No	
	• Is the time frame and budget sufficient to meet objectives	Yes/No	
Monitor operational process	• Has the census and asset verification/quantification procedures been implemented?	Yes/No	
	• Is the timing and duration during the hearing objections procedures adequate?	Yes/No	
	• Is the coordination between NGO, NHIDCL, and other line agencies effective in addressing the issues identified?	Yes/No	
Stakeholder consultation and participation	• Implementation of information dissemination and its adequacy	No. of cases	
	• Consultations and meetings with community, PAPs, vulnerable people, women, etc. are implemented.	No. of cases	
	• Number of GRC conducted, and participation of appropriate stakeholders including government officials, NHIDCL, PAPs.	No. of cases	
	• Types of complaints/grievances raised and resolved and time taken for the resolution of complaints/grievances	Describe	
Land and asset	• Agreement and consent received before the acquisition and change of official registration after the acquisition.	Progress	

Major Items in Actions	Details (Sub-items)	Answer	Remark
acquisition	• Land acquired (private and government owned land, land use by agricultural, residential, commercial etc.);	Progress	
	• Structures acquired (private buildings, government buildings and infrastructure etc.);	Progress	
	• Trees and crops acquired	Progress	
Delivery of entitlements	• Payment of compensation and assistance including the timing.	Progress	
	• Has the resettlement sites adequately prepared, when required?	Yes/No	
	• Has the compensation paid for temporary impact and has the site restored after construction?	Yes/No	
	• Level of satisfaction	Positive %	
Restoration of livelihoods	• Provision of employment to compensate loss of earnings	Yes/No	
	• Provision of job trainings and other assistance programs to restore livelihoods and their adequacy.	Yes/No	
	• Monetary and technical assistances sufficient for livelihood restoration	Positive %	
	• Level of satisfaction	Positive %	
Economic activities of PAPs	• Employment status	Positive %	
	• Change in occupation and stability of income source	Positive %	
	• Change in income of households	Positive %	
	• Change in skill levels	Positive %	
Access to Infrastructure and networks	• Change in access to transport and mode of transportation	Positive %	
	• Change in access to markets	Positive %	
	• Change in access to health care, education facilities and other community facilities etc.	Positive %	

添付資料-8

入札図書案のレビュー結果

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
0	IFB	Invitation for Bids		The draft made by MoRTH complies almost with JICA SBD, though there are some minor deviations.	acceptable
		Notes on Invitation for Bids	(a) as an advertisement in at one newspaper of general circulation in the Borrower's country; and	(a) as an advertisement in at one three newspaper of general circulation in the Borrower's country; and	acceptable
			There is no "Disclaimer" in JICA SBD.	<p>"DISCLAIMER" and "GLODDARY" are added at the end of IFB.</p> <p style="text-align: center;">DISCLAIMER</p> <p>The information contained in this Request for Proposal document (the "RFP") or subsequently provided to Bidder(s), whether verbally or in documentary or any other form by or on behalf of the Authority or any of its employees or advisors, is provided to Bidder(s) on the terms and conditions set out in this RFP and such other terms and conditions subject to which such information is provided.</p> <p>This RFP is not an Agreement and is neither an offer nor invitation by the Authority to the prospective Bidders or any other person. The purpose of this RFP is to provide interested parties with information that may be useful to them in making their financial offers (BIDs) pursuant to this RFP. This RFP includes statements, which reflect various assumptions and assessments arrived at by the Authority in relation to the Project. Such assumptions, assessments and statements do not purport to contain all the information that each Bidder may require. This RFP may not be appropriate for all persons, and it is not possible for the Authority, its employees or advisors to consider the investment objectives, financial situation and particular needs of each party who reads or uses this RFP. The assumptions, assessments, statements and information contained in the Bidding Documents, especially the [Feasibility Report], may not be complete, accurate, adequate or correct. Each Bidder should, therefore, conduct its own investigations and analysis and should check the accuracy, adequacy, correctness, reliability and completeness of the assumptions, assessments, statements and information contained in this RFP and obtain independent advice from appropriate sources.</p> <p>Information provided in this RFP to the Bidder(s) is on a wide range of matters, some of which may depend upon interpretation of law. The information given is not intended to be an exhaustive account of statutory requirements and should not be regarded as a complete or authoritative statement of law. The Authority accepts no responsibility for the accuracy or otherwise for any interpretation or opinion on law expressed herein.</p> <p>The Authority, its employees and advisors make no representation or warranty and shall have no liability to any person, including any Applicant or Bidder under any law, statute, rules or regulations or tort, principles of restitution or unjust enrichment or otherwise for any loss, damages, cost or expense which may arise from or be incurred or suffered on account of anything contained in this RFP or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of the RFP and any assessment, assumption, statement or information contained therein or deemed to form part of this RFP or arising in any way for participation in this BID Stage.</p> <p>The Authority also accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any Bidder upon the statements contained in this RFP. The Authority may in its absolute discretion, but without being under any obligation to do so, update, amend or supplement the information, assessment or assumption contained in this RFP.</p> <p>The issue of this RFP does not imply that the Authority is bound to select a Bidder or to appoint the Selected Bidder JV or Contractor, as the case may be, for the Project and the</p>	<p>acceptable</p> <p>(Source of "DISCLAIMER" and "GLODDARY") Model RFP Vol I EPC 16.1.17, Page 5 - 6</p>

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
				<p>Authority reserves the right to reject all or any of the Bidders or BIDs without assigning any reason whatsoever.</p> <p>The Bidder shall bear all its costs associated with or relating to the preparation and submission of its BID including but not limited to preparation, copying, postage, delivery fees and expenses associated with any demonstrations or presentations which may be required by the Authority or any other costs incurred in connection with or relating to its BID. All such costs and expenses will remain with the Bidder and the Authority shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by a Bidder in preparation or submission of the BID, regardless of the conduct or outcome of the Bidding Process.</p> <p style="text-align: center;">GLOSSARY</p> <p>Agreement As defined in Clause 1.1.5 Authority As defined in Clause 1.1.1 Bank Guarantee As defined in Clause 2.20.1 BID(s) As defined in Clause 1.2.2 Bidders As defined in Clause 1.2.2 Bidding Documents As defined in Clause 1.1.7 BID Due Date As defined in Clause 1.1.7 Bidding Process As defined in Clause 1.2.1 BID Security As defined in Clause 1.2.4 BID Price or BID As defined in Clause 1.2.6 Contractor As defined in Clause 1.1.2 Conflict of Interest As defined in Clause 2.2.1 EPC/Design Build As defined in Clause 1.1.1 Contract As defined in Clause 1.1.2 Estimated Project Cost As defined in Clause 1.1.4 Feasibility Report As defined in Clause 1.2.3 Government of ***** Joint Venture As defined in Clause 2.2.1 Lowest Bidder As defined in Clause 1.2.6 LOA As defined in Clause 3.3.4 Project As defined in Clause 1.1.1 Re. or Rs. or INR Indian Rupee RFP or Request for Proposals As defined in the Disclaimer</p> <p>The words and expressions beginning with capital letters and defined in this document shall, unless repugnant to the context, have the meaning ascribed thereto herein.</p>	
1	I Instructions to Bidders (Single-Stage Two-Envelope Bidding)	3. Corrupt and Fraudulent Practices	3.2 Furthermore, Bidders shall be aware of the provision stated in Sub-Clause 15.6 [Corrupt and Fraudulent Practice] of General Conditions.	<p>The below is added as “3.2” and the original “3.2” becomes “3.3”.</p> <p>3.2 I Any entity which has been barred by the Ministry of Road Transport & Highways or its implementing agencies for the works of Expressways, National Highways, ISC and EI works, and the bar subsists as on the date of Application, would not be eligible to submit the BID, either individually or as member of a Joint Venture.</p> <p>II While bidding is open to persons from any country, the following provisions shall apply:</p> <p>(a) Where, on the date of the Application, not less than 15% (fifteen percent) of the aggregate issued, subscribed and paid up equity share capital in a Bidder or its Member is held by persons resident outside</p>	<p>1) Section I can not be revised and/or added.</p> <p>2) If any revisions and/or additions in Section I, such revisions and/or additions should be specified in Section II.</p> <p>(Source of 3.2 I) Model RFP Vol I EPC 16.1.17</p>

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
				<p>India or where a Bidder or its Member is controlled by persons resident outside India; or</p> <p>(b) if at any subsequent stage after the Bid due date, there is an acquisition of not less than 15% (fifteen percent) of the aggregate issued, subscribed and paid up equity share capital or control, by persons resident outside India, in or of the Bidder or its Member; then the Eligibility of such Bidder shall be subject to approval of the Authority from national security and public interest perspective. The decision of the Authority in this behalf shall be final and conclusive and binding on the Bidder.</p> <p>The holding or acquisition of equity or control, as above, shall include direct or indirect holding/ acquisition, including by transfer, of the direct or indirect legal or beneficial ownership or control, by persons acting for themselves or in concert and in determining such holding or acquisition, the Authority shall be guided by the principles, precedents and definitions contained in the Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeovers) Regulations, 1997, or any substitute thereof, as in force on the date of such acquisition.</p> <p>The Bidder shall promptly inform the Authority of any change in the shareholding, as above, and failure to do so shall render the Bidder liable for disqualification from the Bidding Process.</p> <p>3.3 Furthermore, Bidders shall be aware of the provision stated in Sub-Clause 15.6 [Corrupt and Fraudulent Practice] of General Conditions.</p>	<p>2.1.18, Page 13</p> <p>(Source of 3.2 II) Model RFP Vol I EPC 16.1.17, 2.1.16, Page 12</p>
2	I	4. Eligible Bidders	4.1, 4.2, 4.3, 4.4, 4.5 and 4.6 (There is not "4.7" in 4. Eligible Bidders)	<p>4.7</p> <p>In case the Bidder is a Joint Venture, it shall comply with the following additional requirements:</p> <p>(a) Number of members in a Joint Venture shall not exceed 3 (Three);</p> <p>(b) subject to the provisions of clause (a) above, the Bid should contain the information required for each Member of the Joint Venture;</p> <p>(c) Members of the Joint Venture shall nominate one member as the lead member (the "Lead Member"). Lead Member shall met at least 60% requirement of Bid Capacity, Technical and Financial Capacity, required as per Clause 2.2.2.1, 2.2.2.2(i) & 2.2.2.3. The nomination(s) shall be supported by a Power of Attorney, as per the format at Appendix-III, signed by all the other Members of the Joint Venture. Other Member(s) shall meet at least 20% requirement of Bid Capacity, Technical and Financial Capacity required as per Clause 2.2.2.1, 2.2.2.2(i) & 2.2.2.3 and the JV as a whole shall cumulatively/collectively fulfil the 100%</p>	<p>1) Section I can not be revised and/or added.</p> <p>2) If any revisions and/or additions in Section I, such revisions and/or additions should be specified in Section II.</p> <p>In addition, "4.7" has many eligibility requirements to be specified in Section III. Therefore, it is recommended to specify the eligibility</p>

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
				<p>requirement;</p> <p>(d) the Bid should include a brief description of the roles and responsibilities of individual members, particularly with reference to financial, technical and defect liability obligations;</p> <p>(e) an individual Bidder cannot at the same time be member of a Joint Venture applying for this Bid. Further, a member of a particular Bidder Joint Venture cannot be member of any other Bidder Joint Venture applying for this bid;</p> <p>(f) Deleted,</p> <p>(g) members of the Joint Venture shall have entered into a binding Joint Bidding Agreement, substantially in the form specified at Appendix V (the “Jt. Bidding Agreement”), for the purpose of making the Application and submitting a Bid in the event of being pre-qualified. The Jt. Bidding Agreement, to be submitted along with the Application, shall, inter alia:</p> <p>(i) convey the commitment(s) of the Lead Member in accordance with this RFP, in case the contract to undertake the Project is awarded to the Joint Venture; and clearly outline the proposed roles & responsibilities, if any, of each member;</p> <p>(ii) commit the approximate share of work to be undertaken by each member;</p> <p>(iii) include a statement to the effect that all members of the Joint Venture shall be liable jointly and severally for all obligations of the Contractor in relation to the Project until the completion of the Project (the “Defects Liability Period”) is achieved in accordance with the EPC Contract; and</p> <p>(h) except as provided under this RFP, there shall not be any amendment to the Jt. Bidding Agreement.</p> <p>(i) No Joint Venture up to Estimate Project Cost of Rs. 100 crores (One Hundred Crores).</p>	<p>requirements in Section III.</p> <p>(Source of 4.7) Model RFP Vol I EPC 16.1.17, 2.1.15, Page 11</p>
3	I	4. Eligible Bidders	(There is no “4.8” in 4. Eligible Bidders)	<p>4.8</p> <p>While bidding is open to persons from any country, the following provisions shall apply:</p> <p>(a) Where, on the date of the Application, not less than 15% (fifteen percent) of the aggregate issued, subscribed and paid up equity share capital in a Bidder or its Member is held by persons resident outside India or where a Bidder or its Member is controlled by persons resident outside India; or</p> <p>(b) if at any subsequent stage after the Bid due date, there is an acquisition of not less than 15% (fifteen percent) of the aggregate issued, subscribed and paid up equity share capital or control, by persons resident outside India, in or of the Bidder or its Member;</p>	<p>acceptable</p> <p>(Source of 4.8) Model RFP Vol I EPC 16.1.17 2.1.16, Page 12</p> <p>(Note) This “4.8” is the same as “3.2 II” above (Line No.1).</p>

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)	
				<p>then the Eligibility of such Bidder shall be subject to approval of the Authority from national security and public interest perspective. The decision of the Authority in this behalf shall be final and conclusive and binding on the Bidder.</p> <p>The holding or acquisition of equity or control, as above, shall include direct or indirect holding/ acquisition, including by transfer, of the direct or indirect legal or beneficial ownership or control, by persons acting for themselves or in concert and in determining such holding or acquisition, the Authority shall be guided by the principles, precedents and definitions contained in the Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeovers) Regulations, 1997, or any substitute thereof, as in force on the date of such acquisition.</p> <p>The Bidder shall promptly inform the Authority of any change in the shareholding, as above, and failure to do so shall render the Bidder liable for disqualification from the Bidding Process.</p>		
4	I	13. Alternative Bids	13.1, 13.2, 13.3 and 13.4	(All of "13 Alternative Bids" is deleted.)	<p>1) Section I can not be revised and/or added.</p> <p>2) These revisions should be specified in Section II.</p> <p>(Source) Model RFP Vol I EPC 16.1.17</p> <p>1) 2.10, Page 25 2) 2.11, Page 25 3) 2.12, Page 27 4) 2.13, Page 27 5) 2.14, Page 27 6) 2.15, Page 29 7) 2.16, Page 29 8) 2.17, Page 29 9) 2.18, Page 29 10) 2.19, Page 29</p>	
5	I	23. Submission, Sealing and Marking of Bids	23.1, 23.2, 23.3, 23.4 and 23.5	(All of "23 Submission, Sealing and Marking of Bids" is deleted.)		
6	I	24. Deadline for Submission of Bids	24.1 and 24.2	(All of "24 Deadline for Submission of Bids" is deleted.)		
7	I	25. Late Bids	25.	(All of "25 Late Bids" is deleted.)		
8	I	26. Withdrawal	26.1, 26.2 and 26.3	(All of "26 Withdrawal" is deleted.)		
9	I	27. Bid Opening	27.2, 27.2, 27.3, 27.4, 27.5, 27.6, 27.7, 27.8, 27.9, 27.10 and 27.11	<p>(All of "27 Bid Opening" is deleted.)</p> <p>In addition,</p> <p>1) "2.10 Format and Signing of BID" is added.</p> <p>2) "2.11 Documents comprising Technical and Financial BID" is added.</p> <p>3) "2.12 Bid Due Date" is added.</p> <p>4) "2.13 Late Bids" is added.</p> <p>5) "2.14 Procedure for e-tendering" is added.</p> <p>6) "2.15 Online Opening of Bids" is added.</p> <p>7) "2.16 rejection of Bids" is added.</p> <p>8) "2.17 validity of Bids" is added.</p> <p>9) "2.18 Confidentiality" is added.</p> <p>10) "2.19 Correspondence with the Bidder" is added.</p>		
10	I	32. Qualification of the Bidders	32.1, 32.2, 32.3 and 32.4	<p>(All of "32 Qualification of the Bidders" is deleted.)</p> <p>In addition,</p> <p>1) "2.1 Bid Capacity" is added.</p> <p>2) "2.2 Technical Capacity" is added.</p>		
						2) These revisions should

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
				<p>3) "2.2.2.3 Financial Capacity" is added. 4) "2.2.2.4 In case of a Joint Venture" is added. 5) "2.2.2.5 Categories and factors for evaluation of Technical Capacity" is added. 6) "2.2.2.6 Eligible Experience on Eligible Projects in respect of each category" is added. 7) "2.2.2.7" is added. 8) "2.2.2.8 Submission in support of Financial capacity" is added. 9) "2.2.2.9" is added. 10) "2.2.2.10" is added.</p> <p>(Note-1) The tables in each clause above are broken.</p>	<p>be specified in Section II and Section III.</p> <p>Almost all of the additions (2.1, 2.2, 2.2.23, 2.2.24, 2.2.25, 2.2.26, 2.2.27, 2.2.28, 2.2.29 and 2.2.10) are eligibility requirements. Therefore, these additions should be specified in Section III.</p> <p>(Source) Model RFP Vol I EPC 16.1.17 2.2.2 Qualification requirements of Bidders, Page 15</p>
11	I	38. Evaluation of Price Bids	<p>38.5 If the Bid, which results in the lowest evaluated Bid Price, is seriously unbalanced or front loaded in the opinion of the Employer, the Employer may require the Bidder to produce detailed price analyses for any or all items of the Price Schedules, to demonstrate the internal consistency of those prices with the methods and the Price Schedules proposed. After evaluation of the price analyses, taking into consideration the Schedule of Payment, the Employer may require that the amount of the Performance Security be increased at the expense of the Bidder to a level sufficient to protect the Employer against financial loss in the event of default of the successful Bidder under the Contract.</p>	<p>(All of 38.5 is deleted and replaced with the below.) 38.5 performance Security 38.5.1 Within 28 (twenty eight) days of receipt of Letter of Award, the selected Bidder shall furnish to the Authority an irrevocable and unconditional guarantee from a Bank in the format set forth in Appendix-VII (the "Performance Security) and for an amount equal to 5% (five percent) of its Bid Price. In case of unbalanced bids the Selected Bidder alongwith the Performance Security shall also furnish to the Authority an irrevocable and unconditional guarantee from a Bank an Additional Performance Security in the format given at Appendix-VII (the "Additional Performance Security) for an amount calculated as under: (i) If the Bid Price offered by the Selected Bidder is lower than 10% but upto 20% of the Estimated Project Cost, then the Additional Performance Security shall be calculated @20% of the difference in the (a) Estimated Project Cost (as mentioned in RFP)-10% of the Estimated Project Cost and (b) the Bid Price offered by the selected Bidder. (ii) If the Bid Price offered by the Selected Bidder is lower than 20% of the Estimated Project Cost, then the Additional Performance Security shall be calculated @30% of the difference in the (a) Estimated Project Cost (as mentioned in RFP)-10% of the Estimated Project Cost and (b) the Bid Price offered by the selected Bidder. (iii) The Additional Performance Security shall be treated as part of</p>	<p>1) Section I can not be revised and/or added.</p> <p>2) If any revisions and additions in original "38.5", these are specified in Section II.</p> <p>3) "38.5 performance Security should be specified in Section II and Section VIII (PC)-Part A.</p> <p>(Source of 38.5) Model RFP Vol I EPC 16.1.17 2.20.6 Performance Security, Page 31</p> <p>(Note) "38.5" is complies with Substitution proposed by JICA in MoRTH's EPC</p>

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
				<p>Performance Security. The Selected Bidder may initially provide the Performance Security and Additional Performance Security, if any, for a period of 2 (two) years; provided that it shall procure the extension of the validity of the Performance Security and Additional Performance Security, if any, as necessary, at least 2 (two) months prior to the date of expiry thereof.</p> <p>38.5.2 In the event the Selected Bidder fails to provide the Performance Security and Additional Performance Security, if any, within 30 (thirty) days of receipt of Letter of Award, it may seek extension of time for a period not exceeding 60 (Sixty) days on payment of Damages for such extended period in a sum calculated at the rate of 0.01% (zero point zero one per cent) of the Bid Price offered by the Selected Bidder for each day until the Performance Security and Additional Performance Security, if any, is provided. For the avoidance of doubt, in case of failure of submission of Performance Security and Additional Performance Security (if any) within the additional 60 days time period, the award shall be deemed to be cancelled/ withdrawn and Bid security shall be encashed by the Authority.</p> <p>38.5.3 In the event the date of submission of Performance Security and Additional Performance Security (if any) is granted with mutual consent of both parties i.e. the Authority and the bidder, within the additional 60 days time period.</p>	Documents (No. 17), May, 2016.
12	II	13. Alternative Bids	ITB 13.4 [If alternative technical solutions are invited, insert the parts for which they are permitted; otherwise, delete this Clause 13.4 of the BDS.]	ITB 13.4 [If alternative technical solutions are invited, insert the parts for which they are permitted; otherwise, delete this Clause 13.4 of the BDS.] This clause is Deleted	ITB 13.4 should be deleted.
13	III	Evaluation and Qualification Criteria (Without Prequalification)	1. Evaluation 1.1 Technical Evaluation 1.1.1 Personnel 1.1.2 Equipment 1.1.3 Others 1.2 Economic Evaluation 1.2.1 Quantifiable nonmaterial nonconformities 1.2.2 Other Factors 1.2.3 Award Criteria for Multiple Contracts (ITB 38.4) 1.3 Alternative Completion Times 1.4 Alternatives Technical	(All of Section III of JICA SBD is deleted and replaced with the below.) 3.1 Evaluation of Technical Bids 3.1.1 Date of Opening 3.1.2 Submission 3.1.3 Incompletion of Technical Bid 3.1.4 Clarification 3.1.5 Rejection of a Bidder who does not respond to Clarifications. 3.1.6 Tests of responsiveness 3.2 Opening and Evaluation of Financial Bids 3.3 Selection of Bidder 3.4 Contacts during BID Evaluation 3.5 Correspondence with Bidder 3.6	It is recommended to comply with Section III of JICA SBD as much as possible, though it is OK to include the draft made by MoRTH (3.1, 3.2, 3.3, 3.4 and 3.5) in the final draft. 1) It is requested to include each “Eligibility and Qualification Criteria” in “2. Qualification, Section III”. 2) It is recommended to

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
			Solutions 2. Qualification 2.1 Eligibility 2.2 Historical Contract Non-performance 2.3 Financial Situation 2.4 Experience 2.5 Subcontractors/manufacturers	3.7	specify how to give points for each technical requirement. (Source of 3.1 – 3.5) Model RFP Vol I EPC 16.1.17 3.1 Evaluation of Technical Bids, Page 32
			<p>(コメント) Bidder にとって、提出した入札書類が、どのように評価され、採点され、その合否の判定がどうなっているのか、非常に気になります。なので、Bidders にとっては、Section III の内容は、非常に大事なものです。これに関して、以下、コメントします：</p> <p>①Section III には、Bidders にとって、明確に記載してほしい事項は、以下です：</p> <p>1) Technical Bids と Price Bids の評価プロセス</p> <p>2) Bidders の Eligibility に関する評価(各 Requirements に対する評価項目の内訳、各評価項目の配点/重み付け)の仕組み、合否判定(Pass or Fail)の基準</p> <p>3) Technical Proposal に求められる各 Proposal*に対する、評価のポイント、評価項目の内訳、各評価項目の配点/重み付け)の仕組み、1位の Bidder の選定基準(合格点)</p> <p>*各 Proposal：Site Organization, Method Statement, Mobilization Schedule, Construction Schedule, Preliminary Design, Plant, Safety Plan, Schedule of Guarantee, Personnel, Contractor's Equipment, Spare Parts, Proposed Subcontractors for Major Items of Plant, Design, Supply and Installation Services, [Others]</p> <p>(備考 1) Technical な提案書の提出を求める上記の項目として、「Method Statement」は「Method Statement of Design & Build」、「Construction Schedule」は「Schedule of Design & Build」と記載した方が良いでしょう。</p> <p>(備考 2) 「Preliminary Design」は、Bidding Documents に添付される概念設計についてコメントを求める という主旨だろうと判断しますが、「Comments on Preliminary Design attached in the RFP」のように主旨が理解できるタイトルにした方が良いでしょう。</p> <p>②JICA SBD の Section III も、MoRTH の Draft も、共に、上記に示した「Bidders にとって、明確に記載してほしい事項」を含んでいません。今後、Final Draft 化に向けて手作りが必要だと思います。</p>		
14	IV	Bidding Forms		“APPENDIX VI INTEGRITY PACT FORMAT” is added.	Acceptable (Source of APPENDIX VI) Model RFP Vol I EPC 16.1.17, Page 71
15	VI	Employer's Requirements	Table of Contents • Scope of Works • Technical requirements	(All of Section VI of JICA SBD is deleted and replaced with the below.) Schedule-A: SITE OF THE PROJECT Schedule B: Development of the Project	It is recommended for the Consultants in charge of Design to review Section VI.

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
			<ul style="list-style-type: none"> Outline Drawings Supplementary Information 	Schedule – C: PROJECT FACILITIES Schedule – D: SPECIFICATIONS AND STANDARDS SCHEDULE – E: MAINTENANCE REQUIREMENTS SCHEDULE – F: APPLICABLE PERMITS SCHEDULE – G: FORM OF BANK GUARANTEE Schedule-H: Contract Price Weightages SCHEDULE – I: DRAWINGS SCHEDULE – J: PROJECT COMPLETION SCHEDULE SCHEDULE – K: Tests on Completion SCHEDULE – L: PROVISIONAL CERTIFICATE SCHEDULE – M: PAYMENT REDUCTION FOR NON-COMPLIANCE SCHEDULE – N: SELECTION OF AUTHORITY’S ENGINEER SCHEDULE – O: Forms of Payment Statements SCHEDULE – P: INSURANCE	(Source of Schedule: A -P) Final Model EPC Agreement 16.01.2017, Page 134 - 211
16	VIII Particular Conditions	Part A Contract data	1.1.3.3 Time for Completion <i>[Insert the time for completion of the whole of the Works]</i>	1.1.3.3 Time for Completion 7 years 9 months	It is recommended to add “from the commencement date” after “7 years 9 months”
17	VIII Particular Conditions	Part A Contract data	1.1.3.7 Defects Notification period <i>[365 days]</i>	1.1.3.7 Defects Notification period 4 years	It is recommended to include the specifications which require the useful life time (more than 4 years) for each part of the Works in Section VI (Employer’s Requirements).
			<p>(コメント) 「Defects Notification period 4 years」について</p> <ul style="list-style-type: none"> 「Defects Notification period 4 years」には、Contractor に対して片務契約の疑いを感じます。 Warranty(アフターケア)として4年を要求するなら、Bidders は、4年のアフターケア費用を入札価格に含めれば対応可能です。 しかし、「Defects Notification period 4 years」とするなら、Section VI で要求する Specifications に「竣工後、間違いなく耐用年数が4年以上となる仕様を明確に規定する必要があります。」 そうでないと、竣工から4年後のダメージが、設計責任なのか、施工責任なのか、判定するのは困難になります。 「Defects Notification period 4 years」 業者の手抜き工事を懸念して、Defects Notification period を長くしたいという気持ちは理解できますが、契約上は、工事監理者が、施工が契約書どおりに行われているかを日々チェックし、竣工検査で OK なら Certificates を発行して引き取るので、竣工後4年間も瑕疵担保を供給されるのは酷です。入札がこの条件で実施される場合、4年というリスクを負うことになるので、正常な Contractors は、このリスクを金額に換算して、提出金額に加算することになります。 		

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
18	VIII Particular Conditions	Part A Contract data	<p>4.2 Performance Security <i>The Performance Security will be in the form of a "demand guarantee" or "performance bond" in the amount(s) of [insert percentage] percent of the Accepted Contract Amount and in the same currency(ies) of the Accepted Contract Amount.</i></p> <p><i>If the Performance Security of the Contract is in accordance with the ICC Publication No. 758, insert the following sentences; Performance Security of this contract is in accordance with the ICC Publication No.758, the 6th paragraph, "The Employer shall return the Performance Security to the Contractor within 21 days after receiving a copy of the Performance Certificate" is deleted.</i></p>	<p>4.2 Performance Security The instruction at the left is deleted and replaced with: This clause will be superseded by Article 7 of MoRT&H's EPC document provided with this PC.</p>	<p>acceptable</p> <p>(Source of Article 7) Final Model EPC Agreement 16.01.2017, Page 32</p>
19	VIII Particular Conditions	Part A Contract data	(There is no "4.4" in JICA SBD.)	<p>"4.4 Subcontractor" is added. The following write-up will supersede the GC clause (ref clause 3.2 of MoRT&H's EPC document:</p> <p>4.4 Obligations relating to sub-contracts and any other agreements</p> <p>4.4.1 The Contractor, whether Consortium/Joint Venture or sole, shall not sub-contract any Works in more than 49% (forty nine per cent) of the total length of the Project Highway and shall carry out Works directly under its own supervision and through its own personnel and equipment in at least 51% (fifty one per cent) of the total length of the Project Highway. Provided, however, that in respect of the Works carried out directly by the Contractor, it may enter into contracts for the supply and installation of Materials, Plant, equipment, road furniture, safety devices and labour, as the case may be, for such Works. For the avoidance of doubt, the Parties agree that the Contractor may sub-divide the aforesaid length of 51% (fifty one per cent) in no more than 5 (five) sections of the Project Highway. The Parties further agree that all obligations and liabilities under this Agreement for the entire project Highway shall at all</p>	<p>acceptable</p> <p>(Source of 4.4) Final Model EPC Agreement 16.01.2017, Page 20</p>

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
				<p>times remain with the Contractor.* (*May be deleted if the Contractor is not a Consortium) 4.4.2. In the event any sub-contract for Works, or the aggregate of such sub-contracts with any Sub-contractor, exceeds 5% (five percent) of the Contract Price, the Contractor shall communicate the name and particulars, including the relevant experience of the sub-contractor, to the Authority prior to entering into any such sub-contract. The Authority shall examine the particulars of the sub-contractor from the national security and public interest perspective and may require the Contractor, no later than 15 (fifteen) business days from the date of receiving the communication from the Contractor, not to proceed with the sub-contract, and the Contractor shall comply therewith. 4.4.3 In the event any sub-contract referred to in Clause 3.2.2 relates to a sub-contractor who has, over the preceding 3 (three) years, not undertaken at least one work of a similar nature with a contract value exceeding 40% (forty per cent) of the value of the sub-contract to be awarded hereunder and received payments in respect thereof for an amount equal to at least such 40% (forty per cent), the Authority may, no later than 15 (fifteen) business days from the date of receiving the communication from the Contractor, require the Contractor not to proceed with such sub-contract, and the Contractor shall comply therewith. 4.4.4 It is expressly agreed that the Contractor shall, at all times, be responsible and liable for all its obligations under this Agreement notwithstanding anything contained in the agreements with its Sub-contractors or any other agreement that may be entered into by the Contractor, and no default under any such agreement shall excuse the Contractor from its obligations or liability hereunder.</p>	
20	VIII Particular Conditions	Part A Contract data	8.1 (c) Commencement of Works <i>[Insert date effective access to the site is granted, if applicable. Otherwise delete this CD 8.1(c).]</i>	8.1 (c) Commencement of Works The instruction at the left is deleted and replaced with: This clause will be superseded by Article 4 of MoRT&H's EPC document provided with this PC.	What id the source of Article4? "Article 4" is "Compensation for Damages" in the File "Model RFP Vol I EPC 16.1.17". "Article 4" is "OBLIGATIONS OF THE AUTHORITY" in the File "Final Model EPC Agreement 16.01.2017".

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
21	VIII Particular Conditions	Part A Contract data	(There is no "11." in JICA SBD.)	"11. Defect Liability" is added: This clause will be superseded by Article 17 of MoRT&H's EPC document provided with this PC.	acceptable (Source of "Article 17) Final Model EPC Agreement 16.01.2017, Page 72 Article 17: Defects Liability
22	VIII Particular Conditions	Part A Contract data	14.2 Total advance payment <i>[Insert percentage]%, Percentage of the Accepted Contract Amount payable in the currencies and proportions in which the Accepted Contract Amount is payable [Insert number and timing of installments, if applicable]</i>	14.2 Total advance payment The instruction at the left is deleted and replaced with: The following write-up will supersede the GC clause (ref clause 19.2 of MoRT&H's EPC document: 14.2 Advance Payment 14.2.1 The Authority shall make an interest-bearing (@ Bank Rate\$) advance payment (the "Advance Payment"), equal in amount to 10 (ten) percent of the Contract Price, exclusive for mobilisation expenses. The Advance Payment for mobilisation expenses shall be made in two instalments each equal to 5% (five percent) of the Contract Price. The second 5% (five percent) mobilisation advance would be released after submission of utilization certificate by the Contractor for the first 5% advance already released earlier. In addition to above, the Authority shall make an additional interest-bearing advance payment against newly purchased key construction equipment required for the works as per agreed construction programme and brought to the site, if so requested by the Contractor subject to the same terms and conditions specified for Advance Payment for mobilisation expenses in this Agreement. The maximum of such advance shall be 5% (five percent) of the Contract Price against Bank Guarantee. This advance shall be further subject to the condition that (i) such new equipment are considered by the Authority's Engineer to be necessary for the works and (ii) these new equipment should be procured in the name of Contractor and is verified by Authority's Engineer to have been brought to site. The Advance Payment for mobilization expenses and for acquisition of key new construction equipment would be deemed as interest bearing advance at Bank Rate, to be compounded annually. The interest would be recovered along with the recovery of mobilization Advance Payment in equal installments as per provision laid down for the mobilization advance recovery..	acceptable (Source of Article 19.2) Final Model EPC Agreement 16.01.2017", Page 78 Article 19.2: Advance Payment

^s Bank Rate shall be as declared by Reserve Bank of India (RBI).

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
				<p>14.2.2 The Contractor may apply to the Authority for the first instalment of the Advance Payment at any time after the Appointed Date, along with an irrevocable and unconditional guarantee from a Bank for an amount equivalent to 110% (one hundred and ten per cent) of such instalment, substantially in the form provided at Annex-III of Schedule-G, to remain effective till the complete and full repayment thereof.</p> <p>14.2.3 Deleted.</p> <p>14.2.4 At any time, after 60 (sixty) days from the Appointed Date, the Contractor may apply to the Authority for the second instalment of the Advance Payment along with an irrevocable and unconditional guarantee from a Bank for an amount equivalent to 110% (one hundred and ten per cent) of such instalment, substantially in the form provided at Annex-III of Schedule-G, to remain effective till the complete and full repayment thereof.</p> <p>14.2.5 The Advance Payment shall be paid by the Authority to the Contractor within 15 (fifteen) days of the receipt of its respective requests in accordance with the provisions of this Clause 14.2.</p> <p>14.2.6 Deleted.</p> <p>14.2.7 The advance payment shall be repaid through percentage deductions from the stage payments determined by the Authority's Engineer in accordance with Sub-Clause 14.5, as follows: deductions shall commence in the next Stage Payment Statement following that in which the total of all certified stage payments (excluding the advance payment and deductions and repayments of retention) exceeds 20% (twenty percent) of the Contract Price; and (b) deductions shall be made at the rate of 15% (fifteen percent) of each Stage Payment Statement until such time as the advance payment has been repaid; provided that the advance payment shall be completely repaid prior to the time when 80% (80 percent) of the Contract Price has been certified for payment.</p> <p>14.2.8 If the Advance Payment has not been fully repaid prior to Termination under Clause 21.7 or Article 23, as the case may be, the whole of the balance then outstanding shall immediately become due and payable by the Contractor to the Authority. Without prejudice to the provisions of Clause 14.2.7, in the event of Termination for Contractor Default, the Advance Payment shall be deemed to carry interest at the rate of 10% (ten per cent) per annum from the date of Advance Payment to the date of recovery by encashment of the Bank Guarantee for the Advance Payment. For the avoidance of doubt, the aforesaid interest shall be payable on each instalment of the Advance Payment, regardless of whether the instalment or any part thereof has been repaid to the</p>	

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
23	VIII Particular Conditions	Part A Contract data	<p>20.2 Date by which the DB shall be appointed <i>[Insert amount of third party insurance; this minimum amount per occurrence should be commensurate with the risk]</i></p> <p>20.2 The DB shall be comprised of 28 days after the Commencement date</p> <p>20.2 List of potential DB sole members <i>[Only when the DB is to be comprised of one sole member, list names of potential sole members; if no potential sole members are to be included, insert: "none"]</i></p> <p>20.3 Appointment (if not agreed) to be made by <i>[Insert name of the appointing entity or official]</i></p>	<p><i>Authority prior to Termination.</i></p> <p>All of the instruction at the left are deleted and replaced with: 20. Claims, Dispute and Arbitration This clause will be superseded by Article 26 of MoRT&H's EPC document provided with this PC.</p>	<p>acceptable</p> <p>(Source of Article 26) iFinal Model EPC Agreement 16.01.2017, Page 115</p> <p>Article 26: Dispute resolution</p>
24	Section IX. Annex to the Particular Conditions - Contract Forms	[Option B: To be used in case of Two-Stage One-Envelop Bidding procedure] Contract Agreement	(to select Option A or Option B.)	("[Option B: Two-Stage One-Envelop Bidding procedure] Contract Agreement" is not deleted.)	"[Option B: Two-Stage One-Envelop Bidding procedure] Contract Agreement" should be deleted.
25		Article 7 PERFORMANCE SECURITY	(There is no "Article 7" in JICA SBD.)	<p>"Article 7" is added:</p> <p style="text-align: center;">Article 7</p> <p>PERFORMANCE SECURITY</p> <p><i>7.1 Performance Security</i></p> <p>7.1.1 The Contractor shall, for the performance of its obligations hereunder during the Construction Period, provide to the Authority, within 10 (ten) days of the date of this Agreement, an irrevocable and unconditional guarantee from a Bank in the form set forth in Schedule-G (the "Performance Security") for an amount equal to 5% (five percent) of the Contract Price. The Performance Security shall be valid until 60</p>	<p>(Source of Article 7) File Final Model EPC Agreement 16.01.2017, Page 32</p> <p>Article 7: Performance Security</p> <p>(Note) Article 7 at the left does not comply with Substitution proposed by JICA in</p>

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
				<p>(sixty) days after the Defects Liability Period. Until such time the Performance Security is provided by the Contractor pursuant hereto and the same comes into effect, the Bid Security shall remain in force and effect, and upon such provision of the Performance Security, the Authority shall release the Bid Security to the Contractor.</p> <p>The Contractor shall alongwith the Performance Security provide to the Authority an irrevocable and unconditional guarantee from a Bank for a sum equivalent to Rs. crore(Rupees crore) in the form set forth in Schedule-G (the "Additional Performance Security"), to be modified, mutatis mutandis, for this purpose as security to the Authority if the Bid Price offered by the Contractor is lower by more than 10% with respect to the Estimated Project Cost. Additional Performance Security shall be calculated as under:</p> <ul style="list-style-type: none"> (i) If the bid price offered by the Contractor is lower than 10% but upto 20% of the Estimated Project Cost, then the Additional Performance Security shall be calculated @20% of the difference in the (a) Estimated Project Cost (as mentioned in RFP)-10% of the Estimated Project Cost and (b) the Bid Price offered by the selected Bidder. (ii) If the bid price offered by the Contractor is lower than 20% of the Estimated Project Cost, then the Additional Performance Security shall be calculated @30% of the difference in the (a) Estimated Project Cost (as mentioned in RFP)-10% of the Estimated Project Cost and (b) the Bid Price offered by the selected Bidder. (iii) The Additional Performance Security shall be valid until 28 (twenty eight) days after the issue of Completion Certificate under Article 12 of this Agreement. (iv) The Additional Performance Security shall not be treated as part of Performance Security. <p>7.1.2 Notwithstanding anything to the contrary contained in this Agreement, the Parties agree that in the event of failure of the Contractor to provide the Performance Security in accordance with the provisions of Clause 7.1.1 and within the time specified therein or such extended period as may be provided by the Authority, in accordance with the provisions of Clause 7.1.3, the Authority may encash the Bid Security and appropriate the proceeds thereof as Damages, and thereupon all</p>	<p>MoRTH's EPC Documents (No. 17), May, 2016.though "38.5" in Line No.11 above complies with Substitution proposed by JICA in MoRTH's EPC Documents (No. 17), May, 2016.</p>

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
				<p>rights, privileges, claims and entitlements of the Contractor under or arising out of this Agreement shall be deemed to have been waived by, and to have ceased with the concurrence of the Contractor, and this Agreement shall be deemed to have been terminated by mutual agreement of the Parties.</p> <p>7.1.3 In the event the Contractor fails to provide the Performance Security within 10 (ten) days of this Agreement, it may seek extension of time for a period not exceeding 30 (Thirty) days on payment of Damages for such extended period in a sum calculated at the rate of 0.01% (zero point zero one per cent) of the Contract Price for each day until the Performance Security is provided. For the avoidance of doubt the agreement shall be deemed to be terminated on expiry of additional 30 days time period and Bid security shall be encashed by the Authority.</p> <p>7.2 Extension of Performance Security The Contractor may initially provide the Performance Security for a period of 2 (two) years; provided that it shall procure the extension of the validity of the Performance Security, as necessary, at least 2 (two) months prior to the date of expiry thereof. Upon the Contractor providing an extended Performance Security, the previous Performance Security shall be deemed to be released and the Authority shall return the same to the Contractor within a period of 7 (seven) business days from the date of submission of the extended Performance Security.</p> <p>7.3 Appropriation of Performance Security 7.3.1 Upon occurrence of a Contractor's Default, the Authority shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to encash and appropriate the relevant amounts from the Performance Security as Damages for such Contractor's Default. 7.3.2 Upon such encashment and appropriation from the Performance Security, the Contractor shall, within 30 (thirty) days thereof, replenish, in case of partial appropriation, to its original level the Performance Security, and in case of appropriation of the entire Performance Security provide a fresh Performance Security, as the case may be, and the Contractor shall, within the time so granted, replenish or furnish fresh Performance Security as aforesaid failing which the</p>	

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
				<p>Authority shall be entitled to terminate the Agreement in accordance with Article 23. Upon replenishment or furnishing of a fresh Performance Security, as the case may be, as aforesaid, the Contractor shall be entitled to an additional Cure Period of 30 (thirty) days for remedying the Contractor's Default, and in the event of the Contractor not curing its default within such Cure Period, the Authority shall be entitled to encash and appropriate such Performance Security as Damages, and to terminate this Agreement in accordance with Article 23.</p> <p>7.3.3 The Additional Performance Security shall be encashed, in case the Contractor cannot achieve the Milestones –II/III/IV ... within the prescribed period as per this Agreement due to the fault of the Contractor.</p> <p>7.4 Release of Performance Security</p> <p>7.4.1 The Authority shall return the Performance Security to the Contractor within 60 (sixty) days of the later of the expiry of the Maintenance Period or the Defects Liability Period under this Agreement. Notwithstanding the aforesaid, the Parties agree that the Authority shall not be obliged to release the Performance Security until all Defects identified during the Defects Liability Period have been rectified.</p> <p>7.4.2 The Authority shall return the Additional Performance Security to the Contractor within 28 (twenty eight) days from the date of issue of Completion Certificate under Article 12 of this Agreement.</p> <p>7.5 Retention Money</p> <p>(P: The Authority may, in its discretion, omit Clause 7.5 and in lieu thereof increase the Performance Security under Clause 7.1 from 7.5% (seven point five per cent) to 10% (ten per cent).)</p> <p>7.5.1 From every payment for Works due to the Contractor in accordance with the provisions of Clause 19.5, the Authority shall deduct 6% (six per cent) thereof as guarantee money for performance of the obligations of the Contractor during the Construction Period (the "Retention Money") subject to the condition that the maximum amount of Retention Money shall not exceed 5% (five per cent) of the Contract Price.</p> <p>7.5.2 Upon occurrence of a Contractor's Default, the Authority</p>	

No.	Section	Clause	JICA Design&Build SBD (Original contents)	Revised contents by MoRTH	Comments (draft)
				<p>shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to appropriate the relevant amounts from the Retention Money as Damages for such Contractor's Default.</p> <p><i>7.5.3 The Contractor may, upon furnishing an irrevocable and unconditional bank guarantee substantially in the form provided at Annex-II of Schedule-G, require the Authority to refund the Retention Money deducted by the Authority under the provisions of Clause 7.5.1. Provided that the refund hereunder shall be made in tranches of not less than 1% (one per cent) of the Contract Price.</i></p> <p><i>7.5.4 Within 15 (fifteen) days of the date of issue of the Completion Certificate, the Authority shall discharge the bank guarantees furnished by the Contractor under the provisions of Clause 7.5.3 and refund the balance of Retention Money remaining with the Authority after adjusting the amounts appropriated under the provisions of Clause 7.5.2 and the amounts refunded under the provisions of Clause 7.5.3.</i></p> <p><i>7.5.5 The Parties agree that in the event of Termination of this Agreement, the Retention Money and the bank guarantees specified in this Clause 7.5 shall be treated as if they are Performance Security and shall be reckoned as such for the purposes of Termination Payment under Clause 23.6.</i></p>	

JICA 殿から受信したファイル「20180601_比較検討表_mi01 z0606」に記載されたコメント(10 か所)への回答

コメント No.	コメント内容	コメントへの回答
コメント[J1]	<p>3.2 および 3.3 の Corruptand Fraudulent Practices 自身の妥当性/片務性についてコメントいただけますと幸いです。</p> <p>3.2 I Any entity which has been barred by the Ministry of Road Transport & Highways or its implementing agencies for the works of Expressways, National Highways, ISC and EI works, and the bar subsists as on the date of Application, would not be eligible to submit the BID, either individually or as member of a Joint Venture.</p> <p>II While bidding is open to persons from any country, the following provisions shall apply:</p> <p>(a) Where, on the date of the Application, not less than 15% (fifteen percent) of the aggregate issued, subscribed and paid up equity share capital in a Bidder or its Member is held by persons resident outside India or where a Bidder or its Member is controlled by persons resident outside India; or</p> <p>(b) if at any subsequent stage after the Bid due date, there is an acquisition of not less than 15% (fifteen percent) of the aggregate issued, subscribed and paid up equity share capital or control, by persons resident outside India, in or of the Bidder or its Member;</p> <p>then the Eligibility of such Bidder shall be subject to approval of the Authority from national security and public interest perspective. The decision of the Authority in this behalf shall be final and conclusive and binding on the Bidder.</p> <p>The holding or acquisition of equity or control, as above, shall include direct or indirect holding/ acquisition, including by transfer, of the direct or indirect legal or beneficial ownership or control, by persons acting for themselves or in concert and in determining such holding or acquisition, the Authority shall be guided by the principles, precedents and definitions contained in the Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeovers) Regulations, 1997, or any substitute thereof, as in force on the date of such acquisition.</p> <p>The Bidder shall promptly inform the Authority of any change in the shareholding, as above, and failure to do so shall render the Bidder liable for disqualification from the Bidding Process.</p> <p>3.3 Furthermore, Bidders shall be aware of the provision stated in Sub-Clause 15.6 [Corrupt and Fraudulent Practice] of General Conditions.</p>	<p>① 「3.3」は、JICA SBD Section VIII (PC) 3.2 です。 MoRTH が、新たな「3.2」を挿入し、JICA の「3.2」を「3.3」に修正しています。</p> <p>②MoRTH が新たな追加した「3.2」について</p> <p>1)3.2 I 「Ministry of Road Transport & Highways or its implementing agencies for the works of Expressways, National Highways, ISC and EI works, and the bar subsists」が入札参加禁止としている企業は、「not eligible」のは、「妥当」の範囲だと思います。</p> <p>2)3.2.II 「While bidding is open to persons from any country の場合、以下の(a)と(b)に該当する企業は、Authority の承認を必要とする： (a)入札時点で外国資本が 1 5 %以上の企業 (b)入札後に外国資本が 1 5 %以上になった企業」と読めますが、外国資本比率で縛るのは、JICA Procurement Guidelines Section1.02 で表明している International Competitive Bidding (ICB) の主旨に反すると感じています。 なお、「外国資本が 1 5 %以上」で縛りを入れるのは、一種の「自国優遇策(Local Preference)」と判断できます。円借プロジェクト(ICB)の入札においては、「(自国の調達法にある)Local Preference 条項」を適用外とするのが、一般的と認識しています。 (備考)昔は、JICA Guidelines が現地法より優先されていましたが、最近は、各国で現地法の適用を主張するようになってきました。目下、ベトナムで Bidding Documents の最終化をしていますが、多々、現地法の適用を入れ込むよう、現地カウンターパートから要請されていますが、現地カウンターパートも「JICA Guidelines と現地調達法、どちらを優先すべきか」迷っています。現地調達法が「海外ドナー資金のプロジェクトの場合、どちらの規定を優先するのかを明確に規定していない」ことが原因です。</p> <p>「national security and public interest perspective」等の観点から、Bidders をチェックしたいのなら、国籍を問わず全ての Bidders に対して、身の潔白を証させるに必要な Eligibility Requirements を Section III(Evaluation and</p>

コメント No.	コメント内容	コメントへの回答
		Qualification Criteria: 2.1 Eligibility)に 追記するのが良いと思います。
コメント[J2]	Section I を修正しているのでしょうか。 先方資料にて BDS が二回繰り返されているように見受けられますが、 sectionI はそもそも存在していません。	(コメント JI への回答でも述べましたが…) 1)先方資料は、Section I は修正していません。Section II(BDS)「3.2」のみ、 修正しています。 2)JICA BDS (PC)では「3.2 Furthermore, Bidders shall be aware of the provision stated in Sub-Clause 15.6 [Corrupt and Fraudulent Practice] of General Conditions. 」 だけです。 3)先方資料は、Section VIII(PC)「3.2」にて、上記の「3.2」を「3.3」に修 正し、 新たな「3.2」を挿入しています。
コメント[J3]	具体的にどのように Specifu すべきでしょうか。参照すべき JICA SBD の該当箇所はありますか。	JICA SBD の Section III (Page EQC-5)に「Eligibility and Qualification Criteria: 2.1 Eligibility (2.1.1, 2.1.2, 2.1.3)」があります。追加したい入札参加資格に 関する Requirements があれば、2.1.4, 2.1.5 …として追加することになり ます。
コメント[J4]	この規定では国籍規程はありますか。全体的にローカル規程に 沿うようにと読めますが、そのローカル規程が例えば、インド企業のみ を対象にしているなど、競争性を確保できないものではないため、妥当 とのご判断でしょうか。	①「Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeovers) Regulations, 1997」を Web 検索して Download して、「foreign」 で検索すると、 「Page 5/75 (v) foreign institutional investors」とあり、foreign institutional investors も、この Regulations に該当することです。 (備考)全般的に「Financial Institutions, Scheduled Banks, Foreign Institutional Investors (FIIs) and Mutual Funds」を対象とした Regulations のようです。 →この Regulations が、「建設工事の入札で、外国企業が入札に参加する 場合、どのように係わってくるか？」は、是非、MoRTH に確認したい です。 ②先方資料にて Section VIII(PC)に挿入された「4.8」は、上記コメント[J1] の「3.2.II」と同じ条文です。なので、妥当とは思えません。 「外国資本が15%以上」で縛りを入れるのは、一種の「自国優遇策 (Local Preference)」と判断できます。 →ファイル「20180601_比較検討表 _mi01」の Comments 欄に記載した「acceptable」は撤回させていただきます。

コメント No.	コメント内容	コメントへの回答
コメント[J5]	<p>代替札を認めないことの支障はありませんか。</p>	<p>代替札の有無は、それぞれ長所・短所があります： 1)代替札を認める：Bidders のノウハウが加味されたベターな内容が提案される可能性があります。しかし、代替札は Section VII(Employer's Requirements)に修正を加えての代案となるため、入札評価する際、各 Bidders の評価の基準を同じにすることができなくなり、第1を決める評価は困難となります。また、「代案を提案する際、Section VII(Employer's Requirements)を、どの程度まで修正提案して良いか？」を Bidding Documents に明確に規定するのも難しいです。 2)代替札を認めない：入札評価する際、各 Bidders の評価の基準を同じにできます。そして、Contractor のノウハウを加味するには、着工後、VE 提案等を通じて、Variation Orders で対応可能です。 ということで、「代替札を認めないことの支障はほとんど無い」と認識しています。</p>
コメント[J6]	<p>こちらは片務性とみない理由をご教示ください。 38.5.2 In the event the Selected Bidder fails to provide the Performance Security and Additional Performance Security, if any, within 30 (thirty) days of receipt of Letter of Award, it may seek extension of time for a period not exceeding 60 (Sixty) days on payment of Damages for such extended period in a sum calculated at the rate of 0.01% (zero point zero one per cent) of the Bid Price offered by the Selected Bidder for each day</p>	<p>JICA SBD では、Performance Security の提出(28 日以内)の遅れに対して、以下を規定しています：</p> <ul style="list-style-type: none"> • Section I, ITB 21.6 (b) The Bid Security may be forfeited, if the successful Bidder fails to (ii) furnish a Performance Security in accordance with ITB 44. • Section VII, GC 4.2: fails to comply with Sub-Clause 4.2 [Performance Security] <p>これに対して、先方資料の「38.5.2」は：</p> <ul style="list-style-type: none"> • 30 日の期限から、0.01%の金利負担条項は付いてますが、「更に 60 日の猶予」を与えられます。 <p>なので、JICA SBD の「Bid Security 没収 or Terminate」と比べて、厳しくないので、「片務性なし」と判断しました。</p> <p>(補足)通常、まじめに入札に臨んでいる Bidders は、28 日(or30 日)あれば、確実に Performance Security を用意できます。用意できない Bidders は、銀行の信用度が低く、Performance Security の準備が困難な会社と言えます。</p>
コメント[J7]	<p>FIDIC Yellow 等明確に記載しているものはありますか。(参考とする材料として)</p>	<p>以下の2つの事例を参考に提出します： ①FIDIC Yellow の事例として、以下を添付します。 (ファイルは Confidential です) ジャカルタ MRT の事例 ファイル名「Vol 1 Tendering Procedures」</p>

コメント No.	コメント内容	コメントへの回答
		<p>Section III は、Page v-1～ です。</p> <p>②FIDIC Red の事例ですが、現在 Final Draft 化している以下を添付します。</p> <p>ベトナム国カントー大学拡張プロジェクトの事例 ファイル名 「03_CTU_BiddingDocumnet_P1-1_Section-III_201806」 「04_CTU_BiddingDocumnet_P1-1_Section-IV_V_201806」 この事例では、Section IV の Page-BF 11～BF 16 において、Bidders が各 Technical Proposal を作成する際、どのような観点に着目したら良いか判るように、「評価するポイント」をできる限り記載しています。</p> <p>*過去の Bidding Documents には、ほぼ、記載はありません。</p>
コメント[J8]	<p>こちらは片務性というより入札価格の高額化により、入札不調等のリスクの懸念があるとの理解でよろしいでしょうか。</p>	<p>はい、そうです。</p> <p>(補足: Bidders にリスクとなる conditions を与えて、かつ、その Risk Money を入札金額に含めることを認めない ということであれば、片務契約です。)</p>
コメント[J9]	<p>JICA SBD (GC) では” The Employer shall make an advance payment, as an interest-free loan for mobilisation and design, when the Contractor submits a guarantee in accordance with this Sub-Clause. ”とありますが、こちらの interest-bearing との乖離がありますが、片務性はいかがでしょうか。</p>	<p>はい、interest-bearing との乖離があります。</p> <p>1)無利子の前渡金は、Contractors にとって、特に、資金繰りの悪い中小業者にとって魅力的です。</p> <p>2)しかし、前渡金を利用するには、Advance Payment Security を提出する必要があります。</p> <p>Advance Payment Security を取得するにはコストがかかります。</p> <p>特に、資金繰りの悪く、銀行からの信用度の低い中小業者は、割高となります。なので、Advance Payment の利用を断念する場合があります。</p> <p>4)こんな事情なので、Advance Payment Security 取得コストをかけ、かつ、借入金利もつくとなれば、Advance Payment を利用する魅力は無くなります。自前で銀行から短期借入するのと差が無くなります。</p> <p>なので、JICA SBD (GC) の「無利子の Advance Payment」は、長い時間をかけて勝ち取った FIDIC における Contractors の Rights のひとつです。これを否定することは、「片務契約」と言えます。</p>
コメント[J10]	<p>こちらの妥当性／片務性はいかがでしょうか。</p> <p>Article 7 PERFORMANCE SECURITY</p>	<p>先に送付いたしましたファイル「20180612_JICA GC_MoRTH's PC 比較検討表_mi01」の冒頭に JICA SBD GC との比較を記載させていただきました。</p>

コメント No.	コメント内容	コメントへの回答
		<p>この結果から、以下のように考えます：</p> <p>1)全体的には、灰色ですが、「片務性あり」とは断定しにくいです。</p> <p>2)ただし、JICA SBD より、条件が悪い Clauses があります：</p> <ul style="list-style-type: none">• 7.1.1: within 10 (ten) days of the date of this Agreement (JICA 28 日)• 7.1.1: valid until 60 (sixty) days after the Defects Liability Period (JICA 0 日)

List of Comparison between Section VIII (PC) in File“design_hybrid_24-05-2018” and Section VII(GC) and VIII(PC) of JICA SBD

No.	JICA Design&Build SBD		Section VIII (PC) in File“design_hybrid_24-05-2018”	Comparisons (draft)
	Section VII (GC) (Multilateral Development Bank Harmonised Edition June 2010)	Section VIII (PC) Part A: Contract data	Green highlighted: terms different from JICA SBD (GC) / Yellow-highlighted: clauses No. not referred / Gray-highlighted is the clause No. in the referred MoRT&H's EPC documents	
1	<p>4.2 Performance Security The Contractor shall obtain (at his cost) a Performance Security for proper performance, in the amount stated in the Contract Data and denominated in the currency(ies) of the Contract or in a freely convertible currency acceptable to the Employer. If an amount is not stated in the Contract Data, this Sub-Clause shall not apply.</p> <p>The Contractor shall deliver the Performance Security to the Employer within 28 days after receiving the Letter of Acceptance, and shall send a copy to the Engineer. The Performance Security shall be issued by a reputable bank or financial institution selected by the Contractor, and shall be in the form annexed to the Particular Conditions, as stipulated by the Employer in the Contract Data, or in another form approved by the Employer.</p> <p>The Contractor shall ensure that the Performance Security is valid and enforceable until the Contractor has executed and completed the Works and remedied any defects. If the terms of the Performance Security specify its expiry date, and the Contractor has not become entitled to receive the Performance Certificate by the date 28 days prior to the expiry date, the Contractor shall extend the validity of the Performance Security until the Works have been completed and any defects have been remedied.</p> <p>The Employer shall not make a claim under the Performance Security, except for amounts to which the Employer is entitled under the Contract. The Employer shall indemnify and hold the Contractor harmless against and from all damages, losses and expenses (including legal fees and expenses) resulting from a claim under the Performance Security to the extent to which the Employer was not entitled to make the claim.</p> <p>The Employer shall return the Performance Security to the Contractor within 21 days after receiving a copy of the Performance Certificate. Without limitation to the provisions of the rest of this Sub-Clause, whenever the Engineer determines an addition or a reduction to the Contract Price as a result of a change in cost and/or legislation, or as a result of a Variation amounting to more than 25 percent of the portion of the Contract Price payable in a specific currency, the Contractor shall at the Engineer's request promptly increase, or may decrease, as the case may be, the value of the Performance Security in that currency by an equal percentage.</p> <p>Section IX Annex to the Particular Conditions - Contract Forms Performance Security</p> <ul style="list-style-type: none"> Option 1: (Demand Guarantee) Option 2: Performance Bond <p>14.3 Application for Interim Payment Certificates --- (c) any amount to be deducted for retention, calculated by applying the percentage of retention stated in the Contract Data to the total of the above amounts, until the amount so retained by the Employer reaches the limit of Retention Money (if any) stated in the Contract Data; ---</p>	<p>4.2 Performance Security <i>The Performance Security will be in the form of a "demand guarantee" or "performance bond" in the amount(s) of [insert percentage] percent of the Accepted Contract Amount and in the same currency(ies) of the Accepted Contract Amount.</i> <i>If the Performance Security of the Contract is in accordance with the ICC Publication No. 758, insert the following sentences; Performance Security of this contract is in accordance with the ICC Publication No.758, the 6th paragraph, "The Employer shall return the Performance Security to the Contractor within 21 days after receiving a copy of the Performance Certificate" is deleted.</i></p>	<p>4.2 Performance Security This clause will be superseded by Article 7 of MoRT&H's EPC document provided with this PC. (Source: Final Model EPC Agreement 16.01.2017, Page32) ----- Article 7 -----</p> <p>7.1 Performance Security 7.1.1 The Contractor shall, for the performance of its obligations hereunder during the Construction Period, provide to the Authority, within 10 (ten) days of the date of this Agreement, an irrevocable and unconditional guarantee from a Bank in the form set forth in Schedule-G (the "Performance Security") for an amount equal to 5% (five percent) of the Contract Price. The Performance Security shall be valid until 60 (sixty) days after the Defects Liability Period. Until such time the Performance Security is provided by the Contractor pursuant hereto and the same comes into effect, the Bid Security shall remain in force and effect, and upon such provision of the Performance Security, the Authority shall release the Bid Security to the Contractor.</p> <p>The Contractor shall alongwith the Performance Security provide to the Authority an irrevocable and unconditional guarantee from a Bank for a sum equivalent to Rs. crore(Rupees crore) in the form set forth in Schedule-G (the "Additional Performance Security"), to be modified, mutatis mutandis, for this purpose as security to the Authority if the Bid Price offered by the Contractor is lower by more than 10% with respect to the Estimated Project Cost. Additional Performance Security shall be calculated as under:</p> <ol style="list-style-type: none"> If the bid price offered by the Contractor is lower than 10% but upto 20% of the Estimated Project Cost, then the Additional Performance Security shall be calculated @20% of the difference in the (a) Estimated Project Cost (as mentioned in RFP)-10% of the Estimated Project Cost and (b) the Bid Price offered by the selected Bidder. If the bid price offered by the Contractor is lower than 20% of the Estimated Project Cost, then the Additional Performance Security shall be calculated @30% of the difference in the (a) Estimated Project Cost (as mentioned in RFP)-10% of the Estimated Project Cost and (b) the Bid Price offered by the selected Bidder. The Additional Performance Security shall be valid until 28 (twenty eight) days after the issue of Completion Certificate under Article 12 of this Agreement. The Additional Performance Security shall not be treated as part of Performance Security. <p>7.1.2 Notwithstanding anything to the contrary contained in this Agreement, the Parties agree that in the event of failure of the Contractor to provide the Performance Security in accordance with the provisions of Clause 7.1.1 and within the time specified therein or such extended period as may be provided by the Authority, in accordance with the provisions of Clause 7.1.3, the Authority may encash the Bid Security and appropriate the proceeds thereof as Damages, and thereupon all rights, privileges, claims and entitlements of the Contractor under or arising out of this Agreement shall be deemed to have been waived by, and to have ceased with the concurrence of the Contractor, and this Agreement shall be deemed to have been terminated by mutual agreement of the Parties.</p> <p>7.1.3 In the event the Contractor fails to provide the Performance Security within 10 (ten) days of this Agreement, it may seek extension of time for a period not exceeding 30 (Thirty) days on payment of Damages for such extended period in a sum calculated at the rate of 0.01% (zero point zero one per cent) of the Contract Price for each day until the Performance Security is provided. For the avoidance of doubt the agreement shall be deemed to be terminated on expiry of additional 30 days time period and Bid security shall be encashed by the Authority.</p> <p>7.2 Extension of Performance Security The Contractor may initially provide the Performance Security for a period of 2 (two) years; provided that it shall procure the extension of the validity of the Performance Security, as necessary, at least 2 (two) months prior to the date of expiry thereof. Upon the Contractor providing an extended Performance Security, the previous Performance Security shall be deemed to be released and the Authority shall return the same to the Contractor within a period of 7 (seven) business days from the date of submission of the extended Performance Security.</p>	<p>7.1.1: within 10 (ten) days of the date of this Agreement (JICA SBD) within 28 days after receiving the Letter of Acceptance (GC 4.2)</p> <p>7.1.1: irrevocable and unconditional guarantee from a Bank (JICA SBD) "demand guarantee" or "performance bond" / by a reputable bank or financial institution selected by the Contractor (GC 4.2)</p> <p>7.1.1: form set forth in Schedule-G (Source: Final Model EPC Agreement 16.01.2017, Page 167) (JICA SBD) form annexed to the Particular Conditions, as stipulated by the Employer in the Contract Data , or in another form approved by the Employer (GC 4.2, Section IX) (also ITB44.1, Section I)</p> <p>7.1.1: an amount equal to 5% (five percent) of the Contract Price (JICA SBD) the amount stated in the Contract Data (PC 4.2)</p> <p>7.1.1: valid until 60 (sixty) days after the Defects Liability Period (JICA SBD) valid and enforceable until the Contractor has executed and completed the Works and remedied any defects (GC 4.2)</p> <p>7.1.1: Additional Performance Security, --- the bid price offered by the Contractor is lower than 10% but upto 20% of the Estimated Project Cost, --- the bid price offered by the Contractor is lower than 20%, --- valid until 28 (twenty eight) days after the issue of Completion Certificate (JICA SBD) There is no condition similar to this. Related clauses: • ITB 38.5, Section I: the Employer may require that the amount of the Performance Security be increased</p> <p>7.1.2: failure of the Contractor to provide the Performance Security, --- terminated (JICA SBD) fails to comply with Sub-Clause 4.2 [Performance Security] (GC 15.2 Termination by Employer) Related clauses: • ITB 21.6 (b), Section I: The Bid Security may be forfeited, if the successful Bidder fails to (ii) furnish a Performance Security in accordance with ITB 44.</p> <p>7.1.3: fails to provide the Performance Security within 10 (ten) days, --- at the rate of 0.01%, --- additional 30 days (JICA SBD) There is no condition in GC. Within twenty-eight (28) days of the receipt of the Letter of Acceptance from the Employer, the successful Bidder shall furnish the Performance Security (ITB 44.1, Section I)</p> <p>7.2: The Contractor may initially provide the Performance Security for a period of 2 (two) years (JICA SBD) There is no condition in GC valid and enforceable until the Contractor has executed and completed the Works and remedied any defects (GC 4.2)</p>

No.	JICA Design&Build SBD		Section VIII (PC) in File“design_hybrid_24-05-2018”	Comparisons (draft)
	Section VII (GC) (Multilateral Development Bank Harmonised Edition June 2010)	Section VIII (PC) Part A: Contract data	Green highlighted: terms different from JICA SBD (GC) / Yellow-highlighted: clauses No. not referred / Gray-highlighted is the clause No. in the referred MoRT&H's EPC documents	
1	<p>14.9 Payment of Retention Money When the Taking-Over Certificate has been issued for the Works, the first half of the Retention Money shall be certified by the Engineer for payment to the Contractor. If a Taking-Over Certificate is issued for a Section or part of the Works, a proportion of the Retention Money shall be certified and paid. This proportion shall be half (50%) of the proportion calculated by dividing the estimated contract value of the Section or part, by the estimated final Contract Price.</p> <p>Promptly after the latest of the expiry dates of the Defects Notification Periods, the outstanding balance of the Retention Money shall be certified by the Engineer for payment to the Contractor. If a Taking-Over Certificate was issued for a Section, a proportion of the second half of the Retention Money shall be certified and paid promptly after the expiry date of the Defects Notification Period for the Section. This proportion shall be half (50%) of the proportion calculated by dividing the estimated contract value of the Section by the estimated final Contract Price.</p> <p>However, if any work remains to be executed under Clause 11 [Defects Liability], the Engineer shall be entitled to withhold certification of the estimated cost of this work until it has been executed.</p> <p>When calculating these proportions, no account shall be taken of any adjustments under Sub-Clause 13.7 [Adjustments for Changes in Legislation] and Sub-Clause 13.8 [Adjustments for Changes in Cost]. Unless otherwise stated in the Particular Conditions, when the Taking-Over Certificate has been issued for the Works and the first half of the Retention Money has been certified for payment by the Engineer, the Contractor shall be entitled to substitute a guarantee, in the form annexed to the Particular Conditions or in another form approved by the Employer and issued by a reputable bank or financial institution selected by the Contractor, for the second half of the Retention Money. The Contractor shall ensure that the guarantee is in the amounts and currencies of the second half of the Retention Money and is valid and enforceable until the Contractor has executed and completed the Works and remedied any defects, as specified for the Performance Security in Sub-Clause 4.2. On receipt by the Employer of the required guarantee, the Engineer shall certify and the Employer shall pay the second half of the Retention Money. The release of the second half of the Retention Money against a guarantee shall then be in lieu of the release under the second paragraph of this Sub-Clause. The Employer shall return the guarantee to the Contractor within 21 days after receiving a copy of the Performance Certificate.</p> <p>If the Performance Security required under Sub-Clause 4.2 is in the form of a demand guarantee, and the amount guaranteed under it when the Taking-Over Certificate is issued is more than half of the Retention Money, then the Retention Money guarantee will not be required. If the amount guaranteed under the Performance Security when the Taking-Over Certificate is issued is less than half of the Retention Money, the Retention Money guarantee will only be required for the difference between half of the Retention Money and the amount guaranteed under the Performance Security.</p> <p>Section IX Annex to the Particular Conditions - Contract Forms Retention Money Security</p> <ul style="list-style-type: none"> • Demand Guarantee 	<p>Limit of Retention Money 14.3(c) <i>[Insert percentage of limit of retention, usually 5 and not exceeding 10]</i></p>	<p>7.3 Appropriation of Performance Security 7.3.1 Upon occurrence of a Contractor’s Default, the Authority shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to encash and appropriate the relevant amounts from the Performance Security as Damages for such Contractor’s Default.</p> <p>7.3.2 such encashment and appropriation from the Performance Security, the Contractor shall, within 30 (thirty) days thereof, replenish, in case of partial appropriation, to its original level the Performance Security, and in case of appropriation of the entire Performance Security provide a fresh Performance Security, as the case may be, and the Contractor shall, within the time so granted, replenish or furnish fresh Performance Security as aforesaid failing which the Authority shall be entitled to terminate the Agreement in accordance with Article 23. Upon replenishment or furnishing of a fresh Performance Security, as the case may be, as aforesaid, the Contractor shall be entitled to an additional Cure Period of 30 (thirty) days for remedying the Contractor’s Default, and in the event of the Contractor not curing its default within such Cure Period, the Authority shall be entitled to encash and appropriate such Performance Security as Damages, and to terminate this Agreement in accordance with Article 23.</p> <p>7.3.3 The Additional Performance Security shall be encashed, in case the Contractor cannot achieve the Milestones –II/III/IV ... within the prescribed period as per this Agreement due to the fault of the Contractor.</p> <p>7.4 Release of Performance Security 7.4.1 The Authority shall return the Performance Security to the Contractor within 60 (sixty) days of the later of the expiry of the Maintenance Period or the Defects Liability Period under this Agreement. Notwithstanding the aforesaid, the Parties agree that the Authority shall not be obliged to release the Performance Security until all Defects identified during the Defects Liability Period have been rectified.</p> <p>7.4.2 The Authority shall return the Additional Performance Security to the Contractor within 28 (twenty eight) days from the date of issue of Completion Certificate under Article 12 of this Agreement.</p> <p>7.5 Retention Money 7.5.1 From every payment for Works due to the Contractor in accordance with the provisions of Clause 19.5, the Authority shall deduct 6% (six per cent) thereof as guarantee money for performance of the obligations of the Contractor during the Construction Period (the “Retention Money”) subject to the condition that the maximum amount of Retention Money shall not exceed 5% (five per cent) of the Contract Price.</p> <p>7.5.2 Upon occurrence of a Contractor’s Default, the Authority shall, without prejudice to its other rights and remedies hereunder or in law, be entitled to appropriate the relevant amounts from the Retention Money as Damages for such Contractor’s Default.</p> <p>7.5.3 The Contractor may, upon furnishing an irrevocable and unconditional bank guarantee substantially in the form provided at Annex-II of Schedule-G, require the Authority to refund the Retention Money deducted by the Authority under the provisions of Clause 7.5.1. Provided that the refund hereunder shall be made in tranches of not less than 1% (one per cent) of the Contract Price.</p> <p>7.5.4 Within 15 (fifteen) days of the date of issue of the Completion Certificate, the Authority shall discharge the bank guarantees furnished by the Contractor under the provisions of Clause 7.5.3 and refund the balance of Retention Money remaining with the Authority after adjusting the amounts appropriated under the provisions of Clause 7.5.2 and the amounts refunded under the provisions of Clause 7.5.3.</p> <p>7.5.5 The Parties agree that in the event of Termination of this Agreement, the Retention Money and the bank guarantees specified in this Clause 7.5 shall be treated as if they are Performance Security and shall be reckoned as such for the purposes of Termination Payment under Clause 23.6.</p>	<p>7.3.1: entitled to encash and appropriate the relevant amounts from the Performance Security (JICA SBD) specified in Form “Performance Security”, Section IX “irrevocably undertake to pay the Beneficiary any sum or sums”</p> <p>7.3.2: replenish or furnish fresh Performance Security (JICA SBD) There is no condition in GC.</p> <p>7.3.3: the Milestones –II/III/IV (Source: Final Model EPC Agreement 16.01.2017, Page32, Schedule J,) (JICA SBD) If any milestones required, specified in Section VI</p> <p>7.4.1: return the Performance Security to the Contractor within 60 (sixty) days of the later of the expiry of the Maintenance Period or the Defects Liability Period (JICA SBD) return the Performance Security to the Contractor within 21 days after receiving a copy of the Performance Certificate</p> <p>7.5: Retention Money” is included in Article 7. This modification should be done at 14.9 added in Section VIII. (JICA SBD) specified in 14.3 and 14.9 in Section VII (GC).</p> <p>7.5.1: deduct 6% (JICA SBD) applying the percentage of retention stated in the Contract Data (GC 14.3 (c)) <i>[usually 5 and not exceeding 10]</i></p> <p>7.5.2: Upon occurrence of a Contractor’s Default (JICA SBD) Specified in Form “Retention Money Security”, Section IX</p> <p>7.5.3: unconditional bank guarantee / form provided at Annex-II of Schedule-G (Source: Final Model EPC Agreement 16.01.2017, Page 167) (JICA SBD) Form “Retention Money Security”, Section IX (Demand Guarantee), or in another form approved by the Employer and issued by a reputable bank or financial institution selected by the Contractor</p> <p>7.5.4: Within 15 (fifteen) days of the date of issue of the Completion Certificate (JICA SBD) 1) If a Taking-Over Certificate is issued for a Section or part of the Works, a proportion of the Retention Money shall be certified and paid. This proportion shall be half (50%) 2) The release of the second half of the Retention Money against a guarantee shall then be in lieu of the release under the second paragraph of this Sub-Clause. The Employer shall return the guarantee to the Contractor within 21 days after receiving a copy of the Performance Certificate.</p> <p>7.5.5: Termination (JICA SBD) --- Employer shall pay any balance to the Contractor. (GC 15.4 (c))</p>
2	<p>4.4 Subcontractor The Contractor shall not subcontract the whole of the Works. The Contractor shall be responsible for the acts or defaults of any Subcontractor, his agents or employees, as if they were the acts or defaults of the Contractor. Unless otherwise stated in the Particular Conditions:</p>	<p>(There is no “4.4” in Section VIII, JICA SBD.)</p>	<p>The following write-up will supersede the GC clause (ref clause 3.2 of MoRT&H’s EPC document: (Source: Final Model EPC Agreement 16.01.2017, Page 20) ----- clause 3.2 -----</p> <p>4.4 Obligations relating to sub-contracts and any other agreements 4.4.1 The Contractor, whether Consortium/Joint Venture or sole, shall not sub-contract any Works in more than 49% (forty</p>	<p>4.4.1: shall not sub-contract any Works in more than 49% (forty nine per cent) of the total length, --- equipment in at least 51% (fifty one per cent) of the total length (JICA SBD) There is no condition in GC.</p>

No.	JICA Design&Build SBD		Section VIII (PC) in File“design_hybrid_24-05-2018”	Comparisons (draft)
	Section VII (GC) (Multilateral Development Bank Harmonised Edition June 2010)	Section VIII (PC) Part A: Contract data	Green highlighted: terms different from JICA SBD (GC) / Yellow-highlighted: clauses No. not referred / Gray-highlighted is the clause No. in the referred MoRT&H's EPC documents	
	<p>(a) the Contractor shall not be required to obtain consent to suppliers solely of Materials, or to a subcontract for which the Subcontractor is named in the Contract;</p> <p>(b) the prior consent of the Engineer shall be obtained to other proposed Subcontractors;</p> <p>(c) the Contractor shall give the Engineer not less than 28 days' notice of the intended date of the commencement of each Subcontractor's work, and of the commencement of such work on the Site; and</p> <p>(d) each subcontract shall include provisions which would entitle the Employer to require the subcontract to be assigned to the Employer under Sub-Clause 4.5 [Assignment of Benefit of Subcontract] (if or when applicable) or in the event of termination under Sub-Clause 15.2 [Termination by Employer].</p> <p>The Contractor shall ensure that the requirements imposed on the Contractor by Sub-Clause 1.12 [Confidential Details] apply equally to each Subcontractor.</p> <p>Where practicable, the Contractor shall give fair and reasonable opportunity for from the Country to be appointed as Subcontractors.</p> <p>4.5 Assignment of Benefit of Subcontract If a Subcontractor's obligations extend beyond the expiry date of the relevant Defects Notification Period and the Engineer, prior to this date, instructs the Contractor to assign the benefit of such obligations to the Employer, then the Contractor shall do so. Unless otherwise stated in the assignment, the Contractor shall have no liability to the Employer for the work carried out by the Subcontractor after the assignment takes effect.</p> <p>1.14 Joint and Several Liability If the Contractor constitutes (under applicable Laws) a joint venture, consortium or other unincorporated grouping of two or more persons: (a) these persons shall be deemed to be jointly and severally liable to the Employer for the performance of the Contract; (b) these persons shall notify the Employer of their leader who shall have authority to bind the Contractor and each of these persons; and (c) the Contractor shall not alter its composition or legal status without the prior consent of the Employer.</p>		<p>nine per cent) of the total length of the Project Highway and shall carry out Works directly under its own supervision and through its own personnel and equipment in at least 51% (fifty one per cent) of the total length of the Project Highway. Provided, however, that in respect of the Works carried out directly by the Contractor, it may enter into contracts for the supply and installation of Materials, Plant, equipment, road furniture, safety devices and labour, as the case may be, for such Works. For the avoidance of doubt, the Parties agree that the Contractor may sub-divide the aforesaid length of 51% (fifty one per cent) in no more than 5 (five) sections of the Project Highway. The Parties further agree that all obligations and liabilities under this Agreement for the entire project Highway shall at all times remain with the Contractor.* (*May be deleted if the Contractor is not a Consortium)</p> <p>4.4.2. In the event any sub-contract for Works, or the aggregate of such sub-contracts with any Sub-contractor, exceeds 5% (five percent) of the Contract Price, the Contractor shall communicate the name and particulars, including the relevant experience of the sub-contractor, to the Authority prior to entering into any such sub-contract. The Authority shall examine the particulars of the sub-contractor from the national security and public interest perspective and may require the Contractor, no later than 15 (fifteen) business days from the date of receiving the communication from the Contractor, not to proceed with the sub-contract, and the Contractor shall comply therewith.</p> <p>4.4.3 In the event any sub-contract referred to in Clause 3.2.2 relates to a sub-contractor who has, over the preceding 3 (three) years, not undertaken at least one work of a similar nature with a contract value exceeding 40% (forty per cent) of the value of the sub-contract to be awarded hereunder and received payments in respect thereof for an amount equal to at least such 40% (forty per cent), the Authority may, no later than 15 (fifteen) business days from the date of receiving the communication from the Contractor, require the Contractor not to proceed with such sub-contract, and the Contractor shall comply therewith.</p> <p>4.4.4 It is expressly agreed that the Contractor shall, at all times, be responsible and liable for all its obligations under this Agreement notwithstanding anything contained in the agreements with its Sub-contractors or any other agreement that may be entered into by the Contractor, and no default under any such agreement shall excuse the Contractor from its obligations or liability hereunder.</p>	<p>If required, this conditions should be included in Section III.</p> <p>4.4.1: in no more than 5 (five) sections of the Project Highway (JICA SBD) There is no condition.</p> <p>4.4.1: all obligations and liabilities --- shall at all times remain with the Contractor (JICA SBD) The relevant clause is “GC 4.4 The Contractor shall be responsible for the acts or defaults of any Subcontractor” and “GC 1.14 Joint and Several Liability“.</p> <p>4.4.2: aggregate of such sub-contracts with any Sub-contractor, exceeds 5%, --- The Authority shall examine the particulars of the sub-contractor --- (JICA SBD) There is no condition in GC. If required, this conditions should be included in Section III.</p> <p>4.4.3: over the preceding 3 (three) years, not undertaken at least one work of a similar nature with a contract value exceeding 40%, --- value of the sub-contract to be awarded hereunder and received payments in respect thereof for an amount equal to at least such 40% (JICA SBD) For the member of Consortium/Joint Venture and subcontractors, the conditions should be specified in Eligibility and Qualification Criteria Section III.</p> <p>4.4.4: Contractor shall, at all times, be responsible and liable for all its obligations under this Agreement notwithstanding anything contained in the agreements with its Sub-contractors --- (JICA SBD) The relevant clause is “GC 4.4 The Contractor shall be responsible for the acts or defaults of any Subcontractor” and “GC 1.14 Joint and Several Liability“.</p>
3	<p>8.1 Commencement of Works Except as otherwise specified in the Particular Conditions of Contract, the Commencement Date shall be the date at which the following precedent conditions have all been fulfilled and the Engineer's notification recording the agreement of both Parties on such fulfilment and instructing to commence the Work is received by the Contractor: (a) signature of the Contract Agreement by both Parties, and if required, approval of the Contract by relevant authorities of the Country; (b) delivery to the Contractor of reasonable evidence of the Employer's Financial arrangements (under Sub-Clause 2.4 [Employer's Financial Arrangements]); (c) except if otherwise specified in the Contract Data, effective access to and possession of the Site given to the Contractor together with such permission(s) under (a) of Sub-Clause 1.13 [Compliance with Laws] as required for the commencement of the Works; (d) receipt by the Contractor of the Advance Payment under Sub-Clause 14.2 [Advance Payment] provided that the corresponding bank guarantee has been delivered by the Contractor.</p> <p>If the said Engineer's instruction is not received by the Contractor within 180 days from his receipt of the Letter of Acceptance, the Contractor shall be entitled to terminate the Contract under Sub-Clause 16.2 [Termination by Contractor]. The Contractor shall commence the execution of the Works as soon as is reasonably practicable after the Commencement Date, and shall then proceed with the Works with due expedition and without delay.</p>	<p>8.1 (c) Commencement of Works <i>[Insert date effective access to the site is granted, if applicable. Otherwise delete this CD 8.1(c).]</i></p>	<p>8.1 (c) Commencement of Works This clause will be superseded by Article 4 of MoRT&H's EPC document provided with this PC.</p> <p>1) Article 4: Compensation for Damages” (Source: Model RFP Vol I EPC 16.1.17”, Page 74) (Refer to Appendix 1 (1) below)</p> <p>If Article 4 is “Article 4: Compensation for Damages”: • The modification of contents related to Article 4 (1) should be done in Section II (Bid data Sheet), as “ITB Bid Security”, etc., if necessary. (***This modification will not make a discrepancy in JICA SBD.***)</p> <p>• The modification of contents related to Article 4 (2) should be done in Section VIII (PC), as “15.5 Employer's Entitlement to Termination for Convenience ”, etc., if necessary. (***This modification will not make a discrepancy in JICA SBD.***)</p> <p>2) ARTICLE 4: OBLIGATIONS OF THE AUTHORITY (Source: Final Model EPC Agreement 16.01.2017, Page 24) (Refer to Appendix 1 (2) below)</p> <p>If Article 4 is “Article 4: OBLIGATIONS OF THE AUTHORITY”: • The modification of contents related to Article 4 should be done in Section VIII (PC), as “2.6 Obligation of the Employer”, etc., if necessary. (***This modification will not make a discrepancy in JICA SBD.***)</p>	<p>Which is the source of “Article 4” ?</p>
4	<p>11 DEFECTS LIABILITY 11.1 Completion of Outstanding Work and Remedying Defects 11.2 Cost of Remedying Defects</p>	<p>(There is no “11.” in Section VIII, JICA SBD.) Section VIII (PC)</p>	<p>This clause will be superseded by Article 17 of MoRT&H's EPC document provided with this PC. (Source of Article 17: Defects Liability, Final Model EPC Agreement 16.01.2017, Page 72) ----- Article 17 -----</p>	<p>17.1.1: a period of 4 (four) years commencing from the date of Provisional Certificate (JICA SBD) specified at 1.1.3.7 in Section VIII (PC)</p>

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	<p>11.3 Extension of Defects Notification Period 11.4 Failure to Remedy Defects 11.5 Removal of Defective Work 11.6 Further Tests 11.7 Right of Access 11.8 Contractor to Search 11.9 Performance Certificate 11.10 Unfulfilled Obligations 11.11 Clearance of Site</p> <p>(Refer to Appendix 2, below)</p>	<p>1.1.3.7 Defects Notification Period [365 days]</p>	<p>ARTICLE 17 DEFECTS LIABILITY</p> <p>17.1 Defects Liability Period 17.1.1 The Contractor shall be responsible for all the Defects and deficiencies, except usual wear and tear in the Project Highway or any Section thereof, till the expiry of a period of 4 (four) years commencing from the date of Provisional Certificate (the “Defects Liability Period”). Provided that the Defects Liability Period shall in no case be less than 42 (forty two) months from the date of Completion Certificate for and in respect of works for which Time Extension was granted. Provided further that in the event no Provisional Certificate is issued, the Defects Liability Period shall commence from the date of the Completion Certificate. For the avoidance of doubt, any repairs or restoration on account of usual wear or tear in the Project Highway or any Section thereof shall form a part of the Maintenance obligations of the Contractor as specified in Article 14.</p> <p>17.1.2 Deleted.</p> <p>17.2 Remedying Defects Save and except as provided in Clause 14.1.2, the Contractor shall repair or rectify all Defects and deficiencies observed by the Authority’s Engineer during the Defects Liability Period within a period of 15 (fifteen) days from the date of notice issued by the Authority’s Engineer in this behalf, or within such reasonable period as may be determined by the Authority’s Engineer at the request of the Contractor, in accordance with Good Industry Practice.</p> <p>17.3 Cost of remedying Defects For the avoidance of doubt, any repair or rectification undertaken in accordance with the provisions of Clause 17.2, including any additional testing, shall be carried out by the Contractor at its own risk and cost, to the extent that such rectification or repair is attributable to:</p> <p>(a) the design of the Project; (b) Plant, Materials or workmanship not being in accordance with this Agreement and the Specifications and Standards; (c) improper maintenance during construction of the Project Highway by the Contractor; and/ or (d) failure by the Contractor to comply with any other obligation under this Agreement.</p> <p>17.4 Contractor’s failure to rectify Defects In the event that the Contractor fails to repair or rectify such Defect or deficiency within the period specified in Clause 17.2, the Authority shall be entitled to get the same repaired, rectified or remedied at the Contractor’s cost so as to make the Project Highway conform to the Specifications and Standards and the provisions of this Agreement. All costs consequent thereon shall, after due consultation with the Authority and the Contractor, be determined by the Authority’s Engineer. The cost so determined and an amount equal to twenty percent of the cost as Damages shall be recoverable by the Authority from the Contractor and may be deducted by the Authority from any monies due to the Contractor.</p> <p>17.5 Contractor to search cause 17.5.1 The Authority’s Engineer may instruct the Contractor to examine the cause of any Defect in the Works or part thereof before the expiry of the Defects Liability Period. 17.5.2 In the event any Defect identified under Clause 17.5.1 is attributable to the Contractor, the Contractor shall rectify such Defect within the period specified by the Authority’s Engineer, and shall bear the cost of the examination and rectification of such Defect. 17.5.3 In the event such Defect is not attributable to the Contractor, the Authority’s Engineer shall, after due consultation with the Authority and the Contractor, determine the costs incurred by the Contractor on such examination and notify the same to the Contractor, with a copy to the Authority, and the Contractor shall be entitled to payment of such costs by the Authority.</p> <p>17.6. Extension of Defects Liability Period The Defects Liability Period shall be deemed to be extended till the identified Defects under Clause 17.2 have been remedied.</p>	<p>17.1.1: Defects Liability Period shall in no case be less than 42 (forty two) months from the date of Completion Certificate (JICA SBD) The period should be specified in 1.1.3.7, Part A, Section VIII (PC)</p> <p>17.1.1: Maintenance obligations (JICA SBD) specified in GC 11.1 Completion of Outstanding Work and Remedying Defects</p> <p>17.2: 15 (fifteen) days from the date of notice issued (JICA SBD) GC 11.1 (b): execute all work required to remedy defects or damage, as may be notified by (or on behalf of) the Employer on or before the expiry date of the Defects Notification Period for the Works or Section / GC 11.4: within a reasonable time</p> <p>17.3: Cost of remedying Defects (JICA SBD) specified at GC 11.2: Cost of Remedying Defects</p> <p>17.4: Contractor’s failure to rectify Defects (JICA SBD) specified at GC 11.4 Failure to Remedy Defects</p> <p>17.5.1: instruct the Contractor to examine the cause of any Defect (JICA SBD) specified at GC 11.8 Contractor to Search</p> <p>17.5.2: any Defect identified is attributable to the Contractor (JICA SBD) specified at GC 11.2: Cost of Remedying Defects</p> <p>17.6.: Extension of Defects Liability Period ***The limit of the extension period is not stated.*** (JICA SBD) specified at GC 11.3 Extension of Defects Notification Period *** However, a Defects Notification Period shall not be extended by more than two years.***</p>
5	<p>14.2 Advance Payment The Employer shall make an advance payment, as an interest-free loan for mobilisation and cash flow support, when the Contractor submits a guarantee in accordance with this Sub-Clause. The total advance payment, the number and timing of instalments (if more than one), and the applicable currencies and proportions, shall be as stated in the Contract Data. Unless and until the Employer receives this guarantee, or if the total advance payment is not stated in the Contract Data, this Sub-Clause shall not apply. The Engineer shall deliver to the Employer and to the Contractor an Interim Payment Certificate for the advance payment or its first instalment after receiving a Statement (under Sub-Clause 14.3 [Application for Interim Payment Certificates]) and after the Employer receives (i) the Performance Security in accordance with Sub-Clause 4.2 [Performance Security] and (ii) a guarantee in amounts and currencies equal to the advance payment. This guarantee shall be issued by a reputable bank or financial institution selected by the Contractor, and shall be in the form annexed to the Particular Conditions or in another form approved by the Employer. The Contractor shall ensure that the guarantee is valid and enforceable until the advance payment has been repaid, but its amount shall be progressively reduced by the amount repaid by the Contractor as indicated in the Payment Certificates. If the terms of the guarantee specify its expiry date, and the advance payment has not been repaid by the date 28 days prior to the expiry date, the Contractor shall extend the validity of the guarantee until the advance payment has been repaid.</p>	<p>14.2 Total advance payment [Insert percentage]%, Percentage of the Accepted Contract Amount payable in the currencies and proportions in which the Accepted Contract Amount is payable [Insert number and timing of instalments, if applicable]</p>	<p>14.2 Total advance payment The following write-up will supersede the GC clause (ref clause 19.2 of MoRT&H’s EPC document: (Source of Article 19.2: Final Model EPC Agreement 16.01.2017”, Page 78)</p> <p>----- 14.2 Advance Payment -----</p> <p>14.2.1 The Authority shall make an interest-bearing (@ Bank Rate ⁽¹⁾) advance payment (the “Advance Payment”), equal in amount to 10 (ten) percent of the Contract Price, exclusive for mobilisation expenses. The Advance Payment for mobilisation expenses shall be made in two instalments each equal to 5% (five percent) of the Contract Price. The second 5% (five percent) mobilisation advance would be released after submission of utilization certificate by the Contractor for the first 5% advance already released earlier. In addition to above, the Authority shall make an additional interest-bearing advance payment against newly purchased key construction equipment required for the works as per agreed construction programme and brought to the site, if so requested by the Contractor subject to the same terms and conditions specified for Advance Payment for mobilisation expenses in this Agreement. The maximum of such advance shall be 5% (five percent) of the Contract Price against Bank Guarantee. This advance shall be further subject to the condition that (i) such new equipment are considered by the Authority’s Engineer to be necessary for the works and (ii) these new equipment should be procured in the name of Contractor and is verified by Authority’s Engineer to have been brought to site. The Advance Payment for mobilization expenses and for acquisition of key new construction equipment would be deemed as interest bearing advance at Bank Rate, to be compounded annually. The interest would be recovered along with the recovery of mobilization Advance Payment in equal instalments as per provision laid down for the mobilization advance recovery. (Note) ⁽¹⁾ Bank Rate shall be as declared by Reserve Bank of India (RBI).</p> <p>14.2.2 The Contractor may apply to the Authority for the first instalment of the Advance Payment at any time after the Appointed Date, along with an irrevocable and unconditional guarantee from a Bank for an amount equivalent to 110% (one hundred and ten per cent) of such instalment, substantially in the form provided at Annex-III of Schedule-G, to</p>	<p>14.2.1: an interest-bearing advance payment (JICA SBD) an interest-free loan for mobilisation and cash flow support (GC 14.2)</p> <p>14.2.1: amount to 10 (ten) percent of the Contract Price (JICA SBD) specified at 14.2 Total advance payment, Section VIII (PC)</p> <p>14.2.1: The second 5% (five percent) mobilisation advance (JICA SBD) specified at 14.2 Total advance payment, Section VIII (PC)</p> <p>14.2.1: an additional interest-bearing advance payment (JICA SBD) an interest-free loan for mobilisation and cash flow support (GC 14.2)</p> <p>14.2.2: an amount equivalent to 110% (JICA SBD) There is no condition in GC.</p> <p>14.2.2: form provided at Annex-III of Schedule-G (Source: Final Model EPC Agreement 16.01.2017, Page 167) (JICA SBD) form annexed to the Particular Conditions</p>

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	<p>Unless stated otherwise in the Contract Data, the advance payment shall be repaid through percentage deductions from the interim payments determined by the Engineer in accordance with Sub-Clause 14.6 [Issue of Interim Payment Certificates], as follows:</p> <p>(a) deductions shall commence in the next interim Payment Certificate following that in which the total of all certified interim payments (excluding the advance payment and deductions and repayments of retention) exceeds 30 percent (30%) of the Accepted Contract Amount less Provisional Sums; and</p> <p>(b) deductions shall be made at the amortisation rate stated in the Contract Data of the amount of each Interim Payment Certificate (excluding the advance payment and deductions for its repayments as well as deductions for retention money) in the currencies and proportions of the advance payment until such time as the advance payment has been repaid; provided that the advance payment shall be completely repaid prior to the time when 90 percent (90%) of the Accepted Contract Amount less Provisional Sums has been certified for payment.</p> <p>If the advance payment has not been repaid prior to the issue of the Taking-Over Certificate for the Works or prior to termination under Clause 15 [Termination by Employer], Clause 16 [Suspension and Termination by Contractor] or Clause 19.6 [Force Majeure] (as the case may be), the whole of the balance then outstanding shall immediately become due and in case of termination under Clause 15 [Termination by Employer], except for Sub-Clause 15.5 [Employer's Entitlement to Termination for Convenience], payable by the Contractor to the Employer.</p>		<p>remain effective till the complete and full repayment thereof.</p> <p>14.2.3 Deleted.</p> <p>14.2.4 At any time, after 60 (sixty) days from the Appointed Date, the Contractor may apply to the Authority for the second instalment of the Advance Payment along with an irrevocable and unconditional guarantee from a Bank for an amount equivalent to 110% (one hundred and ten per cent) of such instalment, substantially in the form provided at Annex-III of Schedule-G, to remain effective till the complete and full repayment thereof.</p> <p>14.2.5 The Advance Payment shall be paid by the Authority to the Contractor within 15 (fifteen) days of the receipt of its respective requests in accordance with the provisions of this Clause 14.2.</p> <p>14.2.6 Deleted.</p> <p>14.2.7 The advance payment shall be repaid through percentage deductions from the stage payments determined by the Authority's Engineer in accordance with Sub-Clause 14.5, as follows:</p> <p>8a) deductions shall commence in the next Stage Payment Statement following that in which the total of all certified stage payments (excluding the advance payment and deductions and repayments of retention) exceeds 20% (twenty percent) of the Contract Price; and</p> <p>(b) deductions shall be made at the rate of 15% (fifteen percent) of each Stage Payment Statement until such time as the advance payment has been repaid; provided that the advance payment shall be completely repaid prior to the time when 80% (80 percent) of the Contract Price has been certified for payment.</p> <p>14.2.8 If the Advance Payment has not been fully repaid prior to Termination under Clause 21.7 or Article 23, as the case may be, the whole of the balance then outstanding shall immediately become due and payable by the Contractor to the Authority. Without prejudice to the provisions of Clause 14.2.7, in the event of Termination for Contractor Default, the Advance Payment shall be deemed to carry interest at the rate of 10% (ten per cent) per annum from the date of Advance Payment to the date of recovery by encashment of the Bank Guarantee for the Advance Payment. For the avoidance of doubt, the aforesaid interest shall be payable on each instalment of the Advance Payment, regardless of whether the instalment or any part thereof has been repaid to the Authority prior to Termination.</p>	<p>or in another form approved by the Employer (GC 14.2)</p> <p>14.2.4: after 60 (sixty) days from the Appointed Date (JICA SBD) after the Employer receives (i) the Performance Security in accordance (ii) a guarantee in amounts and currencies equal to the advance payment (GC 14.2)</p> <p>14.2.4: the second instalment of the Advance Payment, --- amount equivalent to 110% (one hundred and ten per cent) of such instalment (JICA SBD) There is no condition in GC.</p> <p>14.2.5: within 15 (fifteen) days of the receipt of its respective requests in accordance with the provisions of this Clause 14.2 (JICA SBD) when the Contractor submits a guarantee in accordance with this Sub-Clause (GC 14.2)</p> <p>14.2.7 : advance payment shall be repaid through percentage deductions from the stage payments determined by the Authority's Engineer in accordance with Sub-Clause 14.5 (JICA SBD) specified at GC 14.2 a) and (b)</p> <p>14.2.7: deductions shall be made at the rate of 15% (fifteen percent) of each Stage Payment Statement , --- repaid prior to the time when 80% (80 percent) of the Contract Price (JICA SBD) exceeds 30 percent (30%) of the Accepted Contract Amount, --- repaid prior to the time when 90 percent (90%) (GC 14.2 a) and (b))</p> <p>14.2.8: Advance Payment has not been fully repaid prior to Termination (JICA SBD) If the advance payment has not been repaid prior to the issue of the Taking-Over Certificate for the Works or prior to termination under Clause 15 [Termination by Employer]</p>
6	<p>20 CLAIMS, DISPUTES AND ARBITRATION</p> <p>20.1 Contractor's Claims</p> <p>20.2 Appointment of the Dispute Board</p> <p>20.3 Failure to Agree on the Composition of the Dispute Board</p> <p>20.4 Obtaining Dispute Board's Decision</p> <p>20.5 Amicable Settlement</p> <p>20.6 Arbitration</p> <p>20.7 Failure to Comply with Dispute Board's Decision</p> <p>20.8 Expiry of Dispute Board's Appointment</p> <p>(Refer to Appendix 3, below)</p> <p>APPENDIX: DISPUTE BOARD General Conditions of Dispute Board Agreement Annex: Procedural Rules</p>	(There is no "20." in Section VIII, JICA SBD.)	<p><i>This clause will be superseded by Article 26 of MoRT&H's EPC document provided with this PC.</i> (Source of Article 26: Final Model EPC Agreement 16.01.2017, Page 115)</p> <p>----- Article 26: Dispute resolution -----</p> <p>26.1 Dispute Resolution</p> <p>26.1.1 Any dispute, difference or controversy of whatever nature howsoever arising under or out of or in relation to this Agreement (including its interpretation) between the Parties, and so notified in writing by either Party to the other Party (the "Dispute") shall, in the first instance, be attempted to be resolved amicably in accordance with the conciliation procedure set forth in Clause 26.2.</p> <p>26.1.2 The Parties agree to use their best efforts for resolving all Disputes arising under or in respect of this Agreement promptly, equitably and in good faith, and further agree to provide each other with reasonable access during normal business hours to all non-privileged records, information and data pertaining to any Dispute.</p> <p>26.2 Conciliation</p> <p>In the event of any Dispute between the Parties, either Party may call upon the Authority's Engineer, or such other person as the Parties may mutually agree upon (the "Conciliator") to mediate and assist the Parties in arriving at an amicable settlement thereof. Failing mediation by the Conciliator or without the intervention of the Conciliator, either Party may require such Dispute to be referred to the Chairman of the Authority and the Chairman of the Board of Directors of the Contractor for amicable settlement, and upon such reference, the said persons shall meet no later than 7 (seven) business days from the date of reference to discuss and attempt to amicably resolve the Dispute. If such meeting does not take place within the 7 (seven) business day period or the Dispute is not amicably settled within 15 (fifteen) days of the meeting or the Dispute is not resolved as evidenced by the signing of written terms of settlement within 30 (thirty) days of the notice in writing referred to in Clause 26.1.1 or such longer period as may be mutually agreed by the Parties, either Party may refer the Dispute to arbitration in accordance with the provisions of Clause 26.3.</p> <p>26.3 Arbitration</p> <p>26.3.1 Any Dispute which is not resolved amicably by conciliation, as provided in Clause 26.2, shall be finally settled by arbitration in accordance with the rules of arbitration of the SOCIETY FOR AFFORDABLE REDRESSAL OF DISPUTES (SAROD).</p> <p>26.3.2 Deleted.</p> <p>26.3.3 The arbitrators shall make a reasoned award (the "Award"). Any Award made in any arbitration held pursuant to this Article 26 shall be final and binding on the Parties as from the date it is made, and the Contractor and the Authority agree and undertake to carry out such Award without delay.</p> <p>26.3.4 The Contractor and the Authority agree that an Award may be enforced against the Contractor and/or the Authority.</p>	<p>"JICA GC 20. 1 Contractor's Claims" is also deleted. This results in unilateral contract, as "Contractor's Claims" is one of Contractor's rights in the international standard of general conditions of Contract.</p> <p>26.1.1: notified in writing by either Party to the other Party (the "Dispute"), --- in the first instance, be attempted to be resolved amicably --- (JICA SBD) There is no discrepancy in between.</p> <p>26.1.2: use their best efforts, --- equitably and in good faith --- (JICA SBD) There is no discrepancy in between.</p> <p>26.1.2: Conciliator (JICA SBD) Dispute Board (GC 20.2)</p> <p>26.2: conciliation procedure Step-1: meet no later than 7 (seven) business days for amicable settlement Step-2: not amicably settled within 15 (fifteen) days of the meeting or the Dispute is not resolved as evidenced by the signing of written terms of settlement within 30 (thirty) days. This results in Arbitration. (JICA SBD) Step-1: The notice shall be given as soon as practicable, and not later than 28 days after the Contractor became aware. (GC 20.1) Step-2: Within 42 days after the Contractor became aware, --- the Contractor shall send to the Engineer a</p>

No.	JICA Design&Build SBD		Section VIII (PC) in File“design_hybrid_24-05-2018”	Comparisons (draft)
	Section VII (GC) (Multilateral Development Bank Harmonised Edition June 2010)	Section VIII (PC) Part A: Contract data	Green highlighted: terms different from JICA SBD (GC) / Yellow-highlighted: clauses No. not referred / Gray-highlighted is the clause No. in the referred MoRT&H's EPC documents	
			<p>as the case may be, and their respective assets wherever situated.</p> <p>26.3.5 This Agreement and the rights and obligations of the Parties shall remain in full force and effect, pending the Award in any arbitration proceedings hereunder.</p> <p>26.3.6 In the event the Party against whom the Award has been granted challenges the Award for any reason in a court of law, it shall make an interim payment to the other Party for an amount equal to 75% (seventy five per cent) of the Award, pending final settlement of the Dispute. The aforesaid amount shall be paid forthwith upon furnishing an irrevocable Bank Guarantee for a sum equal to 120 % (one hundred and twenty per cent) of the aforesaid amount. Upon final settlement of the Dispute, the aforesaid interim payment shall be adjusted and any balance amount due to be paid or returned, as the case may be, shall be paid or returned with interest calculated at the rate of 10% (ten per cent) per annum from the date of interim payment to the date of final settlement of such balance.</p> <p>26.4 Adjudication by Regulatory Authority, Tribunal or Commission</p> <p>In the event of constitution of a statutory regulatory authority, tribunal or commission, as the case may be, with powers to adjudicate upon disputes between the Contractor and the Authority, all Disputes arising after such constitution shall, instead of reference to arbitration under Clause 26.3, be adjudicated upon by such regulatory authority, tribunal or commission in accordance with the Applicable Law and all references to Dispute Resolution Procedure shall be construed accordingly. For the avoidance of doubt, the Parties hereto agree that the adjudication hereunder shall not be final and binding until an appeal against such adjudication has been decided by an appellate tribunal or court of competent jurisdiction, as the case may be, or no such appeal has been preferred within the time specified in the Applicable Law.</p>	<p>fully detailed claim (GC 20.1)</p> <p>Step-3: If the Engineer does not respond within the timeframe, --- may refer to the Dispute Board --- (GC 20.1)</p> <p>Step-4: Within 84 days after receiving such reference, or within such other period as may be proposed by the DB and approved by both Parties, the DB shall give its decision. If the DB fails to give its decision within the period of 84 days (GC 20.4)</p> <p>Step-5: shall be finally settled by arbitration (GC 20.6)</p> <p>26.3.1: rules of arbitration of the SOCIETY FOR AFFORDABLE REDRESSAL OF DISPUTES (JICA SBD) if the Contract is with foreign contractors, International arbitration, such as UNCITRAL, ICC (GC 20.6)</p> <p>26.3.3: The arbitrators shall make a reasoned award (JICA SBD) There is no discrepancy in between.</p> <p>26.3.3: undertake to carry out such Award without delay (JICA SBD) There is no condition in GC.</p> <p>26.3.4: an Award may be enforced (JICA SBD) There is no condition in GC.</p> <p>26.3.5: remain in full force and effect, pending the Award (JICA SBD) There is no condition in GC.</p> <p>26.3.6: an interim payment to the other Party for an amount equal to 75%, --- Bank Guarantee for a sum equal to 120 %, --- rate of 10% (ten per cent) per annum (JICA SBD) There is no condition in GC.</p> <p>26.4: Adjudication by Regulatory Authority, Tribunal or Commission (JICA SBD) There is no condition in GC.</p>
7	<p>20.2 Appointment of the Dispute Board</p> <p>20.3 Failure to Agree on the Composition of the Dispute Board</p>	<p>20.2 Date by which the DB shall be appointed <i>[Insert amount of third party insurance; this minimum amount per occurrence should be commensurate with the risk]</i></p> <p>20.2 The DB shall be comprised of <i>28 days after the Commencement date</i></p> <p>20.2 List of potential DB sole members <i>[Only when the DB is to be comprised of one sole member; list names of potential sole members; if no potential sole members are to be included, insert: “none”]</i></p> <p>20.3 Appointment (if not agreed) to be made by <i>[Insert name of the appointing entity or official]</i></p>	<p>All of the particular conditions for 20.2 and 20.3 at the left are deleted.</p>	

Appendix

Appendix-1 (1)

(Source: Model RFP Vol 1 EPC 16.1.17", Page 74)

Article – 4: Compensation for Damages.

(1) If the **Principal** has disqualified the Bidder(s) from the tender process prior to the award according to **Article-3**, the **Principal** shall be entitled to forfeit the Earnest Money Deposit/ Bid Security or demand and recover the damages equivalent to Earnest Money Deposit/ Bid Security apart from any other legal right that may have accrued to the **Principal**.

(2) In addition to 1 above, the **Principal** shall be entitled to take recourse to the relevant provisions of the contract related to **Termination of Contract** due to Contractor/ Concessionaire/Consultant's Default. In such case, the **Principal** shall be entitled to forfeit the Performance Bank Guarantee of the Contractor/ Concessionaire/ Consultant and/ or demand and recover liquidated and all damages as per the provisions of the contract/concession agreement against Termination.

Appendix-1 (2)

(Source: Final Model EPC Agreement 16.01.2017, Page 24)

ARTICLE 4 OBLIGATIONS OF THE **AUTHORITY**

4.1 Obligations of the **Authority**

4.1.1 The **Authority** shall, at its own cost and expense, undertake, comply with and perform all its obligations set out in **this Agreement** or arising hereunder.

4.1.2 The **Authority** shall be responsible for the correctness of the Scope of the Project, Project Facilities, Specifications and Standards and the criteria for testing of the completed Works.

4.1.3 The **Authority** shall provide to the Contractor:

(a) upon receiving the Performance Security under Clause 7.1.1, the Right of Way in accordance with the provisions of Clauses 8.2 and 8.3, within a period of 30 (thirty) days from the date of this Agreement, on no less than 90% (ninety per cent) of the total length of the Project Highway;

(b) approval of the general arrangement drawings (the "GAD") from railway authorities to enable the Contractor to construct road over-bridges/ under-bridges at level crossings on the Project Highway in accordance with the Specifications and Standards, and subject to the terms and conditions specified in such approval, within a period of 60 (sixty) days from the Appointed Date, and reimbursement of all the costs and expenses paid by the Contractor to the railway authorities for and in respect of the road over-bridges/under bridges; and

(c) all environmental clearances as required under Clause 4.3.

4.1.4 Delay in providing the Right of Way or approval of GAD by railway authorities, as the case may be, in accordance with the provisions of Clause 4.1.3 shall entitle the Contractor to Damages in a sum calculated in accordance with the provisions of Clause 8.3 of **this Agreement** and Time Extension in accordance with the provisions of Clause 10.5 of this Agreement. For the avoidance of doubt, the Parties agree that the Damages for delay in approval of GAD by the railway authorities for a particular road over-bridge/under-bridge shall be deemed to be equal to the Damages payable under the provisions of Clause 8.3 for delay in providing Right of Way for a length of 2 (two) kilometre for each such road over-bridge/under-bridge.

4.1.5 Notwithstanding anything to the contrary contained in this Agreement, the Parties expressly agree that the aggregate Damages payable under Clauses 4.1.4, 8.3 and 9.2 shall not exceed 1% (one per cent) of the Contract Price. For the avoidance of doubt, the Damages payable by the **Authority** under the aforesaid Clauses shall not be additive if they arise concurrently from more than one cause but relate to the same part of the Project Highway.

Both the parties agree that payment of these Damages shall be full and final settlement of all claims of the Contractor and such compensation shall be the sole remedy against delays of the **Authority** and both parties further agree this as final cure against delays of the **Authority**.

4.1.6 The **Authority** agrees to provide support to the Contractor and undertakes to observe, comply with and perform, subject to and in accordance with the provisions of **this Agreement** and the Applicable Laws, the following:

(a) upon written request from the Contractor, and subject to the Contractor complying with Applicable Laws, provide reasonable support to the Contractor in procuring Applicable Permits required from any Government Instrumentality for implementation of the Project;

(b) upon written request from the Contractor, provide reasonable assistance to the Contractor in obtaining access to all necessary infrastructure facilities and utilities, including water and electricity at rates and on terms no less favourable than those generally available to commercial customers receiving substantially equivalent services;

(c) procure that no barriers that would have a material adverse effect on the works are erected or placed on or about the Project Highway by any Government Instrumentality or persons claiming through or under it, except for reasons of Emergency, national security, law and order or collection of inter-state taxes;

(d) not do or omit to do any act, deed or thing which may in any manner be violative of any of the provisions of **this Agreement**;

(e) support, cooperate with and facilitate the Contractor in the implementation of the Project in accordance with the provisions of **this Agreement**; and

(f) upon written request from the Contractor and subject to the provisions of Clause 3.3, provide reasonable assistance to the Contractor and any expatriate personnel of the Contractor or its Sub-contractors to obtain applicable visas and work permits for the purposes of discharge by the Contractor or its Sub-contractors of their obligations under **this Agreement** and the agreements with the Sub-contractors.

4.2 Maintenance obligations prior to the Appointed Date

The **Authority** shall, prior to the Appointed Date, maintain the Project Highway, at its own cost and expense, so that its traffic worthiness and safety are at no time materially inferior as compared to its condition 10 (ten) days prior to the last date for submission of the Bid, and in the event of any material deterioration or damage other than normal wear and tear, undertake repair thereof. For the avoidance of doubt, the **Authority** shall undertake only routine maintenance prior to the Appointed Date, and it shall undertake special repairs only in the event of excessive deterioration or damage caused due to unforeseen events such as floods or earthquake.

4.3 Environmental Clearances

The **Authority** represents and warrants that the environmental clearances required for construction of the Project shall be procured by the **Authority** prior to the date of issue of LOA. For the avoidance of doubt, the present status of environmental clearances is specified in Schedule-A (1).

(Note) (1) Clause 4.3 may be suitably modified in the event that all the environmental clearances for the Project Highway have been received or are not required. It should be clearly stated that all the environmental clearances for the Project Highway have been received; or such environmental clearances for the Project Highway are not required.

Appendix-2 (Source: JICA SBD, Section VII (GC), Multilateral Development Bank Harmonised Edition June 2010)

11 DEFECTS LIABILITY

11.1 Completion of Outstanding Work and Remedying Defects

In order that the Works and Contractor's Documents, and each Section, shall be in the condition required by the Contract (fair wear and tear excepted) by the expiry date of the relevant Defects Notification Period or as soon as practicable thereafter, the Contractor shall:

- (a) complete any work which is outstanding on the date stated in a Taking-Over Certificate, within such reasonable time as is instructed by the Engineer, and
- (b) **execute all work required to remedy defects or damage, as may be notified by (or on behalf of) the Employer on or before the expiry date of the Defects Notification Period for the Works or Section** (as the case may be).

If a defect appears or damage occurs, the Contractor shall be notified accordingly, by (or on behalf of) the Employer.

11.2 Cost of Remedying Defects

All work referred to in sub-paragraph (b) of Sub-Clause 11.1 [Completion of Outstanding Work and Remedying Defects] shall be executed at the risk and cost of the Contractor, if and to the extent that the work is attributable to:

- (a) any design for which the Contractor is responsible,
- (b) Plant, Materials or workmanship not being in accordance with the Contract, or
- (c) failure by the Contractor to comply with any other obligation.

If and to the extent that such work is attributable to any other cause, the Contractor shall be notified promptly by (or on behalf of) the Employer, and Sub-Clause 13.3 [Variation Procedure] shall apply.

11.3 Extension of Defects Notification Period

The Employer shall be entitled subject to Sub-Clause 2.5 [*Employer's Claims*] to an extension of the Defects Notification Period for the Works or a Section if and to the extent that the Works, Section or a major item of Plant (as the case may be, and after taking over) cannot be used for the purposes for which they are intended by reason of a defect or by reason of damage attributable to the Contractor. **However, a Defects Notification Period shall not be extended by more than two years.**

If delivery and/or erection of Plant and/or Materials was suspended under Sub-Clause 8.8 [*Suspension of Work*] or Sub-Clause 16.1 [*Contractor's Entitlement to Suspend Work*], the Contractor's obligations under this Clause shall not apply to any defects or damage occurring more than two years after the Defects Notification Period for the Plant and/or Materials would otherwise have expired.

11.4 Failure to Remedy Defects

If the Contractor fails to remedy any defect or damage **within a reasonable time**, a date may be fixed by (or on behalf of) the Employer, on or by which the defect or damage is to be remedied. The Contractor shall be given reasonable notice of this date.

If the Contractor fails to remedy the defect or damage by this notified date and this remedial work was to be executed at the cost of the Contractor under Sub-Clause 11.2 [*Cost of Remedying Defects*], the Employer may (at his option):

- (a) carry out the work himself or by others, in a reasonable manner and at the Contractor's cost, but the Contractor shall have no responsibility for this work; and the Contractor shall subject to Sub-Clause 2.5 [*Employer's Claims*] pay to the Employer the costs reasonably incurred by the Employer in remedying the defect or damage;
- (b) require the Engineer to agree or determine a reasonable reduction in the Contract Price in accordance with Sub-Clause 3.5 [*Determinations*]; or
- (c) if the defect or damage deprives the Employer of substantially the whole benefit of the Works or any major part of the Works, terminate the Contract as a whole, or in respect of such major part which cannot be put to the intended use. Without prejudice to any other rights, under the Contract or otherwise, the Employer shall then be entitled to recover all sums paid for the Works or for such part (as the case may be), plus financing costs and the cost of dismantling the same, clearing the Site and returning Plant and Materials to the Contractor.

11.5 Removal of Defective Work

If the defect or damage cannot be remedied expeditiously on the Site and the Employer gives consent, the Contractor may remove from the Site for the purposes of repair such items of Plant as are defective or damaged. This consent may require the Contractor to increase the amount of the Performance Security by the full replacement cost of these items, or to provide other appropriate security.

11.6 Further Tests

If the work of remedying of any defect or damage may affect the performance of the Works, the Engineer may require the repetition of any of the tests described in the Contract. The requirement shall be made by notice within 28 days after the defect or damage is remedied.

These tests shall be carried out in accordance with the terms applicable to the previous tests, except that they shall be carried out at the risk and cost of the Party liable, under Sub-Clause 11.2 [*Cost of Remedying Defects*], for the cost of the remedial work.

11.7 Right of Access

Until the Performance Certificate has been issued, the Contractor shall have such right of access to the Works as is reasonably required in order to comply with this Clause, except as may be inconsistent with the Employer's reasonable security restrictions.

11.8 Contractor to Search

The Contractor shall, if required by the Engineer, search for the cause of any defect, under the direction of the Engineer. Unless the defect is to be remedied at the cost of the Contractor under Sub-Clause 11.2 [*Cost of Remedying Defects*], the Cost of the search plus profit shall be agreed or determined by the Engineer in accordance with Sub-Clause 3.5 [*Determinations*] and shall be included in the Contract Price.

11.9 Performance Certificate

Performance of the Contractor's obligations shall not be considered to have been completed until the Engineer has issued the Performance Certificate to the Contractor, stating the date on which the Contractor completed his obligations under the Contract.

The Engineer shall issue the Performance Certificate within 28 days after the latest of the expiry dates of the Defects Notification Periods, or as soon thereafter as the Contractor has supplied all the Contractor's Documents and completed and tested all the Works, including remedying any defects. A copy of the Performance Certificate shall be issued to the Employer.

Only the Performance Certificate shall be deemed to constitute acceptance of the Works.

11.10 Unfulfilled Obligations

After the Performance Certificate has been issued, each Party shall remain liable for the fulfilment of any obligation which remains unperformed at that time. For the purposes of determining the nature and extent of unperformed obligations, the Contract shall be deemed to remain in force.

11.11 Clearance of Site

Upon receiving the Performance Certificate, the Contractor shall remove any remaining Contractor's Equipment, surplus material, wreckage, rubbish and Temporary Works from the Site.

If all these items have not been removed within 28 days after receipt by the Contractor of the Performance Certificate, the Employer may sell or otherwise dispose of any remaining items. The Employer shall be entitled to be paid the costs incurred in connection with, or attributable to, such sale or disposal and restoring the Site.

Any balance of the moneys from the sale shall be paid to the Contractor. If these moneys are less than the Employer's costs, the Contractor shall pay the outstanding balance to the Employer.

Appendix-3 20 CLAIMS, DISPUTES AND ARBITRATION

(Source: JICA SBD, Section VII (GC), Multilateral Development Bank Harmonised Edition June 2010)

20.1 Contractor's Claims

If the Contractor considers himself to be entitled to any extension of the Time for Completion and/or any additional payment, under any Clause of these Conditions or otherwise in connection with the Contract, the Contractor shall give notice to the Engineer, describing the event or circumstance giving rise to the claim. [The notice shall be given as soon as practicable, and not later than 28 days after the Contractor became aware](#), or should have become aware, of the event or circumstance.

If the Contractor fails to give notice of a claim within such period of 28 days, the Time for Completion shall not be extended, the Contractor shall not be entitled to additional payment, and the Employer shall be discharged from all liability in connection with the claim. Otherwise, the following provisions of this Sub-Clause shall apply.

The Contractor shall also submit any other notices which are required by the Contract, and supporting particulars for the claim, all as relevant to such event or circumstance.

The Contractor shall keep such contemporary records as may be necessary to substantiate any claim, either on the Site or at another location acceptable to the Engineer. Without admitting the Employer's liability, the Engineer may, after receiving any notice under this Sub-Clause, monitor the record-keeping and/or instruct the Contractor to keep further contemporary records. The Contractor shall permit the Engineer to inspect all these records, and shall (if instructed) submit copies to the Engineer.

[Within 42 days after the Contractor became aware](#) (or should have become aware) of the event or circumstance giving rise to the claim, or within such other period as may be proposed by the Contractor and approved by the Engineer, [the Contractor shall send to the Engineer a fully detailed claim](#) which includes full supporting particulars of the basis of the claim and of the extension of time and/or additional payment claimed.

If the event or circumstance giving rise to the claim has a continuing effect:

- (a) this fully detailed claim shall be considered as interim;
- (b) the Contractor shall send further interim claims at monthly intervals, giving the accumulated delay and/or amount claimed, and such further particulars as the Engineer may reasonably require; and
- (c) the Contractor shall send a final claim within 28 days after the end of the effects resulting from the event or circumstance, or within such other period as may be proposed by the Contractor and approved by the Engineer.

Within 42 days after receiving a claim or any further particulars supporting a previous claim, or within such other period as may be proposed by the Engineer and approved by the Contractor, the Engineer shall respond with approval, or with disapproval and detailed comments. He may also request any necessary further particulars, but shall nevertheless give his response on the principles of the claim within the above defined time period.

Within the above defined period of 42 days, the Engineer shall proceed in accordance with Sub-Clause 3.5 [Determinations] to agree or determine (i) the extension (if any) of the Time for Completion (before or after its expiry) in accordance with Sub-Clause 8.4 [Extension of Time for Completion], and/or (ii) the additional payment (if any) to which the Contractor is entitled under the Contract.

Each Payment Certificate shall include such additional payment for any claim as has been reasonably substantiated as due under the relevant provision of the Contract. Unless and until the particulars supplied are sufficient to substantiate the whole of the claim, the Contractor shall only be entitled to payment for such part of the claim as he has been able to substantiate.

[If the Engineer does not respond within the timeframe](#) defined in this Clause, either Party may consider that the claim is rejected by the Engineer and any of the Parties may [refer to the Dispute Board](#) in accordance with Sub-Clause 20.4 [Obtaining Dispute Board's Decision].

The requirements of this Sub-Clause are in addition to those of any other Sub-Clause which may apply to a claim. If the Contractor fails to comply with this or another Sub-Clause in relation to any claim, any extension of time and/or additional payment shall take account of the extent (if any) to which the failure has prevented or prejudiced proper investigation of the claim, unless the claim is excluded under the second paragraph of this Sub-Clause.

20.2 Appointment of the Dispute Board

Disputes shall be referred to a DB for decision in accordance with Sub-Clause 20.4 [Obtaining Dispute Board's Decision]. The Parties shall appoint a DB by the date stated in the Contract Data.

The DB shall comprise, as stated in the Contract Data, either one or three suitably qualified persons ("the members"), each of whom shall be fluent in the language for communication defined in the Contract and shall be a professional experienced in the type of construction involved in the Works and with the interpretation of contractual documents. If the number is not so stated and the Parties do not agree otherwise, the DB shall comprise three persons.

If the Parties have not jointly appointed the DB 21 days before the date stated in the Contract Data and the DB is to comprise three persons, each Party shall nominate one member for the approval of the other Party. The first two members shall recommend and the Parties shall agree upon the third member, who shall act as chairman.

However, if a list of potential members has been agreed by the Parties and is included in the Contract, the members shall be selected from those on the list, other than anyone who is unable or unwilling to accept appointment to the DB.

The agreement between the Parties and either the sole member or each of the three members shall incorporate by reference the General Conditions of Dispute Board Agreement contained in the Appendix to these General Conditions, with such amendments as are agreed between them.

The terms of the remuneration of either the sole member or each of the three members, including the remuneration of any expert whom the DB consults, shall be mutually agreed upon by the Parties when agreeing the terms of appointment. Each Party shall be responsible for paying one-half of this remuneration.

If at any time the Parties so agree, they may jointly refer a matter to the DB for it to give its opinion. Neither Party shall consult the DB on any matter without the agreement of the other Party.

If a member declines to act or is unable to act as a result of death, disability, resignation or termination of appointment, a replacement shall be appointed in the same manner as the replaced person was required to have been nominated or agreed upon, as described in this Sub-Clause.

The appointment of any member may be terminated by mutual agreement of both Parties, but not by the Employer or the Contractor acting alone. Unless otherwise agreed by both Parties, the appointment of the DB (including each member) shall expire when the discharge referred to in Sub-Clause 14.12 [Discharge] shall have become effective.

20.3 Failure to Agree on the Composition of the Dispute Board

If any of the following conditions apply, namely:

- (a) the Parties fail to agree upon the appointment of the sole member of the DB by the date stated in the first paragraph of Sub-Clause 20.2 [Appointment of the Dispute Board],
- (b) either Party fails to nominate a member (for approval by the other Party), or fails to approve a member nominated by the other Party, of a DB of three persons by such date,
- (c) the Parties fail to agree upon the appointment of the third member (to act as chairman) of the DB by such date, or

(d) the Parties fail to agree upon the appointment of a replacement person within 42 days after the date on which the sole member or one of the three members declines to act or is unable to act as a result of death, disability, resignation or termination of appointment,

then the appointing entity or official named in the Contract Data shall, upon the request of either or both of the Parties and after due consultation with both Parties, appoint this member of the DB. This appointment shall be final and conclusive. Each Party shall be responsible for paying one-half of the remuneration of the appointing entity or official.

20.4 Obtaining Dispute Board's Decision

If a dispute (of any kind whatsoever) arises between the Parties in connection with, or arising out of, the Contract or the execution of the Works, including any dispute as to any certificate, determination, instruction, opinion or valuation of the Engineer, either Party may refer the dispute in writing to the DB for its decision, with copies to the other Party and the Engineer. Such reference shall state that it is given under this Sub-Clause.

For a DB of three persons, the DB shall be deemed to have received such reference on the date when it is received by the chairman of the DB.

Both Parties shall promptly make available to the DB all such additional information, further access to the Site, and appropriate facilities, as the DB may require for the purposes of making a decision on such dispute. The DB shall be deemed to be not acting as arbitrator(s).

[Within 84 days after receiving such reference, or within such other period as may be proposed by the DB and approved by both Parties, the DB shall give its decision](#), which shall be reasoned and shall state that it is given under this Sub-Clause. The decision shall be binding on both Parties, who shall promptly give effect to it unless and until it shall be revised in an amicable settlement or an arbitral award as described below. Unless the Contract has already been abandoned, repudiated or terminated, the Contractor shall continue to proceed with the Works in accordance with the Contract.

If either Party is dissatisfied with the DB's decision, then either Party may, within 28 days after receiving the decision, give a Notice of Dissatisfaction to the other Party indicating its dissatisfaction and intention to commence arbitration. If the DB fails to give its decision within the period of 84 days (or as otherwise approved) after receiving such reference, then either Party may, within 28 days after this period has expired, give a Notice of Dissatisfaction to the other Party.

In either event, this Notice of Dissatisfaction shall state that it is given under this Sub-Clause, and shall set out the matter in dispute and the reason(s) for dissatisfaction. Except as stated in Sub-Clause 20.7 [Failure to Comply with Dispute Board's Decision] and Sub-Clause 20.8 [Expiry of Dispute Board's Appointment], neither Party shall be entitled to commence arbitration of a dispute unless a Notice of Dissatisfaction has been given in accordance with this Sub-Clause.

If the DB has given its decision as to a matter in dispute to both Parties, and no Notice of Dissatisfaction has been given by either Party within 28 days after it received the DB's decision, then the decision shall become final and binding upon both Parties.

20.5 Amicable Settlement

Where a Notice of Dissatisfaction has been given under Sub-Clause 20.4 above, both Parties shall attempt to settle the dispute amicably before the commencement of arbitration. However, unless both Parties agree otherwise, the Party giving a Notice of Dissatisfaction in accordance with Sub-Clause 20.4 above should move to commence arbitration after the fifty-sixth day from the day on which a Notice of Dissatisfaction was given, even if no attempt at an amicable settlement has been made.

20.6 Arbitration

Any dispute between the Parties arising out of or in connection with the Contract not settled amicably in accordance with Sub-Clause 20.5 above and in respect of which the DB's decision (if any) has not become final and binding [shall be finally settled by arbitration](#). Arbitration shall be conducted as follows:

- (a) [if the Contract is with foreign contractors](#),
 - (i) for contracts financed by all participating Banks except under subparagraph (a)(ii) below: [international arbitration](#) (1) with proceedings administered by the arbitration institution designated in the Contract Data, and conducted under the rules of arbitration of such institution; or, if so specified in the Contract Data, (2) international arbitration in accordance with the arbitration rules of the [United Nations Commission on International Trade Law \(UNCITRAL\)](#); or (3) if neither an arbitration institution nor UNCITRAL arbitration rules are specified in the Contract Data, with proceedings administered by the [International Chamber of Commerce \(ICC\)](#) and conducted under the ICC Rules of Arbitration; by one or more arbitrators appointed in accordance with said arbitration rules.
 - (ii) for contracts financed by the Asian Development Bank:
international arbitration (1) with proceedings administered by the arbitration institution specified in the Contract Data and conducted under the rules of arbitration of such institution unless it is specified in the Contract Data that the arbitration shall be conducted under the rules of the United Nations Commission on International Trade Law (UNCITRAL) and if UNCITRAL Rules are so specified then the named arbitration institution shall be the appointing authority and shall administer the arbitration); or (2) if an arbitration institution is not specified in the Contract Data, with proceedings administered by the Singapore International Arbitration Centre (SIAC) and conducted under the SIAC Rules, by one or more arbitrators appointed in accordance with the said arbitration rules.
- (b) if the Contract is with domestic contractors, arbitration with proceedings conducted in accordance with the laws of the Employer's country.

The place of arbitration shall be the neutral location specified in the Contract Data; and the arbitration shall be conducted in the language for communications defined in Sub- Clause 1.4 [Law and Language].

The arbitrators shall have full power to open up, review and revise any certificate, determination, instruction, opinion or valuation of the Engineer, and any decision of the DB, relevant to the dispute. Nothing shall disqualify representatives of the Parties and the Engineer from being called as a witness and giving evidence before the arbitrators on any matter whatsoever relevant to the dispute.

Neither Party shall be limited in the proceedings before the arbitrators to the evidence or arguments previously put before the DB to obtain its decision, or to the reasons for dissatisfaction given in its Notice of Dissatisfaction. Any decision of the DB shall be admissible in evidence in the arbitration. Arbitration may be commenced prior to or after completion of the Works. The obligations of the Parties, the Engineer and the DB shall not be altered by reason of any arbitration being conducted during the progress of the Works.

20.7 Failure to Comply with Dispute Board's Decision
In the event that a Party fails to comply with a final and binding DB decision, then the other Party may, without prejudice to any other rights it may have, refer the failure itself to arbitration under Sub-Clause 20.6 [Arbitration]. Sub-Clause 20.4 [Obtaining Dispute Board's Decision] and Sub-Clause 20.5 [Amicable Settlement] shall not apply to this reference.

20.8 Expiry of Dispute Board's Appointment
If a dispute arises between the Parties in connection with, or arising out of, the Contract or the execution of the Works and there is no DB in place, whether by reason of the expiry of the DB's appointment or otherwise:

- (a) Sub-Clause 20.4 [Obtaining Dispute Board's Decision] and Sub-Clause 20.5 [Amicable Settlement] shall not apply, and
- (b) the dispute may be referred directly to arbitration under Sub-Clause 20.6 [Arbitration].

List of Comparison between JICA GC/PC and MoRT&H's modifications of Section VIII(PC)

(備考)本検討においては、「片務性あり」の定義は「JICA Procurement Guidelines/SBD より、条件が(少しでも)悪い modifications」、
「片務性の可能性がある」の定義は「未経験の内容であり、MoRT&H に、Clauses の主旨、どのように運用するか?等の確認が
必要な modifications」としています。

No.	JICA GC/PC	MoRT&H's modifications in PC	「片務性」の検討			
			「片務性あり」 = × 「片務性の可能性がある」 = △ 「片務性なし」 = ○	検討結果(案)		
1	JICA GC: 4.2 Performance Security JICA PC: 4.2 Performance Security -----Modification by MoRT&H at PC 4.2----- This clause will be superseded by Article 7 of MoRT&H's EPC document provided with this PC. (Source: Final Model EPC Agreement 16.01.2017, Page32) -	(MoRT&H's Article 7) 7.1 Performance Security 7.1.1: within 10 (ten) days of the date of this Agreement (JICA SBD) within 28 days after receiving the Letter of Acceptance (GC 4.2)	JICA SBD(28 日)より、短い(10 日)	*通常、契約ネゴ段階に、準備に入るので、契約調印後、10 日でも、実務的な支障は無いが、JICA SBD より、条件が悪くなっている、「片務性あり」とした。	×	
		7.1.1: irrevocable and unconditional guarantee from a Bank (JICA SBD) "demand guarantee" or "performance bond" / by a reputable bank or financial institution selected by the Contractor (GC 4.2)	MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。			○
		7.1.1: form set forth in Schedule-G (Source: Final Model EPC Agreement 16.01.2017, Page 167) (JICA SBD) form annexed to the Particular Conditions, as stipulated by the Employer in the Contract Data , or in another form approved by the Employer (GC 4.2, Section IX) (also ITB44.1, Section I)	JICA SBD でも「or in another form approved by the Employer」としており、JICA SBD より、特段、JICA SBD より条件が悪くなっていない。			○
		7.1.1: an amount equal to 5% (five percent) of the Contract Price (JICA SBD) the amount stated in the Contract Data (PC 4.2)	JICA Procurement Guidelines (Section 4.14)に「the amount (which may vary greatly, depending on the case, and is between 5 and 15% of the contract price)」とあり、MoRT&H の方の 5%は、推奨範囲の下限値であり、Contractor にとって、JICA SBD より条件が悪くなっていない。			○
		7.1.1: valid until 60 (sixty) days after the Defects Liability Period (JICA SBD) valid and enforceable until the Contractor has executed and completed the Works and remedied any defects (GC 4.2)	JICA Procurement Guidelines (Section 4.14)に「the validity period is normally about one year after completion of the work) should be reasonable」あり、MoRT&H の条件は Contractor にとって JICA SBD より条件が悪くなっており、「片務性あり」とした。			×
		7.1.1: Additional Performance Security, --- the bid price offered by the Contractor is lower than 10% but upto 20% of the Estimated Project Cost, --- the bid price offered by the Contractor is lower than 20%, --- valid until 28 (twenty eight) days after the issue of Completion Certificate	経験したことの無い条件であり、具体的に「Additional Performance Security の主旨と、どのように運用するか?」を、MoRT&H に確認する必要がある、「片務性の可能性がある」とした。			△

No.	JICA GC/PC	MoRT&H's modifications in PC	「片務性」の検討 「片務性あり」 = × 「片務性の可能性がある」 = △ 「片務性なし」 = ○	
			考察(案)	検討結果(案)
		(JICA SBD) There is no condition similar to this. Related clauses: • ITB 38.5, Section I: the Employer may require that the amount of the Performance Security be increased		
		7.1.2: failure of the Contractor to provide the Performance Security, --- terminated (JICA SBD) fails to comply with Sub-Clause 4.2 [Performance Security] (GC 15.2 Termination by Employer) Related clauses: • ITB 21.6 (b), Section I: The Bid Security may be forfeited, if the successful Bidder fails to (ii) furnish a Performance Security in accordance with ITB 44.	MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。	○
		7.1.3: fails to provide the Performance Security within 10 (ten) days, --- at the rate of 0.01%, --- additional 30 days (JICA SBD) There is no condition in GC. Within twenty-eight (28) days of the receipt of the Letter of Acceptance from the Employer, the successful Bidder shall furnish the Performance Security (ITB 44.1, Section I)	JICA SBD では「期限を過ぎた場合の猶予(金利が付加されるが、更に 30 日延長)」という規定は無く、期限を過ぎると、いきなり、Bid Security を没収される可能性がある (ITB 21.6 (b))。そのため、MoRT&H の条件は、「条件が悪くなっている」とは言えない。	○
		7.2 Extension of Performance Security 7.2: The Contractor may initially provide the Performance Security for a period of 2 (two) years (JICA SBD) There is no condition in GC valid and enforceable until the Contractor has executed and completed the Works and remedied any defects (GC 4.2)	MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。	○
		7.3 Appropriation of Performance Security 7.3.1: entitled to encash and appropriate the relevant amounts from the Performance Security (JICA SBD) specified in Form “Performance Security”, Section IX “irrevocably undertake to pay the Beneficiary any sum or sums”	MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。	○
		7.3.2: replenish or furnish fresh Performance Security (JICA SBD) There is no condition in GC.	「7.1.1 Additional Performance Security」と同様、具体的に「fresh Performance Security の主旨と、どのように運用するのか」を、MoRT&H に確認する必要があるので、「片務性の可能性がある」とした。	△
		7.3.3: the Milestones -II/III/IV (Source: Final Model EPC Agreement 16.01.2017, Page32, Schedule J,) (JICA SBD) If any milestones required, specified in Section VI	MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。	○

No.	JICA GC/PC	MoRT&H's modifications in PC	「片務性」の検討	
			「片務性あり」 = × 「片務性の可能性がある」 = △ 「片務性なし」 = ○	検討結果(案)
			考察(案)	検討結果(案)
		<p>7.4 Release of Performance Security 7.4.1: return the Performance Security to the Contractor within 60 (sixty) days of the later of the expiry of the Maintenance Period or the Defects Liability Period (JICA SBD) return the Performance Security to the Contractor within 21 days after receiving a copy of the Performance Certificate</p>	MoRT&H の条件は、JICA SBD より条件が悪くなっており、「片務性あり」と言える。	×
		<p>7.5 Retention Money 7.5: Retention Money” is included in Article 7. This modification should be done at 14.9 added in Section VIII. (JICA SBD) specified in 14.3 and 14.9 in Section VII (GC).</p>	(検討対象外)	—
		<p>7.5.1: deduct 6% (JICA SBD) applying the percentage of retention stated in the Contract Data (GC 14.3 (c)) <i>[usually 5 and not exceeding 10]</i></p>	MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。	○
		<p>7.5.2: Upon occurrence of a Contractor’s Default (JICA SBD) Specified in Form “Retention Money Security”, Section IX</p>	MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。	○
		<p>7.5.3: unconditional bank guarantee / form provided at Annex-II of Schedule-G (Source: Final Model EPC Agreement 16.01.2017, Page 167) (JICA SBD) Form “Retention Money Security”, Section IX (Demand Guarantee), or in another form approved by the Employer and issued by a reputable bank or financial institution selected by the Contractor</p>	JICA SBD でも「or in another form approved by the Employer」としており、「JICA SBD より条件が悪くなっている」とは言えない。	○
		<p>7.5.4: Within 15 (fifteen) days of the date of issue of the Completion Certificate, the Authority shall discharge the bank guarantees (JICA SBD) 1) If a Taking-Over Certificate is issued for a Section or part of the Works, a proportion of the Retention Money shall be certified and paid. This proportion shall be half (50%) 2) The release of the second half of the Retention Money against a guarantee shall then be in lieu of the release under the second paragraph of this Sub-Clause. The Employer shall return the guarantee to the Contractor within 21 days after receiving a copy of the Performance Certificate.</p>	JICA SBD では、「the guarantee を Performance Certificate 発効後(Defect Notification Period 後)に返却」とあり、MoRT&H の条件では、「the guarantee を Completion Certificate 発効後(工事竣工後)に返却」であり、「JICA SBD より条件が悪くなっている」とは言えない。	○
		<p>7.5.5: Termination (JICA SBD) --- Employer shall pay any balance to the Contractor. (GC 15.4 (c))</p>	MoRT&H の条件は、「条件が悪くなっている」とは言えない。	○

No.	JICA GC/PC	MoRT&H's modifications in PC	「片務性」の検討	
			「片務性あり」 = × 「片務性の可能性がある」 = △ 「片務性なし」 = ○	検討結果(案)
			考察(案)	検討結果(案)
2	<p>JICA GC: 4.4 Subcontractor JICA PC: (There is no “4.4” in Section VIII (PC), JICA SBD.)</p> <p>-----Modification by MoRT&H at PC4.4----- The following write-up will supersede the GC clause (ref clause 3.2 of MoRT&H's EPC document: (Source: Final Model EPC Agreement 16.01.2017, Page 20)</p>	<p>(MoRT&H's Clause 3.2)</p> <p>4.4 Obligations relating to sub-contracts and any other agreements</p> <p>4.4.1: shall not sub-contract any Works in more than 49% (forty nine per cent) of the total length, --- equipment in at least 51% (fifty one per cent) of the total length (JICA SBD) There is no condition in GC. If required, this conditions should be included in Section III.</p>	<p>JICA SBD では、通常、Section III で、subcontractors への工事下請けに関する制限事項を追記するケースはないが、必要であれば Section III に追記できる。 よって、 MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。</p>	○
		<p>4.4.1: in no more than 5 (five) sections of the Project Highway (JICA SBD) There is no condition.</p>	<p>JICA SBD (Section VIII(PC) 1.1.5.6) で、Sections を規定できる。 よって、 MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。</p>	○
		<p>4.4.1: all obligations and liabilities --- shall at all times remain with the Contractor (JICA SBD) The relevant clause is “GC 4.4 The Contractor shall be responsible for the acts or defaults of any Subcontractor” and “GC 1.14 Joint and Several Liability“.</p>	<p>MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。</p>	○
		<p>4.4.2: aggregate of such sub-contracts with any Sub-contractor, exceeds 5%, --- The Authority shall examine the particulars of the sub-contractor --- (JICA SBD) There is no condition in GC. If required, this conditions should be included in Section III.</p>	<p>JICA SBD では、Section III で、「Contractor が使う予定の subcontractors の Experience 等の Requirements を規定することは可能であるが、 「Employer が Contractor が使う予定の subcontractors をチェックする」規定を付加する事例は見たことが無い。 MoRT&H の条件は「Employer が、subcontractors を審査して、Reject できる可能性がある」と読めるので、「片務性の可能性がある」とした。MoRT&H に、この規定の主旨を確認する必要がある。</p>	△
		<p>4.4.3: over the preceding 3 (three) years, not undertaken at least one work of a similar nature with a contract value exceeding 40%, --- value of the sub-contract to be awarded hereunder and received payments in respect thereof for an amount equal to at least such 40% (JICA SBD) For the member of Consortium/Joint Venture and subcontractors, the conditions should be specified in Eligibility and Qualification Criteria Section III.</p>	<p>JICA SBD では、通常、Section III で、subcontractors の Experience の Requirements を追記するケースはないが、必要であれば Section III に追記できる。 よって、MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。</p>	○

No.	JICA GC/PC	MoRT&H's modifications in PC	「片務性」の検討 「片務性あり」 = × 「片務性の可能性がある」 = △ 「片務性なし」 = ○	
			考察(案)	検討結果(案)
		4.4.4: Contractor shall, at all times, be responsible and liable for all its obligations under this Agreement notwithstanding anything contained in the agreements with its Sub-contractors --- (JICA SBD) The relevant clause is “GC 4.4 The Contractor shall be responsible for the acts or defaults of any Subcontractor” and “GC 1.14 Joint and Several Liability“.	MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。	○
3	<p>JICA GC: 8 COMMENCEMENT, DELAYS AND SUSPENSION</p> <p>8.1 Commencement of Works 8.2 Time for Completion 8.3 Programme 8.4 Extension of Time for Completion 8.5 Delays Caused by Authorities 8.6 Rate of Progress 8.7 Delay Damages 8.8 Suspension of Work 8.9 Consequences of Suspension 8.10 Payment for Plant and Materials in Event of Suspension 8.11 Prolonged Suspension 8.12 Resumption of Work</p> <p>JICA PC: 8.1 (c) Commencement of Works</p> <p>-----Modification by MoRT&H at PC8.1 (c)----- This clause will be superseded by Article 4 of MoRT&H's EPC document provided with this PC.</p>	<p>MoRT&H's Article 4)</p> <p>1) Article 4: Compensation for Damages” (Source: Model RFP Vol I EPC 16.1.17”, Page 74) (Refer to Appendix 1 (1) below)</p> <p>If Article 4 is “Article 4: Compensation for Damages”:</p> <ul style="list-style-type: none"> The modification of contents related to Article 4 (1) should be done in Section II (Bid data Sheet), as “ITB Bid Security”, etc., if necessary. (***This modification will not make a discrepancy in JICA SBD.***) The modification of contents related to Article 4 (2) should be done in Section VIII (PC), as “15.5 Employer’s Entitlement to Termination for Convenience ”, etc., if necessary. (*This modification will not make a discrepancy in JICA SBD.*) 	MoRT&Hの条件は、「JICA SBDより条件が悪くなっている」とは言えない。	○
		<p>2) ARTICLE 4: OBLIGATIONS OF THE AUTHORITY (Source: Final Model EPC Agreement 16.01.2017, Page 24) (Refer to Appendix 1 (2) below)</p> <p>If Article 4 is “Article 4: OBLIGATIONS OF THE AUTHORITY”:</p> <ul style="list-style-type: none"> The modification of contents related to Article 4 should be done in Section VIII (PC), as “2.6 Obligation of the Employer”, etc., if necessary. (*This modification will not make a discrepancy in JICA SBD.*) 	MoRT&Hの条件は、「JICA SBDより条件が悪くなっている」とは言えない。	○
4	<p>GC: 11 DEFECTS LIABILITY</p> <p>11.1 Completion of Outstanding Work and Remedying Defects 11.2 Cost of Remedying Defects 11.3 Extension of Defects Notification Period 11.4 Failure to Remedy Defects 11.5 Removal of Defective Work</p>	<p>(MoRT&H's Article 17) ARTICLE 17 DEFECTS LIABILITY</p> <p>17.1 Defects Liability Period 17.1.1: a period of 4 (four) years commencing from the date of Provisional Certificate (JICA SBD) specified at 1.1.3.7 in Section VIII (PC)</p>	<p>International defacto standard および FIDIC ベースの契約では、通常「1~2年」であり、「JICA SBD より条件が悪くなっている」と言えます。 (補足 1) Bidders は、Bidding Documents の条件を精査して、リスクを感じる条件がある場合、以下の対応を考えます：</p>	×

No.	JICA GC/PC	MoRT&H's modifications in PC	「片務性」の検討 「片務性あり」 = × 「片務性の可能性がある」 = △ 「片務性なし」 = ○	
			考察(案)	検討結果(案)
	11.6 Further Tests 11.7 Right of Access 11.8 Contractor to Search 11.9 Performance Certificate 11.10 Unfulfilled Obligations 11.11 Clearance of Site PC: (There is no "11." in Section VIII, JICA SBD.) -----Modification by MoRT&H at PC11----- This clause will be superseded by Article 17 of MoRT&H's EPC document provided with this PC. (Source of Article 17: Defects Liability, Final Model EPC Agreement 16.01.2017, Page 72)		1) 保険に入ることができれば、それでカバーする。 2) リスク(新たな金利負担 等)を金額に換算して、 Bid Price に加算する。 しかし、瑕疵担保期間 4 年というリスクは、 1) 金額を想定しにくいこと 2) 「SECTION VI(Employer' s R)の不備から生じたダメージ」か「施工責任」なのかの判定が困難であり、よって、紛争発生の可能性を高めることから「JICA SBD より条件が悪くなっている」と言えます。 (補足 2) 「Contractor の手抜き工事を防止するのが、4 年とする主旨のようですが、手抜き工事の防止は、Supervision(工事監理)の課題であると認識しています。」	
		17.1.1: Defects Liability Period shall in no case be less than 42 (forty two) months from the date of Completion Certificate (JICA SBD) The period should be specified in 1.1.3.7, Part A, Section VIII (PC)	International defacto standard および FIDIC ベースの契約では、通常「1~2年」であり、「JICA SBD より条件が悪くなっている」と言えます。	×
		17.1.1: Maintenance obligations (JICA SBD) specified in GC 11.1 Completion of Outstanding Work and Remedying Defects	「期間の長さ」以外は、「JICA SBD より条件が悪くなっている」とは言えない。	○
		17.2 Remedying Defects 17.2: 15 (fifteen) days from the date of notice issued (JICA SBD) GC 11.1 (b): execute all work required to remedy defects or damage, as may be notified by (or on behalf of) the Employer on or before the expiry date of the Defects Notification Period for the Works or Section / GC 11.4: within a reasonable time	MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。	○
		17.3 Cost of remedying Defects 17.3: Cost of remedying Defects (JICA SBD) specified at GC 11.2: Cost of Remedying Defects		
		17.4 Contractor's failure to rectify Defects 17.4: Contractor's failure to rectify Defects (JICA SBD) specified at GC 11.4 Failure to Remedy Defects		
		17.5 Contractor to search cause 17.5.1: instruct the Contractor to examine the cause of any Defect (JICA SBD) specified at GC 11.8 Contractor to Search		

No.	JICA GC/PC	MoRT&H's modifications in PC	「片務性」の検討 「片務性あり」 = × 「片務性の可能性がある」 = △ 「片務性なし」 = ○	
			考察(案)	検討結果(案)
		17.5.2: any Defect identified is attributable to the Contractor (JICA SBD) specified at GC 11.2: Cost of Remedying Defects		
		17.6.: Extension of Defects Liability Period ***The limit of the extension period is not stated.*** (JICA SBD) specified at GC 11.3 Extension of Defects Notification Period *** However, a Defects Notification Period shall not be extended by more than two years.***	MoRT&Hは、GC 11.3「a Defects Notification Period shall not be extended by more than two years.」を削除しており、「JICA SBDより条件が悪くなっている」と言えます。	×
5	JICA GC: 14.2 Advance Payment JICA PC: 14.2 Total advance payment ----Modification by MoRT&H at PC14.2---- The following write-up will supersede the GC clause (ref clause 19.2 of MoRT&H's EPC document: (Source of Article 19.2: Final Model EPC Agreement 16.01.2017", Page 78)	(MoRT&H's Clause 19.2) 14.2 Advance Payment 14.2.1: an interest-bearing advance payment (JICA SBD) an interest-free loan for mobilisation and cash flow support (GC 14.2)	MoRT&H の条件は、金利付きであり、「JICA SBD より条件が悪くなっている」と言えます。	×
		14.2.1: amount to 10 (ten) percent of the Contract Price (JICA SBD) specified at 14.2 Total advance payment, Section VIII (PC)	JICA Procurement Guidelines (Section 4.13)に「The percentage can usually be expected to lie between 10 and 15% of the contract price.」とあり、MoRT&H の方の 10% は、JICA Guidelines を満たしており、「JICA SBD より条件が悪くなっている」とは言えない。	○
		14.2.1: The second 5% (five percent) mobilisation advance (JICA SBD) specified at 14.2 Total advance payment, Section VIII (PC)	経験したことの無い条件であり、具体的に「Advance Payment 分割の主旨と、どのように運用するのか」を、MoRT&H に確認する必要があるので、「片務性の可能性がある」とした。	△
		14.2.1: an additional interest-bearing advance payment (JICA SBD) an interest-free loan for mobilisation and cash flow support (GC 14.2)		
		14.2.2: an amount equivalent to 110% (JICA SBD) There is no condition in GC.		
		14.2.2: form provided at Annex-III of Schedule-G (Source: Final Model EPC Agreement 16.01.2017, Page 167) (JICA SBD) form annexed to the Particular Conditions or in another form approved by the Employer (GC 14.2)	JICA SBD でも「or in another form approved by the Employer」としており、「JICA SBD より条件が悪くなっている」とは言えない。	○

No.	JICA GC/PC	MoRT&H's modifications in PC	「片務性」の検討 「片務性あり」 = × 「片務性の可能性がある」 = △ 「片務性なし」 = ○	
			考察(案)	検討結果(案)
		14.2.4: after 60 (sixty) days from the Appointed Date, --- second instalment of the Advance Payment --- (JICA SBD) after the Employer receives (i) the Performance Security in accordance (ii) a guarantee in amounts and currencies equal to the advance payment (GC 14.2)	経験したことの無い条件であり、具体的に「Advance Payment の分割の主旨と、どのように運用するのか」を、MoRT&H に確認する必要があるので、「片務性の可能性がある」とした。	△
		14.2.4: the second instalment of the Advance Payment, --- amount equivalent to 110% (one hundred and ten per cent) of such instalment (JICA SBD) There is no condition in GC.		
		14.2.5: within 15 (fifteen) days of the receipt of its respective requests in accordance with the provisions of this Clause 14.2 (JICA SBD) when the Contractor submits a guarantee in accordance with this Sub-Clause (GC 14.2)	JICA SBD では、Contractor が Advance Payment を請求してから「**日以内に支払う」という規定は無く、MoRT&H の条件は「15 日以内」となっており、Contractor にとって好ましい規定である。よって、「JICA SBD より条件が悪くなっている」とは言えない。	○
		14.2.7 : advance payment shall be repaid through percentage deductions from the stage payments determined by the Authority's Engineer in accordance with Sub-Clause 14.5 (JICA SBD) specified at GC 14.2 a) and (b)	MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。	○
		14.2.7: deductions shall be made at the rate of 15% (fifteen percent) of each Stage Payment Statement , --- repaid prior to the time when 80% (80 percent) of the Contract Price (JICA SBD) exceeds 30 percent (30%) of the Accepted Contract Amount, --- repaid prior to the time when 90 percent (90%) (GC 14.2 a) and (b))	JICA SBD では「90%」、MoRT&H の条件は「80%」ではあるが、MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。	○
		14.2.8: Advance Payment has not been fully repaid prior to Termination (JICA SBD) If the advance payment has not been repaid prior to the issue of the Taking-Over Certificate for the Works or prior to termination under Clause 15 [Termination by Employer]	MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。	○

No.	JICA GC/PC	MoRT&H's modifications in PC	「片務性」の検討	
			「片務性あり」 = × 「片務性の可能性がある」 = △ 「片務性なし」 = ○	検討結果(案)
			考察(案)	検討結果(案)
6	<p>JICA GC: 20 CLAIMS, DISPUTES AND ARBITRATION</p> <p>20.1 Contractor's Claims 20.2 Appointment of the Dispute Board 20.3 Failure to Agree on the Composition of the Dispute Board 20.4 Obtaining Dispute Board's Decision 20.5 Amicable Settlement 20.6 Arbitration 20.7 Failure to Comply with Dispute Board's Decision 20.8 Expiry of Dispute Board's Appointment</p> <p>JICA PC: (There is no "20." in Section VIII, JICA SBD.)</p> <p>-----Modification by MoRT&H at PC20.----- <i>This clause (GC 20.) will be superseded by Article 26 of MoRT&H's EPC document provided with this PC.</i> (Source of Article 26: Final Model EPC Agreement 16.01.2017, Page 115)</p> <p>All of the particular conditions for PC 20.2 and PC 20.3 at the left are also deleted.</p>	<p>(MoRT&H's Article 26) Article 26: Dispute resolution</p> <p><i>"JICA GC 20. 1 Contractor's Claims" is also deleted. This results in unilateral contract, as "Contractor's Claims" is one of Contractor's rights in the international standard of general conditions of Contract.</i></p>	<p>MoRT&H は、“JICA GC 20. 1 Contractor’ s Claims”を削除しており、 JICA SBD より条件が悪くなっている。</p>	×
		<p>26.1 Dispute Resolution 26.1.1: <i>notified in writing by either Party to the other Party (the "Dispute"), --- in the first instance, be attempted to be resolved amicably ---</i> (JICA SBD) <i>There is no discrepancy in between.</i></p>	<p>MoRT&H の条件は、「JICA SBD より条件が悪くなっている」とは言えない。</p>	○
		<p>26.1.2: <i>use their best efforts, --- equitably and in good faith ---</i> (JICA SBD) <i>There is no discrepancy in between.</i></p>		
		<p>26.1.2: Conciliator (JICA SBD) Dispute Board (GC 20.2)</p>	<p>26.2: conciliation procedure 26.2: conciliation procedure Step-1: meet no later than 7 (seven) business days for amicable settlement Step-2: not amicably settled within 15 (fifteen) days of the meeting or the Dispute is not resolved as evidenced by the signing of written terms of settlement within 30 (thirty) days. This results in Arbitration. (JICA SBD) Step-1: The notice shall be given as soon as practicable, and not later than 28 days after the Contractor became aware. (GC 20.1) Step-2: Within 42 days after the Contractor became aware, --- the Contractor shall send to the Engineer a fully detailed claim (GC 20.1) Step-3: If the Engineer does not respond within the timeframe, --- may refer to the Dispute Board ---(GC 20.1)</p>	<p>MoRT&H の条件は、JICA SBD より Arbitration へ突入する期間が短く、Contractor にとって、Disputes を争う準備期間が短くなり、よって、 JICA SBD より条件が悪くなっている</p>

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			「片務性あり」 = × 「片務性なし」 = ○	「片務性の可能性がある」 = △
			考察(案)	検討結果(案)
		<p>Step-4: Within 84 days after receiving such reference, or within such other period as may be proposed by the DB and approved by both Parties, the DB shall give its decision. If the DB fails to give its decision within the period of 84 days (GC 20.4)</p> <p>Step-5: shall be finally settled by arbitration (GC 20.6)</p>		
		<p>26.3 Arbitration</p> <p>26.3.1: rules of arbitration of the SOCIETY FOR AFFORDABLE REDRESSAL OF DISPUTES (JICA SBD) if the Contract is with foreign contractors, International arbitration, such as UNCITRAL, ICC (GC 20.6)</p>	<p>MoRT&H の条件は、国際機関ではなく自国の組織を指定しており、JICA SBD より条件が悪くなっている。</p>	×
		<p>26.3.3: The arbitrators shall make a reasoned award (JICA SBD) There is no discrepancy in between.</p>		
		<p>26.3.3: undertake to carry out such Award without delay (JICA SBD) There is no condition in GC.</p>		
		<p>26.3.4: an Award may be enforced (JICA SBD) There is no condition in GC.</p>		
		<p>26.3.5: remain in full force and effect, pending the Award (JICA SBD) There is no condition in GC.</p>		
		<p>26.3.6: an interim payment to the other Party for an amount equal to 75%, --- Bank Guarantee for a sum equal to 120 %, --- rate of 10% (ten per cent) per annum (JICA SBD) There is no condition in GC.</p>		
		<p>26.4: Adjudication by Regulatory Authority, Tribunal or Commission (JICA SBD) There is no condition in GC.</p>		

JICA GC/PC 以外の部分での片務性の検討

a	<p>Section I Instructions to Bidders (Single-Stage Two-Envelope Bidding)</p> <p>3. Corrupt and Fraudulent Practices</p>	<p>"JICA SBD PC 3.2" is deleted and replace with:</p> <p>The below is added as "3.2" and the original "3.2" becomes "3.3".</p> <p>3.2 I Any entity which has been barred by the Ministry of Road Transport & Highways or its implementing agencies for the works of Expressways, National Highways, ISC and EI works, and the bar subsists as on the date of Application, would not be eligible to submit the BID, either individually or as member of a Joint Venture.</p> <p>II While bidding is open to persons from any country, the following provisions shall apply:</p> <p>(a) Where, on the date of the Application, not less than 15% (fifteen percent) of the aggregate issued, subscribed and paid up equity share capital in a Bidder or its Member is held by persons resident outside India or where a Bidder or its Member is controlled by persons resident outside India; or</p> <p>(b) if at any subsequent stage after the Bid due date, there is an acquisition of not less than</p>	<p>MoRT&H の条件"3.2.II"は、「外国資本が 15%以上」で縛りを入れており、JICA SBD より条件が悪くなっている。</p> <p>(補足事項)"3.2.II" の規定の主旨を、MoRT&H に、確認する必要がある。</p>	×
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		<p>15% (fifteen percent) of the aggregate issued, subscribed and paid up equity share capital or control, by persons resident outside India, in or of the Bidder or its Member; then the Eligibility of such Bidder shall be subject to approval of the Authority from national security and public interest perspective. The decision of the Authority in this behalf shall be final and conclusive and binding on the Bidder.</p> <p>The holding or acquisition of equity or control, as above, shall include direct or indirect holding/ acquisition, including by transfer, of the direct or indirect legal or beneficial ownership or control, by persons acting for themselves or in concert and in determining such holding or acquisition, the Authority shall be guided by the principles, precedents and definitions contained in the Securities and Exchange Board of India (Substantial Acquisition of Shares and Takeovers) Regulations, 1997, or any substitute thereof, as in force on the date of such acquisition.</p> <p>The Bidder shall promptly inform the Authority of any change in the shareholding, as above, and failure to do so shall render the Bidder liable for disqualification from the Bidding Process.</p> <p>3.3 Furthermore, Bidders shall be aware of the provision stated in Sub-Clause 15.6 [Corrupt and Fraudulent Practice] of General Conditions.</p>		
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